PN-ACF-379

FAMILY-CENTERED MATERNITY CARE TRAINING OF TRAINERS CURRICULUM

UKRAINE, 1996

Patricia A. Paluzzi, CNM, MPH
Pauline Glatleider, CNM, MSN

A USAID supported collaborative project of the American College of Nurse-Midwives under John Snow, Incorporated / Mother Care
CONTRACT NUMBER -5966-C-00-3038-00
DELIVERY ORDER NUMBER 3

BEST AVAILABLE COPY

A

Introduction
to
Family-Centered Maternity Care Curriculum
Training of Trainers

The past two decades have been a time of significant change for maternity care practices Simultaneous medical and social dynamics have led to increased attention to the need for a balance between technology and the human element when providing maternity care The result is an approach to care known as Family-Centered Maternity Care (FCMC)

Family-Centered Maternity Care (FCMC) is defined as care which emphasizes the multiple needs of women and utilizes education and family involvement as major tools for engaging the woman in the process of her own care FCMC is based on current research which has demonstrated the true effectiveness of maternity care practices

The FCMC Training of Trainers Project in Ukraine is a part of a larger cooperative agreement between the Ukraine Ministry of Health and USAID The primary goal of the cooperative agreement is to improve the quality of reproductive health in Ukraine Family Planning and FCMC are components of this work The inclusion of FCMC is a response to requests for such content from Ukrainian women's health care providers

The Ukraine Ministry of Health, Mothercare/JSI and the American College of Nurse-Midwives have collaborated to produce a FCMC project The main objectives of the FCMC project are to create a core group of women's health care providers to implement FCMC They will then develop FCMC demonstration projects at their own institutions Further, these providers will be trained as trainers and will train other Ukrainian practitioners in the philosophy and practices of Family-Centered Maternity Care

This curriculum serves as the primary teaching tool for the Ukraine Training of Trainers (TOT) I n Family Centered Maternity Care It is also the basis for future training of additional Ukrainian women's health care providers in FCMC

Through the request for and acceptance of FCMC practices, women's health care providers in Ukraine have demonstrated their commitment to the improvement of maternity services and thus the health and well-being of the mothers and babies in their country

B

TABLE OF CONTENTS

I CURRICULUM

A	DAY ONE		1
B	DAY TWO	..	14
C	DAY THREE		21
D	DAY FOUR		28
E	DAY FIVE		33

II ADDENDA. DAY ONE

- A Definition of FCMC
- B Chalmer's List
- C Case Study
- D Action Plan
- E TOT Schedule

III ADDENDA DAY TWO

- A Pre-Test
- B Key Literature Articles
- C Risk Assessment Criteria

IV ADDENDA DAY THREE

- A Case Studies (3) Barriers
- B Fetal Kick Count

V ADDENDA DAY FOUR

- A Case Study Evaluation Process
- B Case Studies (3) Evaluation Process
- C Critical Indicators

VI ADDENDA DAY FIVE

- A Scenarios for Role Play
- B Evaluation Week One
- C. Post-Test
- D Clinical Skills List

C

DAY 1 *Overview/Defining Family Centered Maternity Care (FCMC)*

Learning Objectives
At the end Day 1, the participants will be able to

1 define and describe FCMC
2 describe the current and future FCMC Training of Trainers (TOT) Project
3 describe global trends in maternal-child health practices
4 describe current thinking on the appropriate use of technology in obstetrics
5 define and describe the anticipated barriers, reactions and outcomes to the integration of FCMC into the maternal health services of the Ukraine

Morning Session

- Time
  - 1 hour of greetings and introductions
  - 2 hours of lecture
- Materials
  - Slides
  - Handouts
  - Video

	TOPIC	TIME	TEACHING METHODS
	Greetings/introductions/recognitions	40 Minutes	Presentation
I	FCMC definition and introduction	10 Minutes	Lecture
II	Maternal-Child Health (MCH) in the Ukraine	20 Minutes	Lecture
	BREAK	**15 Minutes**	
III	Overview/goals of the FCMC TOT Project	20 Minutes	Lecture Slides
IV	MCH practices and impact on women s health	40 Minutes	Lecture Slides
V	The impact of technology on maternal and infant health and well being		Lecture Slides
VI	Global maternal-child health (MCH) trends including country specific information		Lecture Slides
VII	More detail about FCMC	30 Minutes	Lecture Slides

Lunch break 60 minutes

Optional viewing of JHPIEGO Video on Infection Control during lunch

Afternoon Session

- Time
  - 1 hour lecture to group
  - 75 mins case study and group work
  - 1 hour meeting with week-long participants
- Materials
  - Case study
  - Overheads
  - Handouts
  - Curriculum with action plan and schedule
  - Flip chart

TOPIC	TIME	TEACHING METHODS
VIII Review of Infection Control	30 Minutes	Lectures Overheads Handouts
IX Review of Risk Assessment	30 Minutes	Lectures Overheads Handouts
BREAK	15 Minutes	
SUMMARY/CLOSING QUESTION AND ANSWER PERIOD	60 Minutes	GROUP LED
XI Meet with trainers to orient to week and dispense materials Discuss goals and objectives of TOT Project and trainers expectations	60 minutes	Curriculum Action plan Handouts Schedule

MORNING SESSION

SESSION OUTLINE	SESSION NOTES
I Introduction/Definition of FCMC	**See Appendix A-Day One**
II MCH practices in the Ukraine	
1 Accepted standards of practice	• Educational preparation of women and family members for pregnancy labor and birth • Partner and family participation • Routine care practices • Mother and infant during the postpartum period • Length of postpartum stay for uncomplicated births
2 Current MCH statistics	• Maternal Mortality Rate • Infant Mortality Rate • Breastfeeding Rate • Fertility Rate • Abortion Rate • Contraception use • Cesarian Rate • Hospital Infection Rate • Perinatal Mortality
3 Current issues in MCH care	• Concerned about decreasing IMR and MMR • Concerned about ability to increase contraception use

MORNING SESSION - CON'T

SESSION OUTLINE	SESSION NOTES
3 Current issues in MCH care - cont d	• Concerned about ability to increase supplies • Concerned about improving the quality of care including implementing FCMC principles and practices such as 1 updating care practices 2 changing provider attitudes 3 offering labor support 4 not separating mother and baby • Concerned about in-hospital postpartum visitation by family and friends • Concerned about risk of infection
III Overview of the FCMC Project 1 History of the FCMC Project	• In 1994 USAID and the Ukraine MOH entered into a cooperative agreement to provide a 3-4 year comprehensive Reproductive Health program in Ukraine The emphasis has been on family planning however FCMC was requested by health care providers in Ukraine and further recommended by visiting consultants MotherCare accepted this initia-tive
2 Goal of the Reproductive Health	• Improve quality ofreproductive program health services in Ukraine • Improve access to reproductive health services in Ukraine
3 Goal of this initiative	• Integrate FCMC philosophy and practices into the maternity care services in Ukraine

MORNING SESSION - CON'T

SESSION OUTLINE	SESSION NOTES
4 Goals of the TOT	• Create a core group of FCMC trainers • Develop action plans for FCMC implementation into each training site • Develop training strategies for conducting FCMC TOT s at their institutions and others • Motivate and attain commitment from TOT Trainers to establish a demonstration model for FCMC at their various institutions • Develop strategies to reduce barriers to implementation of FCMC • Maintain technical working to provide training oversight each institution
IV Impact of MCH Practices	**See Appendix B - Day One**
1 Brief description of source	Chalmers et al reviewed maternity care practices and studies to date which either did or did not support their use and effectiveness The authors then listed these practices in a range from clearly beneficial to harmful This work represents randomized clinical trials of research-based care practices and is being used by countries such as the UK to review and change current maternity care practices

MORNING SESSION - CON'T

SESSION OUTLINE	SESSION NOTES
1 Beneficial practices	• Emotional and psycho-logical support in labor and birth
	• Maternal mobility and choice of position in labor
	• Free mobility during labor to augment slow labor
	• Consistent support for breastfeeding moms
	• Unrestricted breastfeeding
2 Likely beneficial practices	• Midwifery care for women with no serious risk factors
	• Antenatal classes for women and their partners who want them
	• Respecting women s choice of companions during labor and birth
	• Presence of a companion on admission to the hospital
	• Giving women as much information they desire
	• Other methods of pain relief in labor such as maternal movement and position change counter pressure superficial heat or cold touch and massage music and audio-analgesia atten-tion focusing and distraction
	• Women s choice of position for second stage of labor and/or giving birth
	• Encourage early infant-mother contact

MORNING SESSION - CON'T

SESSION OUTLINE	SESSION NOTES
3 Unlikely beneficial practices	
	• Routinely involve physicians/obstetricians in the care of all women during pregnancy and childbirth
	• Nor involving physicians in the care of women with serious risk factors
	• Routinely withholding food and drink from women in labor
	• Routine intravenous infusion in labor
	• Restriction of sibling visits to babies in hospitals
4 Ineffective or harmful practices	
	• Routine enema in labor
	• Routine pubic shave in preparation for delivery
	• Electronic fetal monitoring w/o access to scalp sampling during labor
	• Rectal exam for labor progress
	• Routine or liberal use of episiotomy for birth
	• Routine lithotomy or supine position in second stage of labor
	• Limitation of suckling time for breastfeeding

SESSION OUTLINE	SESSION NOTES
4 Ineffective or harmful practices -cont d	• Routine restriction of mother-infant contact • Routine hospital nursery care
V Impact of Technology	
1 Ultrasound	Positive impact Useful in SPECIFIC situations e g to diagnose fetal congenital anomalies Negative impact Ultrasound is expensive and routine use on healthy pregnant women does not positively effect perinatal outcomes There is still missing evidence about the safety of ultrasound during pregnancy
2 Routine electronic fetal monitoring	Positive impact Effective in detecting specific fetal compromised situations Negative impact has not improved overall fetal outcomes and has contributed to the rapidly increased cesarian rate in the U S from 4 5% in 1968 to 24 7% in 1988 The cesarian rate for 1993 declined to 21 8% partly as a response to the decreased reliance on electronic monitoring to decide management Interpretation of fetal heart rate patterns open to wide variation
3 Increased cesarian sections	Positive impact Life saving for unequivocal indications such as placenta previa and transverse lie Negative impact Despite improved skills and outcome cesarian s still have higher morbidity and mortality risks for the mother including a 2-4 times higher rate of maternal mortality than vaginal birth Elective repeat cesarian without trial of labor still practiced

SESSION OUTLINE	SESSION NOTES
4 Epidural anesthesia	Positive impact Pain relief for women Negative impact Increased use of oxytocin Increased risk of cesarian section and operative delivery
5 Oxytocin stimulation	Positive impact The use of oxytocin to augment labor with PROM if successful may subsequently reduce the rate of infection When accompanied by amniotomy oxytocin use can reduce morbidity in cases such as post-datism Negative impact Hyperstimulation with oxytocin can lead to reduced fetal oxygenation There is a correlation with increased jaundice in the newborn
VI Global MCH Trends	
1 United Kingdom	• Health care access for all • Majority hospital births with midwives • MMR is 6/100 00 LB • IMR is 7 8/1000 LB Ranks 17th in IMR • Undergoing major evaluation and revision of maternity care practices based on the findings of a recent report on childbirth specifically focusing on 1 women-centered care 2 accessible and appropriate care 3 efficient and effective care 4 varied birth site options 5 shift to community-based care 6 cost effective care
2 Netherlands	• Health care access for all • 36% of births at home and 46% of all births attended by midwives

MORNING SESSION - CON'T

SESSION OUTLINE	SESSION NOTES
2 Netherlands - cont d	• IMR is 7 06/1000 LB Ranks 10th in IMR
	• Offers choice of birth site and uses national-based risk assessment criteria to determine appropriate provider and site for care
3 United States	• Inadequate access to health care for a large portion of the population
	• Majority of births in hospitals 4 8% of all births with midwives
	• MMR is 6/100 000 LB
	• IMR is 9 22/1000 LB Ranks 24th in IMR
	• High use of technology with rapidly increasing cesarian rates liability issues and cost
	• The U S is in the midst of a major review and reform of the medical care system due to high cost and questionably effective practices in areas such as maternity care
4 Sweden	• Health care access for all
	• Provides incentives to increase birth rate
	• Births occur primarily in the hospitals
	• Boasts very high rate of attendance to prenatal visits (average 14) conducted primarily by midwives
	• MMR 4/100 000 LB
	• IMR is 5 96/1000 LB Ranks 3rd

SESSION OUTLINE	SESSION NOTES
VII More detail about FCMC	
1 Evolution	• Women s movement brought attention to birth practices
	• Increased consumer knowledge led to increased demands for changes in health care practices
	• Texts such as Chalmer s reported research-based evidence for practices causing countries to evaluate their current systems
	• Studies have been published in peer-reviewed journals evaluating the effect of newer technologies
2 Barriers	• **Institution** concerns about cost reluctance to impose changes on consumers or providers unknown impact on policy and procedure
	• **Provider** reluctance to change practices comfortable with what s known resistance to accepting effectiveness of new procedures
	• **Consumer** lack of knowledge about safety of new ideas general mistrust of medical community intimated by physicians and a respon siveness to and simultaneous fear of fads
	• **Types of barriers** Knowledge skills attitude resources
3 Benefits	• Consumer satisfaction
	• Provider satisfaction
	• Institutional well-being through the provision of cost effective care
	• Demonstrated effectiveness to enhance maternal and infant well being without increasing risk to either

AFTERNOON SESSION

SESSION OUTLINE	SESSION NOTES
VIII Infection control	• Microbes most responsible for perinatal infection and modes of transmission • Procedures for cleaning sterilization etc • Changes in policy regarding infection control • Evaluation of infection rates post FCMC
IX Risk Assessment	• A method of evaluating pregnant women for medical or behavioral factors that affect their health status It may effect management that is where and by whom care is given • Performed throughout the prenatal course and on admission to the birth site • Different criteria for different settings • Review birth center vs hospital criteria • Elicit list of criteria used in the Ukraine
X Case study of FCMC	**SEE APPENDIX C-DAY ONE** Discuss particulars of FCMC utilizing a casestudy which has been previously reviewed by some participants who will lead the discussion Important aspects of FCMC to be emphasized in the case study include risk assessment and infection control issues Discussion will address • Initial motivation for implementing FCMC • Evaluation of current practices • Implementation process • Barriers and how they were addressed • On going evaluation after implementation

AFTERNOON SESSION - CONT'D

SESSION OUTLINE	SESSION NOTES
Question and answer period	Entertain questions from audience utilizing Ukrainian resources when able
Summary and Closure	
XI Participant orientation	Meet with participants and orient to the week s agenda, schedule and materials including action plan and use of teams to co-teach for practicum experience

END OF DAY 1

DAY 2 Risk Assessment/Adult Learning Techniques/FCMC Practices

Learning Objectives
At the end of Day 2 the participants will be able to

1 discuss adult learning theory and techniques
2 identify key literature on the topic of FCMC
3 define and describe the known positive and negative impacts of current MCH practices
4 list specific FCMC practices for all phases of MCH care
5 discuss the appropriate use of risk assessment utilizing an FCMC model of care
6 discuss the integration of technology and FCMC practices for safe woman-centered maternity care

Morning Session

- Time
  - 20 mins pre-test
  - 1 hour review of key literature
  - 1 hour lecture adult learning
  - 1 hour lecture on risk assessment and the role of technology in FCMC
- Materials
  - Pre-test
  - Slides
  - Overheads
  - Flip chart
  - Handouts

	TOPIC	TIME	TEACHING METHODS
	Pre-Test	20 Minutes	Pre-Test
I	Review of key literature by participants utilizing articles received the night before from faculty	60 Minutes	Handouts Slides
II	Adult Learning Techniques	60 Minutes	Lecture Overheads
	BREAK	**15 Minutes**	
III	Risk Assessment and the Role of Technology in FCMC	60 Minutes	Handouts Overheads Flip chart Group Discussion

Lunch Break 60 minutes

Afternoon Session

- Time
  - 1 1/2 hour lecture and demonstration
  - 1 hour large group discussion
- Materials
  - Flip chart
  - Handouts
  - Slides

	TOPIC	TIME	TEACHING METHODS
IV	Specific FCMC practices presented by participants using information received the previous day from faculty	90 Minutes	Handouts Slides Demonstrations
	BREAK	**15 Minutes**	
V	Questions and answers Group discussion of FCMC practices in participants settings	60 Minutes	Flip chart Group Discussion

MORNING SESSION

SESSION OUTLINE	SESSION NOTES
I Key Literature	**See Appendix B-Day Two** Topics to include • Care during the prenatal period • Care during labor and delivery including support techniques maternal desires for companions place and position of birth and maternal activity in labor and birth and the impact of these • Maternal-infant bonding at delivery • Breastfeeding at delivery and beyond • Postpartum care and teaching • Comparison of outcomes using FCMC
II Adult Learning	
1 Premise	Adult learning is most effective in an interactive environment where the participants discuss role play create action plans etc The adult learner must see relevance of the material to his/her profession to be motivated to learn it The adult learner brings her/his own expertise and experience to share with others The adult learner has the responsibility to 1 actively participate in learning 2 adequately prepare 3 accept responsibility for learning 4 communicate with faculty
2 Techniques	• Lecture with audio visual aides such as slides or overheads • Video • Role play and demonstration • Small group work • Case studies • Team teach with participants • Group discussion

MORNING SESSION - CONT'D

SESSION OUTLINE	SESSION NOTES
III Risk Assessment	**See Appendix C-Day Two**
1 Premise	Using specific criteria assesses the pregnant woman for the likelihood of problems arising which may require interventions and impact outcomes and then categorizes her accordingly as low or high risk Management decisions are often based on risk status
2 Purpose	Different birth sites may use different criteria but purpose is the same i e to determine in what setting and with what type of provider the woman should receive care and give birth
3 Timing	• First prenatal visit • All subsequent prenatal visits • On admission to birth site
4 Compare settings	• Out-of-hospital settings • In-hospital settings
5 Risk in participants settings	• Facilitate discussion • List risks at participants sites on flip charts
6 Risk assessment criteria	• List according to participants in the Ukraine
7 Compare	• Discuss differences in national policy and particular settings • Compare Ukraine and U S criteria • Discuss changes needed to integrate FCMC
8 Discuss role of technology	Discuss the use of ultrasound in FCMC care as a diagnostic tool in maternity care Discuss the role of maternal hydration in maternal and fetal well-being specifically the relationship to adequate amniotic fluid Present information regarding

SESSION OUTLINE	SESSION NOTES
8 Discuss role of technology - cont'd	1) maternal-monitored activities (kick count) to assess fetal well-being 2) provider-monitored activities to assess fetal well-being such as amniotic fluid volume index (AFI) to detect low fluid and auscultated non-stress test (NST) or biophysical profile (BOP) depending on site and availability of equipment and 3) non-invasive interventions strategies such as oral or intravenous hydration and amnioscopy to check meconium (when available)as a precursor to more invasive management techniques such as artificial rupture of membranes labor induction and cesarian section Discuss the importance of client education regarding adequate hydration and fetal activity including performing a fetal kick count

SESSION OUTLINE	SESSION NOTES
IV FCMC Practices	Antenatal care-promoting self care • patient education a key component • involve in decision making process • involve in prenatal care e g weigh self do fetal kick counts • involve significant others in care Childbirth Preparation • education decreases fear for labor and birth and increases compliance with prenatal care • involves significant others • opportunity for informal discussion and learning • opportunity for socializing with other couples • a variety of formats available Labor management and support • necessary for natural childbirth • usually provider or nurse at bedside and offering active support • promotes maternal activity • encourages oral fluids • utilizes intermittent fetal monitoring • facilitates faster labor and birth • no enema or pubic shave Management of birth • minimal analgesia • movement and position changes promoted • calm quiet environment • maintain perineal integrity

AFTERNOON SESSION - CONT'D

SESSION OUTLINE	SESSION NOTES
IV FCMC Practices -cont'd	
	• baby on maternal abdomen at birth • support persons of maternal choice present may include siblings Initiation of breastfeeding • baby to breast immediately after birth • minimal external stimulation to mother and baby • allow ample time to suckle • offer instruction and support Infant care • provide at bedside and teach simultaneously • active participation by mother Postpartum care and teaching • interactive techniques • increases success at breastfeeding • include mother and baby care • initiate family planning
VI Questions and Answers	
END OF DAY 2	

DAY 3 *Change Theory and the Integration of FCMC*

Learning Objectives
At the end of Day 3, the participants' will be able to

1. **discuss and critique adult teaching and learning techniques used in previous day's session**
2. **list and define consumer, institutional and provider barriers to FCMC**
3. **list components of change theory**
4. **develop solutions to identified barriers to FCMC utilizing change theory**
5. **discuss the accepted method of infection control utilizing an FCMC model of care**
6. **discuss the transition from the least to most invasive management techniques in obstetrical care and the relationship to FCMC**

Morning Session

- Time
  - 40 minutes group evaluation and discussion
  - 30 minutes small group work
  - 30 minutes large group work
  - 40 minutes lecture
  - 20 minutes large group work

	TOPIC	TIME	TEACHING METHODS
I	Evaluate teaching techniques Re-orient to action plan	20 Minutes	Discussion Flip chart Action plan
II	Review FCMC material to date	20 Minutes	Slides Overheads Flip charts
III	Group identified barriers to FCMC	30 Minutes	Small group work utilizing case studies
IV	List and discuss barriers	30 Minutes	Large group work List on flip chart
	BREAK	**15 Minutes**	
V	Change Theory and use in the Clinical Setting	40 Minutes	Lecture overheads clinical examples
VI	Change Theory and Identified FCMC Barriers	20 Minutes	Large group work
VII	Review Risk Assessment and Infection Control	20 Minutes	Lecture Overheads Handouts

Lunch Break 60 Minutes

Afternoon Session

- Time
  - 45 Minute Lecture/Demonstration
  - 45 Minute Small Group Work
  - 90 Minute Large Group Work

- Materials
  - Flip chart
  - Ultrasound Fetoscope Amnioscopy (as available) Fetal Kick Count Chart
  - Handouts
  - Action plan

	TOPIC	TIME	TEACHING MATERIALS
VIII	Teach/reinforce fluid dynamics and use of fetal kick count AFI NST BOP amnioscopy	45 Minutes	Lecture Demonstration Tools
IX	Participant use of equipment and charts	45 Minutes	Ultrasound fetal kick chart fetoscope amnios -copy (as available)
	BREAK	**15 Minutes**	
X	Discussion Q&A about techniques	30 Minutes	
XI	Site-specific work on Action Plans	60 Minutes	

END OF DAY 3

MORNING SESSION

SESSION OUTLINE	SESSION NOTES
I Review of Teaching Techniques	
1 Purpose	• Address the training of trainers aspect of the course
2 Format	• Facilitate identification and discussion of pros and cons of various methods
	• Discuss specifically the effectiveness of particular methods for use with FCMC training
	• Re-orient to action plan
	• Large group discussion
	• Role play or demonstration as appropriate
II Review of Material to date	
1 Purpose	• Review content offered to date
	• Facilitate integration of concepts
2 Format	• Large group discussion
	• Review with pertinent AV aides
III Barriers to FCMC (group identified)	**See Appendix A- Day Three**
	• Form three groups with leaders
	• One case study per group
	• One case study each for provider institution and consumer-based barriers
	• Each group to identify barriers and prepare to present and discuss with the large group
	• Differentiate between barriers of knowledge skills attitude and resources
IV Large Group Presentation and discuss group process	
	• List barriers according to institution provider consumer
	• Identify as knowledge skills resource or attitude-based

SESSION OUTLINE	SESSION NOTES
IV Large Group Presentation and discuss group process - cont'd	
	• Discuss process of identifying barriers
	• Evaluate the excercise
V Change Theory in the Clinical Setting	
1 Lewin s model	• Three stages of change
	A Unfreezing purpose is to create disequilibrium often accomplished by comparing groups
	B Moving purpose is to begin to incorporate new behaviors very important to be sensitive to feelings and reactions
	C Refreezing purpose is to stabilize the change and integrate new practices
	• Other significant aspects - recognize allies and adversaries - know your change well - timing is important
2 Reinkmeyer s model	• Seven stages of change
	A Develop need and desire to change
	B Develop change relationship between agent and client system
	C Clarify problem need or objective
	D Examine alternative routes and tentative goals and intentions of actions
	E Transform intentions into action
	F Stabilize
	G Terminate relationship between change agent and client
	• Other significant factors - may not happen in order - requires monitoring throughout

SESSION OUTLINE	SESSION NOTES
3 Resistance to change	• Positive effect of resistance is to force clarity of purpose and results of the change • May indicate inadequate problem solving and decision making processes • Should be seen as a diagnostic symptom and cause identified • Reasons are multiple and varied including cost time perceived threat vested interests fear of failure selective perception and retention
4 Conflict resolution	• Conflict may be between individuals or groups • Conflict reflects value systems • May be due to a lack of clarity • Requires open and honest dialogue to resolve • May involve mediation or confrontation Utilize a case study to demonstrate application in the clinical setting
VI Change Theory and Identified Barriers	Group exercise to demonstrate the utilization of change theory to address identified barriers to FCMC including identifying different approaches to change depending on barrier type
VII Additional Risk Assessment	• Review purpose and content of risk assessment and Infection Control Materials • Discuss as a barrier to FCMC with Application to Sites • Discuss use at participants sites • Review infection control material

AFTERNOON SESSION

SESSION OUTLINE	SESSION NOTES
VIII Use of Ultrasound for AFI, Auscultated	**See Appendix B Day Three**
	• Use ultrasound to demonstrate checking NST, fetal kick counts, amnioscopy pockets of amniotic fluid
	• Teach method for auscultated non-stress test
	• Demonstrate fetal kick count and discuss usefulness
	• Participants will work with all equipment and tools until beginning level of understanding demonstrated
	• Continue to reinforce fluid dynamics maternal hydration directly affects fetal hydration and well-being Amniotic fluid level can alter meconium status as well as activity level Maternal perception of fetal activity often first indicator of compromised fetus
	• Intervention with decreased fetal activity begins with hydration of the mother and re-evaluation AFI useful as indicator of fetal response to non-invasive intervention of hydration If decreased AFI may view membranes with amnioscope if equipment available and cervix adequately dilated Following a course of non-invasive management as a first step can decrease cesarian sections and thus reduce maternal and fetal morbidity and mortality
	• Auscultated NST is possible without a functioning fetal monitor This can augment decision making towards intervention/no intervention depending on outcome If equipment available a biophysical profile (BOP) can be done by checking fetal breathing activity flexion and add scores to

AFTERNOON SESSION - CONT'D

SESSION OUTLINE	SESSION NOTES
VIII Use of Ultrasound for AFI, Auscultated - cont'd	AFI and NST Two points are accorded each category with a possible score range from 0-10 A BOP score greater than 6 is reassuring
IX Question and Answer Period	• participants will demonstrate some understanding in all techniques demonstrated
X Action Plan	• Two site-specific groups with leader • Begin action plan based on material to date including - current policies and procedures - perceived barriers - plan to begin change among all three groups institutions providers and consumers - identification and categorization of areas of change as knowledge skills, attitude or resources
END OF DAY 3	

DAY 4 *Evaluation*

Learning Objectives
At the end of Day 4, the participants will be able to

1. **demonstrate five ways to make their training more effective**
2. **describe the components and rationale of evaluation**
3. **describe more than one evaluation technique**
4. **define working models of evaluation plans for a variety of settings**
5. **describe the purpose and importance of consumer involvement in evaluation**
6. **describe more than one method of consumer involvement in evaluation**

Morning Session

- Time
  - 45 minute exercise
  - 1½ hour lecture / case study on evaluation
  - 1 hour small group work
  - ½ hour presentation of large group work
- Materials
  - Case study
  - Overheads
  - Flip chart
  - Handouts

	TOPIC	TIME	TEACHING METHOD
I	Pelvic exam	45 Minutes	Exercise
	Role Play Skills Practice	30 Minutes	Discussion Handout
II	Evaluate teaching techniques of previous day	30 Minutes	Overheads
III	Evaluation		
IV	Case study of evaluation technique	30 Minutes	Case Study Flip chart
	BREAK	**15 Minutes**	
V	Develop practice evaluation plans for institutions providers consumers	60 Minutes	Small Work Group Handouts Flip chart
VI	Share plans with large group	30 Minutes	Large Group Discussion Flip chart

Lunch Break 60 Minutes

Afternoon Session

- Time
  - ½ hour large group discussion
  - ½ hour lecture
  - ½ hour role play
  - 45 min site specific group work
- Materials
  - Overheads
  - Case Study
  - Sample evaluation plans
  - Flip chart
  - Action plans

TOPIC		TIME	TEACHING METHOD
VII	Large group discussion of shared plans	30 Minutes	Flip chart Practice Plans
VIII	Consumer involvement	30 Minutes	Lecture Overheads
IX	Focus group discussion with demonstration of practice focus group involving participants	30 Minutes	Role Play
	BREAK	**15 Minutes**	
X	Site-specific work on action plans	45 Minutes	Site-specific group work on Action plans

MORNING SESSION

SESSION OUTLINE	SESSION NOTES
I Pelvic Exam Exercise	
II Review Teaching Techniques of Previous Day	
	• Small group work
	• Action plans
	• Review of handout on tips for effective training
III Evaluation	**See Appendix A-Day Four**
1 Purpose	• Determine if project goals achieved
	• Evaluate effectiveness of a change
	• Influence future direction of an initiative
	• Validate for internal community
	• Validate for broader community
2 Techniques	• Written questionnaire or survey
	• In-person interview
	• Pre- and post-tests
	• Focus groups
	• On-site review
3 Comparison of techniques	• Questionnaire - easy to administer - low cost - easy to decipher results - offers many avenues for distribution - able to validate results - lacks interpersonal component-best suited for quantitative measures - can have poor return rate
	• Interviews - more difficult to conduct - higher cost - requires more time and personnel use - less available - may be quantified or qualified for evaluation and validation

SESSION OUTLINE	SESSION NOTES
3 Comparison of techniques - cont'd	
	• Pre- and post-test - commonly used for comparison - low cost and personnel use-easily produced and administered - may evaluate effectiveness over time - quantitative only
	• Focus groups - higher cost - personnel and labor intensive - values personal encounter - primarily qualitative
	• On-site review - higher cost - requires more time and personnel - adds objective evaluation component - can be validated - adds interpersonal component
IV Case Study of Evaluation Plan Utilizing FCMC Project Indicators	**See Appendix B- Day Four** Use case study to discuss and demonstrate an evaluation technique and plan
V Develop Evaluation Plans for Consumer, Institutions and Providers	
	• Three small groups
	• Type of plan and target assigned
	• Develop practice evaluation plan utilizing project critical indicators
VI Share Plans	• Present plans to large group

AFTERNOON SESSION

SESSION OUTLINE	SESSION NOTES
VII Discussion of Practice Plans	• Facilitate group discussion/ critique of practice plans
VIII Consumer Involvement	
1 Purpose	• Evaluate need from consumer perspective
	• Increase identification with change
	• Guide effectiveness and alterations
2 Pros/cons	• Pros - identifies needs more accurately - enhances potential for acceptance - enhances ultimate success of intervention
	• Cons - time consuming - may encumber process with additional information
IX Focus Groups	
1 Purpose	• To discuss a particular topic in an open-ended manner which facilitates discussion while addressing certain questions
2 Method	• Facilitator-led
	• May be audio or video taped
	• Open ended questions or topic directed
3 Evaluation	• Qualitative evaluation techniques
	• May include written quantitative section
X Action Plans	• Site-specific groups
	• Form site specific evaluation plans for each site utilizing the FCMC project critical indicators

END OF DAY 4

DAY 5 *Adaptation of FCMC into Various Settings*

Learning Objectives
At the end of Day 5, the participants will be able to

1 differentiate between a trainer and preceptor
2 demonstrate the possession of the necessary knowledge, skills and motivation to integrate FCMC into a variety of settings
3 identify and articulate remaining barriers, particularly attitudinal to FCMC
4 identify strategies to address and facilitate removal of all remaining barriers

Morning Session

- Time
  - 1 hour discussion
  - 2 hours of role play
- Materials
  - Handouts
  - Flip chart
  - Props for Role Play as Available
  - Clinical skills list

	TOPIC	TIME	TEACHING METHODS
I	General discussion/evaluation of the weeks information and teaching techniques Orient to the clinical experience of the next week Discuss differences between trainer and preceptor Address remaining questions and answers	60 Minutes	All old materials Flip charts Overhead Handouts Clinical skills list
II	Role play demonstration	30 Minutes	Props as appropriate
	BREAK	**15 Minutes**	
III	Separate group role play	90 Minutes	Props as appropriate

Lunch 60 Minutes

Afternoon Session

- Time
  - 2 hours role play
  - 30 minute question and answer period
  - 20 mins written evaluation
  - 20 mins post-test
- Materials
  - Props as appropriate
  - Post-test

	TOPIC	TIME	TEACHING METHODS
IV	Role Play	90 Minutes	Props as appropriate
V	Question and answer period	30 Minutes	Large group discussion
VI	Written evaluation of didactic	20 Minutes	Evaluation form
VII	Post-test	20 Minutes	Post-test
	Complete Action plans	As Needed	

MORNING SESSION

SESSION OUTLINE	SESSION NOTES
I **Large Group Meeting**	• Evaluate previous days teaching techniques • Differentiate between trainer and preceptor • Question and answer period for didactic • Introduce/orient to clinical week • Orient to materials for week 2
II **Role Play Demonstration**	**See Appendix A-Day Five** • Briefly discuss role play • Volunteer participant and staff role play a scenario • Players discuss their dynamic • Observers discuss their reactions
III **Role Play**	• Various groups are formed • Scenarios for all settings of care are role played

AFTERNOON SESSION

SESSION OUTLINE	SESSION NOTES
IV Role Play	• Continue until all participants have role played all care settings
V Questions and Answers	• Address all final questions for this component
VI Written Evaluation	**See Appendix B-Day Five**
	• Written evaluation of didactic component
VII Post-test	**See Appendix C-Day Five**
	• All participants complete post-test
Action Plans	• Spend additional time completing action plans as needed

END OF DAY 5 AND WEEK ONE

APPENDIX A

FAMILY-CENTERED MATERNITY CARE

Developed by Judith Rooks, CNM, DrPH

Family-centered maternity care is care designed to meet the informational, social, emotional, comfort and support needs of normal pregnant women (those without serious complications or co-existing disease) and their families during pregnancy and childbirth Family-centered maternity care emphasizes education and preparation to enable the pregnant woman to take a knowledgeable, active role in promoting her own health and that of her fetus and baby, encourages involvement in the pregnant woman's family members or other persons of her choice in her preparation for childbirth and motherhood and invites their supportive presence during labor and delivery, avoids unnecessary use of invasive, uncomfortable and/or restrictive procedures, manages birth as a process requiring cleanliness but not sterility, encourages women to be active during labor--to sit up, walk, assume whatever position is comfortable, change positions frequently, avoiding the supine and lithotomy positions and supporting women to assume squatting or semi-upright positions during second stage contractions, provides skin-to-skin contact between the mother and newborn immediately after the birth, and supports breast feeding and rooming-in

Technical Report

Consensus was reached by all present that the following 14 behaviors, in composite, represent a solid backbone for a Family Centered Maternity Care Program, in some cases they represent new behaviors or discontinuation of old behaviors, in other cases they represent modification to or strengthening of existing behaviors

1 The acceptance of the family centered maternity program

2 Early and continuous breastfeeding

3 Discrimination in the medical indications for C/Section

4 A liberal policy for vaginal births after C/Section

5 Discrimination in the medical indications for continuous electronic fetal heart rate monitoring

6 Discrimination in the indications for episiotomy for delivery

7 Discrimination in the medical indications for induction of labor

8 Importance of maternal awareness, control, and sense of accomplishment for childbirth

9 The active participation in health care decisions by mothers and families

10 The active participation and support in labor and delivery by both the family and the staff

11 Ambulation in labor

12 The discontinuation of the routine use of enemas in labor

13 The discontinuation of routine shaving of the perineum

14 Minimal separation of the mother and the newborn

Consensus was also reached on the following activities related to the successful implementation of this family centered maternity care program,

1 Strategies to optimize its successful implementation

2 The establishment of a numerical performance benchmark for each behavior (Appendix 1)

3 The establishment of evaluation tools for measuring performance (Appendix 2, 3)

4 The establishment of a continuous improvement feedback mechanism to use the comparison of performance measures to established benchmarks, to direct strategies for reward and/or change (Appendix 4)

APPENDIX B

aides K H Campbell S Bradley R J Bilbardo C M Soothill P W & Gibb D (1987) Maternal oxygen therapy for intrauterine growth retardation *Lancet* i, 942–945

Nicolini U Hubinont C Santolaya J Fisk N M & Rodeck C H (1990) Effects of fetal intravenous glucose challenge in normal and growth retarded fetuses *Horm Met Res* 22, 426–430

Owens J A (1991) Endocrine and substrate control of fetal growth placental and maternal influences and insulin like growth factors *Reprod Fert Dev* 3, 501–517

Owens J A Falconer J & Robinson J S (1987*a*) Effect of restriction of placental growth on oxygen delivery to and consumption by the pregnant uterus and fetus *J Dev Physiol* 9, 137–150

Owens J A. Falconer J & Robinson J S (1987*b*) Effect of restriction of placental growth on fetal and uteroplacental metabolism *J Dev Physiol* 9, 225–238

Owens J A Owens P C & Robinson J S (1989) Experimental fetal growth retardation metabolic and endocrine aspects In *Advances in Fetal Physiology Reviews in Honour of G C Liggins* (Gluckman P D Johnston B M & Nathanielsz P W, eds) Perinatology Press Ithica, New York pp 263–286

Phillips A F Porte P J Stabinski S Rosenkrantz T S & Raye J R (1984) Effects of chronic fetal hyperglycemia upon oxygen consumption in the ovine uterus and conceptus *J Clin Invest* 74, 279–286

Rush D (1989) Effects of changes in protein and calorie intake during pregnancy on the growth of the human fetus In *Effective Care in Pregnancy and Childbirth* (Chalmers I Enkin M & Keirse M J N C eds) Oxford Univ Press Oxford pp 255–280

Soothill P W Nicholaides K H & Campbell S (1987) Prenatal asphyxia, hyperlacticaemia, hypoglycaemia, and erythroblastosis in growth retarded fetuses *Br Med J* 294, 1051–1053

Stein Z. Susser M & Rush D (1978) Prenatal nutrition and birth weight Experiments and quasi-experiments in the past decade *J Reprod Med* 21, 287–299

British Journal of Obstetrics and Gynaecology
September 1992 Vol 99 pp 709–710

WHO appropriate technology for birth revisited

In August 1985 *The Lancet* published the WHO recommendations for birth in an article entitled 'Appropriate technology for birth This publication followed the appearance in the year of the WHO book, *Having a Baby in Europe* which ibed the current status of childbirth care in Europe Both these publications resulted in controversy as to their validity In many, if not most, parts of Europe as well as in other regions this controversy continues

Questions such as How were the publications arrived at? How representative are their contents? Are these biased 'liberal and, most importantly how we co these recommendations match up to research findings?

Development of the WHO recommendations for birth

The United Nations declared 1979 as the International Year of the Child At the Regional Committee for Europe in that year concern was expressed over a number of issues including the rapidly expanding technology being applied to birth with its associated rising costs the doubling or even tripling of the caesarean section rate which took place in the 1970s the question of whether this was associated with the increasing use of electronic fetal heart rate monitoring the increasing demands from women s groups to resume control over their birth experiences and the poorly understood inequities relating to perinatal mortality (Wagner 1991)

The outcome of this debate was a decision by the WHO to undertake research into perinatal services and to develop recommendations for appropriate technology for birth

A series of events followed The first was the establishment of a multidisciplinary 15-member perinatal study group This consisted of representatives from obstetrics paediatrics nursing midwifery epidemiology and statistics health administration sociology psychology anthropology economics and consumer groups Meeting at least once a year as a full group and more frequently in subgroups the team investigated the available literature the perinatal services in 23 of the then 32 WHO–Europe member states mother–infant contact practices in a detailed study of ten representative member states and alternate (meaning outside of the formal health care system) perinatal services in Europe as well as in the USA and Canada (Wagner 1991)

Debate and eventual consensus between the members of the team resulted in *Having a Baby in Europe* (WHO 1985) This [illegible] *Perinatal Health Services in Europe Searching for Better Childbirth* (WHO 1985) was aimed at the academic reader

The second major step in the process followed the organisation of Birth Conferences These were national conferences designed to debate the applicability of the recommendations of the WHO books to a country These conferences have almost always involved professionals and consumer groups as well as non-governmental organizations and the media. To date 43 conferences have been held in 23 European member states as well as in the USA Canada Australia and China (Wagner 1991)

The birth conference movement led to three major interregional meetings These combining in particular the WHO areas of Europe and America covered appropriate technology for pregnancy for birth and for after the birth These conferences always involved multidisciplinary representation and required participants to submit their papers well in advance to enable translation and circulation before the meeting At the conference issues were debated until consensus was reached The outcome of these deliberations was published in the *Lancet* (WHO 1985)

How valid are these recommendations?

There is no doubt that much deliberation research and discussion went into the development of the WHO recommend

Correspondence Prof B Chalmers Dept of Psychology University of the Witwatersrand Private Bag 3 WITS 2050 South Africa

Table 1 WHO recommendations for birth classified according to Chalmers *et al* (1989)

WHO Recommendations	Chalmers *et al* (1989)
The well being of the new mother must be ensured through free access of a chosen member of her family during birth and throughout the postnatal period In addition the health team must provide emotional support	Enhanced social and psychological support from care givers reduces negative outcomes Leaving women unattended during labour should be abandoned
Women must participate in decisions about their birth experiences	Failing to involve women in decisions about their care should be abandoned
The healthy newborn must remain with the mother whenever possible	Separating healthy mothers and babies routinely should be abandoned
Immediate breast feeding should be encouraged even before the mother leaves the delivery room	Unrestricted mother–infant contact after delivery and unrestricted breast feeding reduce breast feeding failure
There is no justification to have a caesarean section rate of higher than 10–15% Vaginal deliveries after a caesarean section should be encouraged	Repeating caesarean section routinely after previous caesarean section should be abandoned (There is little improvement in outcome with rates above 7%)
Electronic fetal monitoring should not be routine	Routine continuous monitoring of fetal heart rate without fetal scalp blood sampling should be abandoned
There is no indication for shaving pubic hair before delivery	Shaving the perineum routinely should be abandoned
There is no indication for routine enemas before delivery	Administering enemas or suppositories routinely should be abandoned.
The dorsal lithotomy position during labour and delivery is not recommended Women must decide which position to adopt for delivery	Restricted maternal position during labour and delivery should be abandoned Upright versus recumbent position during first and second stage reduces negative outcome
Systematic use of episiotomy is not justified	Performing episiotomy routinely should be abandoned
Induction of labour should be reserved for specific medical indications	Inducing labour routinely at less than 42 weeks gestation should be abandoned
The routine administration of analgesic or anaesthetic drugs should be avoided	Prescribing sedatives or tranquilizers routinely should be abandoned
Artificial early rupture of membranes as a routine process is not justifiable	Amniotomy to augment spontaneous labour appears promising but requires further evaluation

ations for appropriate technology at birth Nevertheless some questions persist How valid are these recommendations? How representative were the participants in the various conferences and research teams? Is it not possible if not probable that individuals willing to participate in such meetings and activities would have an interest in changing the system and would be biased? Most important how well do the recommendations match up to research findings?

The recent publication by Chalmers *et al* (1989) encompassing a careful scrutiny of randomized control trials of perinatal technology allows these questions to be answered This two volume tome contains many reviews of great value but of particular relevance here are the four appendices These list the forms of perinatal technology that (a) reduce the negative out comes of pregnancy and childbirth (b) are promising but require further evaluation (c) have unknown effects and require further evaluation and (d) should be abandoned in the light of the available evidence

The WHO recommendations for appropriate technology for birth are examined in Table 1 in terms of their classification by Chalmers *et al* (1989) This appendix deals only with the specific birth technology recommendations and does not assess the general recommendations regarding perinatal health care policy and the setting of policy

The recommendations of the WHO for appropriate technology at birth developed through survey research discussion and debate are strongly endorsed by the findings of carefully controlled and critically evaluated randomized control trials The recommendations provide sound guidance for those providing perinatal care

Beverley Chalmers
Consultant
World Health Organization
Regional Office for Europe
Maternal and Child Health
8 Scherfigsvej
DK 1200 Copenhagen
Denmark

References

Chalmers I Enkin M & Kierse M J N L (eds) (1989) *Effective Care during Pregnancy and Birth* Vol I & II Oxford University Press Oxford

Wagner M (1991) Appropriate perinatal technology of having a baby in Europe In *From Research to Decision Making* WHO Geneva 1991

WHO (1985) Appropriate technology for birth *Lancet* ii, August 24 436–437

Table 6 Forms of care likely to be ineffective or harmful

Ineffectiveness or harm demonstrated by clear evidence

	Chapter
BASIC CARE	
Dietary restriction to prevent pre eclampsia	6,15
Antenatal breast or nipple care for women who plan to breastfeed	46
SCREENING	
Contraction stress cardiotocography to improve perinatal outcome	12
Nipple simulation test cardiotography to improve perinatal outcome	12
Non stress cardiotocography to improve perinatal outcome	12
PREGNANCY PROBLEMS	
ACTH for severe vomiting of pregnancy	13
Diethylstilboestrol during pregnancy	14
External cephalic version preterm to avoid breech presentation at birth	22
Elective delivery for prelabour rupture of membranes preterm	23
Ethanol to stop preterm labour	24
Progestogens to stop preterm labour	24
CHILDBIRTH	
Routine enema in labour	29
Routine pubic shaving in preparation for delivery	29
Electronic fetal monitoring without access to fetal scalp sampling during labour	30
Prophylactic intrapartum amnioinfusion for oligohydramnios	30
Rectal examinations to assess labour progress	31
Requiring a supine (flat on back) position for second stage of labour	32
Routine use of the lithotomy position for the second stage of labour	32
Routine or liberal episiotomy for birth	32
Ergometrine instead of oxytocin in third stage of labour	33
PROBLEMS IN CHILDBIRTH	
Glycerol impregnated catgut for repair of perineal trauma	36

Table 6 *continued*

Forms of care likely to be ineffective or harmful

	Chapter
TECHNIQUES OF INDUCTION AND OPERATIVE DELIVERY	
Oral prostaglandins for cervical ripening	39
Oestrogens for cervical ripening or for induction of labour	39
Oxytocin for cervical ripening before induction of labour	39
CARE AFTER CHILDBIRTH	
Sodium bicarbonate for asphyxiated babies	44
Routine restriction of mother–infant contact	45
Routine nursery care for babies in hospital	45
Antenatal Hoffman's exercises for inverted or flat nipples	46
Antenatal breast shells for inverted or flat nipples	46
Limitation of suckling time for breastfeeding	46
Nipple creams or ointments for breastfeeding mothers	46
Routine supplements of water or formula for breastfed babies	46
Samples of formula for breastfeeding mothers	46
Encouraging fluid intake beyond demands of thirst for breastfeeding mothers	46
Combined oestrogen–progesterone oral contraceptives for breastfeeding mothers	46
Test weighing of breastfed infants	46
Witch hazel for relief of perineal pain	47
Adding salt to bath water for perineal pain	47
Antiseptic solutions added to bath water for perineal pain	47
Hormones for relief of breast symptoms in non breastfeeding mothers	48
Bromocriptine for relief of breast symptoms in non breastfeeding mothers	48

Table 5 *continued*

Forms of care unlikely to be beneficial

	Chapter
CHILDBIRTH	
Routine withholding food and drink from women in labour	29
Routine intravenous infusion in labour	29
Routine measurement of intrauterine pressure with oxytocin administration	31,35
Face masks during vaginal examinations	31
Frequent scheduled vaginal examinations in labour	31
Routine directed pushing during the second stage of labour	32
Pushing by sustained bearing down during second stage of labour	32
Breath holding during the second stage of labour	32
Early bearing down during the second stage of labour	32
Arbitrary limitation of the duration of the second stage of labour	32
Ironing out' or massaging the perineum during the second stage of labour	32
Routine manual exploration of uterus after vaginal delivery	32
PROBLEMS DURING CHILDBIRTH	
Biofeedback to relieve pain in labour	34
Sedatives and tranquillizers to relieve pain in labour	34
Caudal block to relieve pain in labour	34
Paracervical block to relieve pain in labour	34
Intrapartum X ray to diagnose cephalopelvic disproportion	35
Diagnosing cephalopelvic disproportion without ensuring adequate uterine contractions	35
Relaxin for slow or prolonged labour	35
Hyaluronidase for slow or prolonged labour	35
Delivery of a very preterm infant without adequate facilities to care for an immature baby	37
Elective forceps for preterm delivery	37,41
Routine use of episiotomy for preterm birth	37
Trial of labour after previous classical caesarean section	38
Manual exploration of the uterus to assess previous caesarean section scar	38

Table 5 *continued*

Forms of care unlikely to be beneficial

	Chapter
TECHNIQUES OF INDUCTION AND OPERATIVE DELIVERY	
Mechanical methods for cervical ripening before induction of labour	39
Relaxin for cervical ripening before induction of labour	39
Nipple stimulation for cervical ripening before induction of labour	39
Extra amniotic instead of other prostaglandin regimens for cervical ripening	39
Instrumental vaginal delivery to shorten second stage of labour	41
Routine exteriorization of the uterus for repair of uterine incision at caesarean section	42
CARE AFTER CHILDBIRTH	
Silver nitrate to prevent eye infection in newborn babies	44
Elective tracheal intubation for very low birthweight infants who are not depressed	44
Routine suctioning of newborn babies	44
Medicated bathing of babies to reduce infection	45
Wearing hospital gowns in newborn nurseries	45
Restriction of sibling visits to babies in hospital	45
Routine measurements of temperature, pulse, blood pressure, and fundal height postpartum	45
Limiting use of women's own non prescription drugs postpartum in hospital	45
Administering non prescription symptom relieving drugs at regularly set intervals	45
Nipple shields for breastfeeding mothers	46
Switching breasts before babies spontaneously terminate the feed	46
Oxytocin for breast engorgement in breastfeeding mothers	46
Antibiotics for localized breast engorgement (milk stasis)	46
Discontinuing breastfeeding for localized breast engorgement (milk stasis)	46
Combinations of local anaesthetics and topical steroids for relief of perineal pain	47
Relying on these tables without referring to the rest of the book	50

Table 5 Forms of care unlikely to be beneficial

The evidence against these forms of care is not as firmly established as for those in Table 6

	Chapter
BASIC CARE	
Reliance on expert opinion instead of on good evidence for decisions about care	2
Routinely involving doctors in the care of all women during pregnancy and childbirth	3
Routinely involving obstetricians in the care of all women during pregnancy and childbirth	3
Not involving obstetricians in the care of women with serious risk factors	3
Fragmentation of care during pregnancy and childbirth	3
Advice to restrict sexual activity during pregnancy	5
Prohibition of all alcohol intake during pregnancy	5
Imposing dietary restrictions during pregnancy	6
Routine vitamin supplementation in late pregnancy in well nourished populations	6
Routine haematinic supplementation in pregnancy in well nourished populations	6
High protein dietary supplementation	6
SCREENING	
Routine use of ultrasound for fetal anthropometry in late pregnancy	8,12
Using oedema to screen for pre eclampsia	10
Cold pressor test to screen for pre eclampsia	10
Roll over test to screen for pre eclampsia	10
Isometric exercise test to screen for pre eclampsia	10
Measuring uric acid as a diagnostic test for pre eclampsia	10
Screening for 'gestational diabetes	11
Routine glucose challenge test during pregnancy	11
Routine measurement of blood glucose during pregnancy	11
Insulin plus diet therapy for 'gestational diabetes'	11
Diet therapy for gestational diabetes'	11
Routine use of Doppler ultrasound screening in all pregnancies	12
Measurement of placental proteins or hormones (including oestriol and human placental lactogen)	12

Table 5 *continued*

Forms of care unlikely to be beneficial

	Chapter
PREGNANCY PROBLEMS	
Calcium supplementation for leg cramps	13
Screening for and treatment of candidal colonization without symptoms	13
Screening for and treatment of *Trichomonas* colonization without symptoms	13
Bed rest for threatened miscarriage	14
Diazoxide for pre eclampsia or hypertension in pregnancy	15
Diuretics for pregnancy induced hypertension	15
Hospitalization and bed rest in twin pregnancy	17
Cervical cerclage for multiple pregnancy	17
Routine caesarean section for multiple pregnancy	17
Routine screening for mycoplasmas during pregnancy	19
Caesarean section for non active herpes simplex before or at the onset of labour	19
Elective delivery before term in women with otherwise uncomplicated diabetes	20
Elective caesarean section for pregnant women with diabetes	20
Discouraging breastfeeding in women with diabetes	20
Prohibition of oral contraceptives for diabetic women	20
Vaginal or rectal examination when placenta praevia is suspected	21
X ray pelvimetry to diagnose cephalopelvic disproportion	22
Computer tomographic pelvimetry to predict cephalopelvic disproportion	22
Liberal use (pretrial of labour) of caesarean section for macrosomia	22
Amniocentesis for prelabour rupture of membranes preterm	23
Prophylactic tocolytics with prelabour rupture of membranes preterm	23
Regular leucocyte counts for surveillance in prelabour rupture of membranes	23
Betamimetics for preterm labour in women with heart disease or diabetes	24
Hydration to arrest preterm labour	24
Diazoxide to stop preterm labour	24

Table 1 Beneficial forms of care

Effectiveness demonstrated by clear evidence from controlled trials

	Chapter
BASIC CARE	
Support for socially disadvantaged mothers to improve child care	3
Women carrying their case notes during pregnancy to enhance their feeling of being in control	3
Pre-and periconceptional folic acid supplementation to prevent recurrent neural tube defects	5,6
Folic acid supplementation (or high folate diet) for all women contemplating pregnancy	5,6
Programmes (particularly behavioural strategies) to assist stopping smoking during pregnancy	5
Balanced energy and protein supplementation of diet when supplementation is required	6
Vitamin D supplementation for women with inadequate exposure to sunlight	6
Iodine supplementation in populations with a high incidence of endemic cretinism	6
SCREENING	
Doppler ultrasound in pregnancies at high risk of fetal compromise	12
PREGNANCY PROBLEMS	
Antihistamines for nausea and vomiting of pregnancy if simple measures are ineffective	13
Local imidazoles for vaginal candida infection (thrush)	13
Local imidazoles instead of nystatin for vaginal candida infection (thrush)	13
Postpartum adminstration of anti D immunoglobulin to rhesus negative women with a rhesus positive fetus	18
Administration of anti D immunoglobulin to rhesus negative women at 28 weeks of pregnancy	18
Antibiotic treatment of asymptomatic bacteriuria	19
Antibiotics during labour for women colonized with group B streptococcus	19
Tight as opposed to too strict or moderate control of blood sugar levels in diabetic women	20

BEST AVAILABLE COPY

48

Table 3 Forms of care with a trade-off between beneficial and adverse effects

Women and caregivers should weigh these effects according to individual circumstances and priorities

	Chapter
BASIC CARE	
Continuity of caregiver for childbearing women	3
Legislation restricting type of employment for childbearing women	3
SCREENING	
Formal systems of risk scoring	7
Routine early ultrasound	8
Chorion villus sampling versus amniocentesis for diagnosis of chromosomal abnormalities	9
Serum alpha fetoprotein screening for neural tube defects	9
Routine fetal movement counting to improve perinatal outcome	12
PREGNANCY PROBLEMS	
Screening for toxoplasmosis during pregnancy	19
Corticosteroids to promote fetal maturation before preterm delivery in diabetic women	20,25
Induction of labour for prelabour rupture of membranes at term	23
Betamimetic drugs to delay preterm delivery for implementation of effective measures	24
Oral betamimetics to maintain labour inhibition	24
Cervical cerclage for women at risk of preterm birth	24
Betamimetic drugs to stop preterm labour	24
Expectant care versus induction of labour after fetal death	27
CHILDBIRTH	
Continuous EFM plus scalp sampling versus intermittent auscultation during labour	30
Mid line versus mediolateral episiotomy, when episiotomy is necessary	32
Prophylactic oxytocics in the third stage of labour	33
Active versus expectant management of third stage of labour	33

Table 3 *continued*

Forms of care with a trade off between beneficial and adverse effects

	Chapter
PROBLEMS DURING CHILDBIRTH	
Routine preloading with intravenous fluids before epidural analgesia	34
Narcotics to relieve pain in labour	34
Inhalation analgesia to relieve pain in labour	34
Epidural analgesia to relieve pain in labour	34
Epidural administration of opiates to relieve pain in labour	34
Early amniotomy in spontaneous labour	35
TECHNIQUES OF INDUCTION AND OPERATIVE DELIVERY	
Endocervical versus vaginal prostaglandin for cervical ripening before induction of labour	39
Oral prostaglandins for induction of labour with a ripe cervix	40
Prostaglandins versus oxytocin for induction of labour	40
Regional versus general anaesthesia for caesarean section	42
Epidural versus spinal anaesthesia for caesarean section	42
Ampicillin versus broader spectrum antibiotics for caesarean section	43
CARE AFTER CHILDBIRTH	
Prophylactic antibiotic eye ointments to prevent eye infection in the newborn	44
Prophylactic versus rescue' surfactant for very preterm infants	44

BEST AVAILABLE COPY

Table 4 Forms of care of unknown effectiveness

There are insufficient or inadequate quality data upon which to base a recommendation for practice

	Chapter
BASIC CARE	
Social support for high risk women to prevent preterm birth	3,24
Formal preconceptional care for all women	5
Fish oil supplementation to improve pregnancy outcome	6,15
Prostaglandin precursors to improve pregnancy outcome	6,15
Changes in salt intake to prevent pre eclampsia	6,15
Calcium supplementation to improve pregnancy outcome	6,15
Magnesium supplementation to improve pregnancy outcome	6,15
Zinc supplementation to improve pregnancy outcome	6
Antigen avoidance diets to reduce risk of an atopic child	6
SCREENING	
Placental grading by ultrasound to improve perinatal outcome	8,12
Fetal biophysical profile for fetal surveillance	12
PREGNANCY PROBLEMS	
Acupressure for nausea and vomiting of pregnancy if simple measures are ineffective	13
Vitamin B_6 for nausea and vomiting of pregnancy if simple measures are ineffective	13
Ginger for nausea and vomiting of pregnancy	13
Prostigmine for heartburn of pregnancy if simple measures are ineffective	13
Dilute acid or lemon juice for heartburn of pregnancy if antacids do not provide relief	13
Increased salt intake for leg cramps	13
Progestogens for threatened miscarriage with a live fetus	14
Human chorionic gonadotrophin for threatened miscarriage with a live fetus	14
Immunotherapy for recurrent miscarriage	14
Bed rest for women with pre eclampsia	15
Plasma volume expansion for pre eclampsia	15

Table 4 *continued*

Forms of care of unknown effectiveness

	Chapter
Choice among magnesium sulphate, benzodiazepines, and phenytoin for eclampsia	15
Hospitalization and bed rest for impaired fetal growth	16
Abdominal decompression for impaired fetal growth	16
Betamimetics for impaired fetal growth	16
Oxygen therapy for impaired fetal growth	16
Hormone therapy for impaired fetal growth	16
Calcium channel blockers for impaired fetal growth	16
Plasma volume expanders for impaired fetal growth	16
Prophylactic betamimetics for multiple pregnancy	17
Hospitalization and bed rest for triplet and higher order pregnancy	17
Treatment of group B streptococcus colonization during pregnancy	19
Antiviral agents for women with a history of recurrent genital herpes	19
Routine elective caesarean for breech presentation	22
Postural techniques for cephalic version of breech presentation	22
Prophylactic antibiotics for prelabour rupture of membranes at term or preterm	23
Postpartum prophylactic antibiotics after prelabour rupture of membranes	23
Home uterine activity monitoring for prevention of preterm birth	24
Bed rest to prevent preterm birth	24
Magnesium supplementation to prevent preterm birth	24
Calcium supplementation to prevent preterm birth	24
Progestogens to prevent preterm birth	24
Magnesium sulphate to stop preterm labour	24
Calcium antagonists to stop preterm labour	24
Routine cervical assessment for prevention of preterm birth	24
Antibiotic therapy in preterm labour	24
Oxytocin antagonists to stop preterm labour	24
Adding thyrotropin releasing hormone to corticosteroids to promote fetal maturation	25
Sweeping of membranes to prevent post term pregnancy	26,40
Nipple stimulation to prevent post term pregnancy	26
Induction instead of surveillance for pregnancy at 41+ weeks gestation	26

Table 4 *continued*

Forms of care of unknown effectiveness

	Chapter
CHILDBIRTH	
Routine amnioscopy to detect meconium in labour	30
Routine artificial rupture of membranes to detect meconium in labour	30
Short periods of electronic fetal monitoring as an admission screening test in labour	30
Fetal stimulation tests for fetal assessment in labour	30
Maternal oxygen administration for fetal distress in labour	30
Routinely repeated blood pressure measurements in labour	31
Guarding the perineum versus watchful waiting during birth	32
Prophylactic ergometrine + oxytocin versus oxytocin alone in third stage of labour	33
Early versus late clamping of the umbilical cord	33
Controlled cord traction in third stage of labour	33
Intraumbilical vein oxytocin for retained placenta	33
PROBLEMS DURING CHILDBIRTH	
Abdominal decompression to relieve pain in labour	34
Immersion in water to relieve pain in labour	34
Acupuncture to relieve pain in labour	34
Acupressure to relieve pain in labour	34
Transcutaneous electrical nerve stimulation to relieve pain in labour	34
Intradermal injection of sterile water to relieve pain in labour	34
Aromatherapy to relieve pain in labour	34
Hypnosis to relieve pain in labour	34
Continuous infusion versus intermittent top ups for epidural analgesia	34
Early use of oxytocin to augment slow or prolonged labour	35
Active management' of labour	35
Cervical vibration for slow or prolonged labour	35
Histoacryl tissue adhesive for perineal skin repair	36
Phenobarbitone to the mother to prevent intraventricular haemorrhage in the very preterm infant	37
Vitamin K to the mother to prevent intraventricular haemorrhage in the very preterm infant	37

Table 4 *continued*

Forms of care of unknown effectiveness

	Chapter
Caesarean section for very preterm delivery	37
Caesarean section for preterm breech delivery	37
Immediate versus delayed cord clamping at preterm birth	37
TECHNIQUES OF INDUCTION AND OPERATIVE DELIVERY	
Oxytocin by automatic infusion systems versus standard regimens for induction of labour	40
Use of haemostatic stapler for the uterine incision at caesarean section	42
Single layer versus two layer closure of the uterine incision at caesarean section	42
Systemic versus intraperitoneal prophylactic antibiotics at caesarean section	43
CARE AFTER CHILDBIRTH	
Tracheal suctioning for meconium in babies without respiratory depression	44
Routine use of antiseptics for the cord	45
Oral proteolytic enzymes for breast engorgement in breastfeeding mothers	46
Cabbage leaves for breast engorgement in breastfeeding mothers	46
Dopamine agonists to improve milk supply in breastfeeding mothers	46
Oxytocin nasal spray to improve milk supply in breastfeeding mothers	46
Oral proteolytic enzymes for perineal pain postpartum	47
Ultrasound and pulsed electromagnetic energy for perineal pain	47
Rubber rings and similar devices to prevent pressure for perineal pain	47
Cabergoline versus physical methods of suppressing lactation	48

APPENDIX C

CASE STUDY DAY ONE

Anna is a 24 year old, gravida 3 para 0 at 38 and 3/7 weeks arriving at the maternity center in early labor She is married to Misha, a taxi driver Anna stopped working at 32 weeks

Antenatal Care attended 8 visits

treated for a urinary tract infection at 24 weeks gestation

saw 5 different doctors and 3 different midwives

did NOT attend any antenatal classes

always alone at her visits

Anna has 2 sisters who gave birth in the last 2 years - one at the same facility and the other in Kiev Anna's knowledge of labor and birth is from her sisters and friends

ADMISSION/LABOR AND BIRTH "THROUGH HER EYES"

The midwife takes her admitting history, measures the fundus and listens for the fetal heart rate Prior to calling the doctor, Anna is given an enema, shave and then an antiseptic shower The midwife tells Anna this is all necessary to prevent infection and ensure a safe and clean delivery

The physician arrives and tells Anna a vaginal exam needs to be done Anna is very tense during the exam The cervix is 60%/1 cm/ 3/5 station/ vertex and posterior There is no bloody show The membranes are intact Anna's contractions are 6-8 minutes apart and mild to moderate palpation The physician only tells Anna that "you're early but you must stay"

Anna is admitted to a large room with 3 other women The women do not speak to each other One moans, the other two are quiet

Different midwives come and listen to the fetal heart rates One midwife stays in the room but seems to day dream while looking out the window Anna can hear the sounds of labor and birth from another room Many voices at once A woman screams a baby cries

The midwife comes Anna must go to be examined A different physician examines her She is told that labor is too slow and she must be given medication to increase her contractions Anna wonders if something is wrong

The hours seem to pass slowly Her arm aches from being held out straight for the intravenous infusion Anna hears other women give birth Her own pain increases When will this end? She does not understand She remains silent as the busy staff checks her periodically She is afraid She is silent She continues to hurt

No longer She opens her voice A midwife and doctor come It is not time The physician orders some medication for her pain Anna drifts off Her back continue to hurt

She pushes with all of her might It is taking so long She does not recognize the faces The sounds pierce through "Push, harder", again Anna feels the stretch and burn Her baby is out The baby cries, is put on her chest and then suddenly gone "Where is my baby?"

In the hallway Anna has some soup An ice pack is on her abdomen It is strangely quiet now Everyone has given birth But where is her baby? All these babies Where are they?

The midwife says the babies will go upstairs with each mother The mothers should rest and gain some strength Their babies are wrapped and waiting to go It won't be long

Anna lays down She is next to go to her room

TOT SCHEDULE WEEK ONE, FAMILY-CENTERED MATERNITY CARE

TIME	Monday	Tuesday	Wednesday	Thursday	Friday
8 30 AM	Convene	Pre-test	Trainer evaluation	Trainer evaluation	Trainer evaluation
9 00-10 00	Welcome speeches	Review key literature	Review, Small group work on barriers	Evaluation lecture	Orient to Week Two
10 00-11 00	Break Overview TOT Project	Adult learning lecture	Barriers cont'd Break	Break Small group work on evaluation plans	Role play Break
11 00-12 00 PM	MCH and technology lecture	Risk assessment lecture	Barriers work completed	Eval plan group work completed	Role play
12 00-1 00	Lunch	Lunch	Lunch	Lunch	Lunch
1 00-2 00	Infection control, risk assessment lectures	FCMC practices discussed	Review Change theory lecture	Share eval plans Consumer involvement lecture	Role play
2 00-3 00	Break Case Study Barriers	FCMC completed Break	Change theory cont'd Break	Focus group lecture Break	Role play Q&A Break
3 00-4 00	Q&A Non-trainers dismissed	Q&A Dismissed	Group work on change theory	Work on Action plans	Written evaluation Post-test
4 00-5 00	Meet with trainers		Group work on Action plans	Action plans cont's	Action plans completed

ACTION PLAN WORKSHEET

INSTITUTION

KNOWLEDGE	SKILLS	ATTITUDE	RESOURCES

ACTION PLAN WORKSHEET

PROVIDER

KNOWLEDGE	SKILLS	ATTITUDE	RESOURCES

ACTION PLAN WORKSHEET

CONSUMER

KNOWLEDGE	SKILLS	ATTITUDE	RESOURCES

FCMC TOT Pre-Test

Please circle T for True or F for False

1 Women are apt to be less embarrassed and therefore more relaxed if no one familiar is around them in labor	T	F
2 Women with spontaneous rupture of membranes should remain in bed during labor	T	F
3 Newborns are generally too excited to breastfeed soon after birth They should rest first before attempting to nurse	T	F
4 Women, while seeming to be out of control in labor, are in fact hyper-alert and retain what is said and done to them and are impacted by it after birth	T	F
5 Routine ultrasound in every pregnancy is an example inappropriate use of technology	T	F
6 Continuous electronic fetal monitoring has reduced fetal morbidity and mortality extensively	T	F
7 Epidural anesthesia has proven effective in reducing cesarian delivery in primips due to the increased relaxation	T	F
8 Comprehensive risk assessment criteria includes historical, physical and behavioral factors	T	F
9 Perinatal infection is largely preventable with consistent hand washing and wearing of gloves	T	F
10 Allowing family members in street clothes into the labor and delivery unit of a hospital has not increased perinatal infection rates	T	F
11 Adults learn best when presented with data in a formal manner such as lecture and handouts	T	F
12 Women are significantly impacted by their labor and birth experiences and thus should be significantly involved in the decision-making aspect of their care	T	F

The New England
Journal of Medicine

©Copyright 1980 by the Massachusetts Medical Society

Volume 303 SEPTEMBER 11 1980 Number 11

THE EFFECT OF A SUPPORTIVE COMPANION ON PERINATAL PROBLEMS, LENGTH OF LABOR, AND MOTHER-INFANT INTERACTION

ROBERTO SOSA M D JOHN KENNELL M D, MARSHALL KLAUS M D STEVEN ROBERTSON PH D, AND JUAN URRUTIA M D

Abstract We studied the effects of a supportive lay woman (doula) on the length of labor and on mother infant interaction after delivery in healthy Guatemalan primigravid women Initial assignment of mothers to the experimental (doula) or control group was random but controls showed a higher rate (P<0 001) of subsequent perinatal problems (e g cesarean section and meconium staining) It was necessary to admit 103 mothers to the control group and 33 to the experimental group to obtain 20 in each group with uncomplicated deliveries In the final sample the length of time from admission to delivery was shorter in the experimental group (8 8 vs 19 3 hours P<0 001) Mothers who had a doula present during labor were awake more after delivery (P<0 02) and stroked (P<0 001) smiled at (P<0 009) and talked to (P<0 002) their babies more than the control mothers These observations suggest that there may be major perinatal benefits of constant human support during labor (N Engl J Med 1980 303 597 600)

IN all but one of 150 cultures studied by anthropologists a family member or friend usually a woman remained with a mother during labor and delivery (Raphael D Unpublished data) Before childbirth moved from the home to the hospital it was also the practice in industrialized nations for family members to support the mother actively in labor often with the assistance of a trained or untrained midwife Although more fathers relatives and friends have been allowed into labor and delivery rooms in the past 10 years a considerable number of mothers still undergo labor and delivery in some hospitals without the presence of family members or close friends There has been little systematic study of this issue since the Newtons[1] reported that mothers who were quiet and relaxed and had better emotional relations with their attendants during labor and delivery were more pleased at the first sight of their babies The study in Guatemala was designed to investigate the effects of a supportive companion (Raphael[2] termed such a person a 'doula) on the length of labor and on mother-infant interaction after delivery in an obstetric setting in which mothers routinely undergo labor alone

From the Department of Pediatrics Case Western Reserve University and Rainbow Babies and Childrens Hospital Cleveland Ohio the Institute of Nutrition of Central America and Panama and ICSS Maternity Hospital Guatemala City Guatemala and All Children s Hospital St Petersburg Fla (address reprint requests to Dr Kennell at the Department of Pediatrics Rainbow Babies and Childrens Hospital and Case Western Reserve University 2101 Adelbert Road Cleveland OH 44106)

Supported in part by grant from the W T Grant Foundation Research Corporation The Thrasher Research Fund and Public Health Services grants (MCR 390337 04 0 and MCR HD 11089 02)

METHODS

The study was conducted at the Social Security Hospital in Guatemala City Guatemala The women who delivered in this hospital or their husbands have had regular payroll deductions to entitle them to the medical benefits of the governmental Social Security system Although their income level was low by United States standards their general health was superior to that of the women who delivered at the free public hospitals

In the maternity unit of the Social Security Hospital the routine was for primigravid mothers in labor to be admitted to an observation ward when the dilatation of the cervix was 1 to 2 cm and regular uterine contractions were present Mothers remained on this ward until the cervical dilatation was 3 to 4 cm at which time they were transferred to labor rooms adjoining the delivery rooms Hospital policies did not permit any family member friend or continuous nurse caretaker to be present in the rooms apparently as a consequence of the large number of deliveries (average 60 per day) and the limitation of space that was intensified in this hospital after the destruction of the previous maternity unit in the earthquake of 1976

Primigravid mothers in early labor with cervical dilatation of 1 to 2 cm and no known preeclampsia or other medical problems were eligible for the study The initial assignment of women to the control or experimental group was randomized by drawing an envelope after the woman entered the [illegible] and agreed to participate in the study

The control group followed the usual routines which consisted of infrequent vaginal examinations to monitor the labor auscultation of the fetal heart and assistance to the mother during delivery No electronic monitoring was used in this unit In addition to the routine care the mothers in the experimental group received constant support from an untrained lay woman from admission to delivery one woman was present during the day and another at night The support consisted of physical contact (e g rubbing the mother s back and holding her hands) conversation and the presence of a friendly companion whom the mother had not met before

A woman was removed from the study if the labor was false or prolonged if evidence of fetal distress during labor or delivery necessitated an intervention (such as oxytocin augmentation ce

BEST AVAILABLE COPY

cesarean section or forceps) if the infant was asphyxiated (Apgar score less than eight at five minutes) meconium stained depressed stillborn premature or small for gestational age if the infant had any evidence of illness such as respiratory distress These clinical judgments were made by the attending physician who did not know the purpose of the study If a woman was removed her group assignment was inserted at random into the pool of unused assignments Women were enrolled in the study until there were 20 in the control group and 20 in the experimental group

The women who constituted the final sample remained in the delivery room for up to one hour after delivery for the completion of the third stage of labor and episiotomy repair During this period the baby was cleaned and kept in a bassinet in the same room The median stay in the delivery room was 30 minutes (range 20 to 60) for the control group and 28 minutes (range 15 to 50) for the experimental group (Mann-Whitney U 180 P>0 50)

Mothers in both groups were allowed 45 minutes of skin to skin contact with the undressed infant in a private room A radiant heat panel kept the babies warm During the first 22 5 minutes of contact an observer who did not know the previous experience of the mother watched the mother and infant through a one way window for 15 seconds at 45 second intervals

The observer recorded the mother s state (awake or asleep) and whether she maintained trunk to trunk contact with the baby The mother s way of handling the infant was recorded — the part of the hand used (fingertips or palm) the part of the infant handled (head trunk or extremities) and whether the mother simply touched the infant or used a stroking motion Looking (including en face) smiling kissing and talking (including nonspeech vocalizations) by the mother directed toward the infant and nursing behavior by the mother and infant were also recorded Spontaneous movement opening or closing of the eyes and crying by the infant were recorded but only crying could be recorded reliably because of the position of the observer with respect to the mother and infant Some maternal behaviors (i e kissing and obvious attempts to elicit a response from the baby) as well as crying by the infant were recorded but they occurred too infrequently to be analyzed for group differences Agreement between two observers (based on the observation of six mother infant pairs not involved in the study) ranged from 0 88 to 0 98 for the items included in the analysis

Results

Table 1 shows the demographic characteristics of the 40 mothers and babies in the final sample There were no statistically significant differences between the groups in the marital status or age of the mothers or in the birth weights or sex distribution of the infants

Perinatal Problems and Need for Intervention during Labor and Delivery

It was necessary to admit 103 mothers to the control group and 33 to the experimental group to obtain the final samples of 20 in each group with uncomplicated labors and normal vaginal deliveries In other words 83 women assigned to the control group and 13 assigned to the experimental group were not studied after the development of one or more of the problems described above evidence of fetal distress requiring intervention during labor or delivery meconium staining or other manifestations of neonatal asphyxia After exclusion of nine mothers — four in the control group and one in the experimental group who were removed because of false labor and four others in the control group (three with premature infants and one with extreme anxiety) — a chi square analysis indicated an association between the presence of a supportive companion during labor and a lower incidence of the problems of labor delivery or the neonate that were used as criteria for exclusion (chi square with 1 degree of freedom = 17 2 P<0 001) Table 2 contains the number of women excluded for each reason It should be noted that each mother was listed only once under the first problem to occur Thus if a cesarean section was performed the mother was excluded from the study and no further problems (e g meconium staining) were listed

Table 1 Demographic Characteristics of Mothers and Infants

Characteristics	Control Group	Experimental Group
No of mothers	20	20
Mean age of mothers (yr)	21	20
Father not in household (no)	3	1
Mean infant birthweight (g)	3061	2943
Sex of infant		
Male (no)	12	10
Female (no)	8	10

Table 2 Total Study Population Including Mothers Removed Because of Problems or Intervention

Characteristics	Control Group	Experimental Group
	93 mothers	32 mothers
	% of mothers	
No problems	21 (20)	63 (20)
Problems or intervention *		
Meconium staining	25 (24)	9 (3)
Depressed newborn	3 (3)	0 (0)
Stillbirth	2 (2)	0 (0)
Cesarean section	27 (26)	19 (6)
Oxytocin augmentation	17 (16)	6 (2)
Forceps	5 (4)	3 (1)
Total removed	79 (75)	37 (12)

Figures in parentheses denote number of mothers

Chi square (1 degree of freedom) 17 2 (P<0 001) for the association between the group and the total number of problems or interventions None of the women not listed here (eight in the control group and one in the experimental group) were eliminated for reasons explained in the text

Length of Labor

The number of vaginal examinations performed to monitor cervical dilatation for each patient was determined by the obstetric staff and influenced by the clinical course of individual patients such examinations were limited to minimize the risk of infection The mean time from admission to the observation ward until delivery for the 40 mother infant pairs retained in the study was 19 3 hours for the control group and 8 7 hours for the experimental group — ($t[38] = 3 81$ P<0 001)

Maternal Behavior

When the mothers in the two groups were observed alone with their infants in a private room there were

BEST AVAILABLE COPY

BEST AVAILABLE COPY

differences in maternal state and behavior (The normal approximation to the Mann–Whitney test corrected for ties[5] was used to compare the groups.) The amount of time during which the mothers remained awake in the period of observation was greater for the experimental group than for the control group ($z = 2.51$, $P<0.02$). Because some mothers slept for part of the time, scores for individual behaviors were expressed as a proportion of the number of time sampled periods during which a mother was awake.

While the mothers were awake, there was a substantial difference in the amount of stroking, with the experimental mothers stroking more than the control mothers ($z = 4.09$, $P<0.001$) (Fig. 1). However, there was no significant difference in the amount of simple touching of the infants ($z = 1.87$, $P = 0.06$). The proportion of handling time (time spent touching or stroking the infant) that mothers spent in contact with the infant's head, trunk, or extremities did not differ between groups. Similarly, there was no difference between the groups in the proportion of handling time during which mothers used their fingertips or palms.

The mothers in the experimental group also talked to their infants ($z = 3.10$, $P<0.002$) and smiled at them ($z = 2.66$, $P<0.009$) more than the mothers in the control group (Fig. 1). However, the groups did not differ in the amount of time spent in body to body contact, eye to eye looking at the baby, or nursing.

Spearman rank correlation coefficients were computed between the length of labor and the specific maternal behaviors for which there were group differences. Except for a marginal correlation with the amount of stroking by the control mothers ($r = 0.39$, $t[18] = 1.77$, $P = 0.09$), there were no significant correlations ($P>0.25$) between the length of labor and maternal behavior in the first hour after birth. The marginal association in the control group is positive — an indication that longer labors were associated with more stroking of the infant rather than less. Thus, it is unlikely that the group differences in these behaviors were primarily a result of differences in the length of labor.

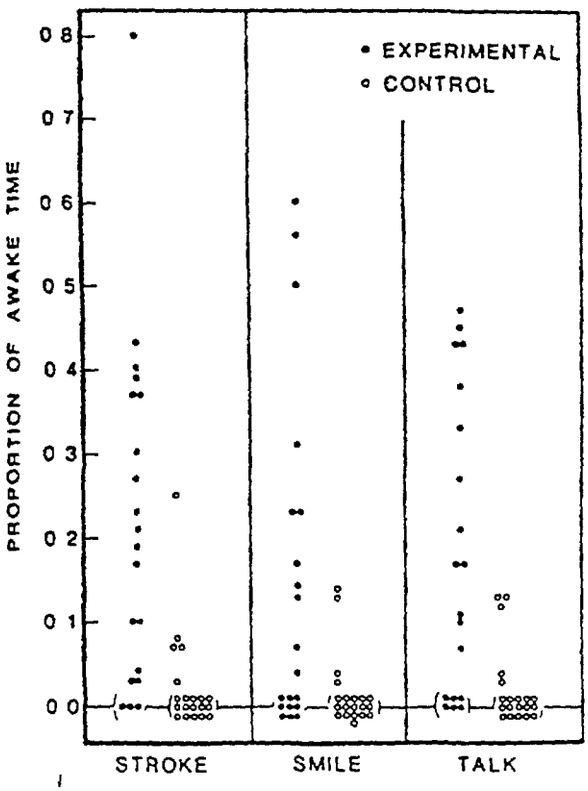


Figure 1. Maternal Behaviors during the First Hour after Birth for Which There Were Significant Differences between the Experimental (Doula) and Control Groups. Expressed as the Proportion of Awake Time.

Discussion

The findings of this study suggest the importance of human companionship during labor and delivery. Labor was shortened, and some aspects of maternal behavior in the first hour after delivery were enhanced. Unexpectedly, the likelihood of development of certain problems that require intervention during labor and delivery was lower for mothers who had a supportive companion. Since data on the length of labor for mothers who were eliminated from the study were not available, the relation between length of labor and the incidence of such problems could not be analyzed.

An earlier study of low-income inner city mothers in Cleveland suggested that the effects of the supportive companion on maternal behavior may last beyond the first hour after delivery.[4] In that study, mothers who were awake in the first 40 minutes of contact with their babies were more affectionate, attentive, and responsive to their infants at one month than were mothers who fell asleep. However, there are some difficulties in the use of the results of that study to argue for the long term effects of a supportive person. In that investigation, mothers who fell asleep were also more heavily medicated, but in the present study, none of the mothers in the final sample received any medication. In addition, contact between mothers and infants in the Cleveland study was limited by hospital routine to feedings lasting 20 to 30 minutes every four hours plus five hours of continuous contact each day, in contrast to almost continuous contact from birth in our study.

Our findings raise the possibility of an association between acute anxiety and arrests of labor or fetal distress. Other studies of human and primate mothers have suggested that one mechanism to account for this relation is an increase in levels of catecholamines, which are known to decrease uterine contractility.[6] Lederman et al.[7] found that plasma epinephrine levels and self reported anxiety at 3 cm of cervical dilatation were significantly correlated in 32 normal primigravid women. Physiologic elevations of plasma

epinephrine were associated with decreased uterine contractile activity at the onset of labor (3 cm of cervical dilatation) and a longer duration of labor from 3 to 10 cm of cervical dilatation.

Fetal distress could be secondary to increased levels of catecholamines as well, but this effect would be due to decreased uterine and placental blood flow. Barton et al.[8] noted marked reductions in blood flow (up to 50 per cent) to the sheep uterus after an injection of epinephrine and norepinephrine. Catecholamines administered to pregnant rhesus monkeys by Adamsons et al.[8] resulted in fetal asphyxia, but they had no such effect when injected only into the fetus. Myers[9] noted that psychological stress alone, without pain or physical contact with the pregnant monkey, resulted in fetal asphyxia.

It should be emphasized that in our study the combination of the crowded hospital conditions, the absence of prenatal preparatory classes, and the unfamiliar hospital environment may have markedly increased maternal anxiety and exaggerated the effect of the supportive companion. In any event, future studies are needed to determine whether the effects can be correlated with maternal catecholamine levels.

The powerful effects of the presence of the supportive companion in this investigation raise the possibility that human companionship may have influenced the results in studies of the effectiveness of electronic fetal monitoring. In four randomized control studies of fetal monitoring in mothers at high risk,[10-15] the rate of cesarean section was increased in the monitored group, presumably because of evidence of fetal distress or failure to progress in labor. Haverkamp et al.[14] suggested that the control group of patients in their study had more individualized nursing care and close physical contact for auscultation of the fetal heart, and that as a result these patients had less anxiety. They proposed that the added attention and physical contact might have contributed to the favorable outcome in the group that received personal nursing care rather than electronic monitoring. The results of our investigation suggest that further studies of any labor intervention must ensure that both groups receive the same amount of time and support from nurses and medical personnel.

The observations in our study, if confirmed, may have important implications for the future care of mothers and neonates in industrialized and developing nations. They are particularly relevant to the care of low income, single, or teenage mothers, who may not receive positive support from their families during labor and delivery, and who may have had no formal or strong cultural preparation for childbirth. How often has false labor or prolongation of the deceleration of a mother's labor after she enters the hospital resulted from her reaction to the strange, inhibiting, or frightening aspects of the hospital environment? An untrained woman in provided the friendly support in this study, but similar or greater benefits may be expected when a family member or a friend remains with the mother throughout the labor and delivery. This low cost intervention may be a simple way to reduce the length of labor and the number of perinatal problems for parturient women and their infants.

We are indebted to Drs. Deborah Hales and Rodolfo Izaquirre and to the medical and nursing staff of IGSS Maternity Hospital for their assistance. We are particularly indebted to Marta Izabel Garcia, Rubidia Mendez, and Maricela Ochoa de Zelada for their work.

References

1. Newton N, Newton M. Mothers' reactions to their newborn babies. JAMA 196: 181:206-10.
2. Raphael D. The tender gift: breastfeeding. Englewood Cliffs, NJ: Prentice Hall, 1973.
3. Siegel S. Nonparametric statistics for the behavioral sciences. New York: McGraw Hill, 1956.
4. Trause MA, Kennell JH, Klaus MH. A fresh look at early mother-infant contact. Pediatr Res 1978; 12:376 (abstract).
5. Zuspan FP, Cibils LA, Lose SV. Myometrial and cardiovascular responses to alterations in plasma epinephrine and norepinephrine. Am J Obstet Gynecol 1962; 84:841-51.
6. Lederman RP, Lederman L, Work BA Jr, McCann DS. The relationship of maternal anxiety, plasma catecholamines, and plasma cortisol to progress in labor. Am J Obstet Gynecol 1978; 132:495-500.
7. Barton MD, Killam AP, Meschia G. Response of ovine uterine blood flow to epinephrine and norepinephrine. Proc Soc Exp Biol Med 1974; 145:996-1003.
8. Adamsons K, Mueller-Heubach E, Myers RE. Production of fetal asphyxia in the rhesus monkey by administration of catecholamines to the mother. Am J Obstet Gynecol 1971; 109:248-62.
9. Myers RE. Maternal psychological stress and fetal asphyxia: a study in the monkey. Am J Obstet Gynecol 1975; 122:47-59.
10. Chalmers I. Randomized controlled trials of intrapartum fetal monitoring. In: Thalhammer O, Baumgarten K, Pollack A, eds. Perinatal medicine. Sixth European Congress. Stuttgart: Georg Thieme, 1979: 760-5.
11. Keith RM, Parsons RJ, Lawrence GF, Arora SS, Edmonds DK, Cooke ID. An assessment of continuous fetal heart rate monitoring: labor: a randomized trial. Am J Obstet Gynecol 1978; 131:526-32.
12. Neutra RR, Fienberg SE, Greenland S, Friedman EA. Effect of fetal monitoring on neonatal death rates. N Engl J Med 1978; 299:324-6.
13. Parer JT. Benefits and detriments of fetal heart rate monitoring. Semin Perinatol 1978; 2:113-8.
14. Renou P, Chang A, Anderson I, Wood C. Controlled trial of fetal intensive care. Am J Obstet Gynecol 1976; 126:470-6.
15. Haverkamp AD, Thompson HE, McFee JG, Cetrulo C. The evaluation of continuous fetal heart rate monitoring in high risk pregnancy. Am J Obstet Gynecol 1976; 125:310-7.

BEST AVAILABLE COPY

BEST AVAILABLE COPY

Betsy Greulich, CNM, MSN is Chief of Nurse-Midwifery Services at Los Angeles County + University of Southern California (LAC+USC) Medical Center, Women's Hospital, Los Angeles, California In addition, she is a Clinical Assistant Professor of Obstetrics and Gynecology in the School of Medicine and Department of Nursing at the University of Southern California.

Lisa L. Paine, CNM, DrPH, FAAN, FACNM, Research consultant to the LAC + USC Nurse-Midwifery Service, is Associate Professor and Director of the Nurse-Midwifery Education and Maternal and Child Health Programs at the Boston University School of Public Health, Boston, Massachusetts In addition, she was founding chairperson of the Division of Research of the American College of Nurse-Midwives and is now a member of the Division's governing board

Cindy McClain CNM, MSN is a staff nurse-midwife at Women s Hospital and, as a member of the Quality Assessment and Improvement Committee, is responsible for the collection of service statistics She is a Clinical Assistant Professor of Obstetrics and Gynecology in the School of Medicine at the University of Southern California.

Mary K Barger CNM MPH, is Assistant Professor and Nurse Midwifery Education Program faculty member at the Boston University School of Public Health Boston Massachusetts She is a member of the Massachusetts Department of Public Health Cesarean Section Review Committee

Nancy Edwards MD is director of Normal Nurseries and Neonatal Consultant for the Normal Birth Center Women's Hospital Los Angeles California She is Associate Professor of Clinical Pediatrics in the School of Medicine at the University of Southern California

Richard Paul MD is Director of the Obstetric Service Division of Maternal-Fetal Medicine and Consultant for the Nurse Midwifery Service at LAC+USC Medical Center Women s Hospital Los Angeles California He is Professor of Obstetrics and Gynecology in the School of Medicine at the University of Southern California

considered a more central role for the nurse-midwife, especially as it relates to the selection of appropriate levels of care for women at medical and social risk.

The Normal Birth Center (NBC) at Los Angeles County (LAC) + University of Southern California (USC) Medical Center, Women's Hospital, was opened in 1981 as an in-hospital birth unit staffed by nurse-midwives, nurses, and pediatric nurse practitioners in response to an increasing demand for obstetric services within a confined traditional labor and delivery unit. Before the development of the NBC at Women's Hospital, however, CNMs were already an integral part of the high-risk labor and delivery unit. From 1979 to 1980, nurse-midwives attended 14% of all births at the hospital (3,677/26,532) Women were considered acceptable nurse-midwifery candidates if they had no known medical problems, prenatal care was not a prerequisite The primary cesarean birth rate at the hospital in 1980 was 8 7% (1,161/13,292) Over the last six months of 1980, the primary cesarean section rate for women cared for by the nurse-midwife on the traditional labor and delivery unit was 2% (18/863), this low rate has been attributed to the selection process used to determine an appropriate caseload (11)

This article describes the setting, policies, and practices of the nurse managed in-hospital birth center at LAC+USC Women's Hospital and summarizes a retrospective analysis of available data on birth outcomes and selected intrapartum transfer, newborn, and postpartum outcomes for more than 30,000 nurse-midwife attended births from mid-1981 through 1992

SERVICE BACKGROUND

Facility and Surroundings

Los Angeles County is a burgeoning megalopolis with approximately 9 3 million people Hispanics primarily originating from Mexico comprise 35% of the population (12) Women's Hospital is located within 3 miles of downtown Los Angeles and provides care to a population that is predominantly Roman Catholic and 95% Hispanic Ninety-one percent of the women who receive care at Women's Hospital pay for their hospitalization via government assistance 8% are responsible for self payment and 1% have insurance or third party reimbursement.

Women are referred to Women s Hospital from three comprehensive health centers as well as other smaller community clinics operated by the Los Angeles County Department of Health Services, the providers in these clinics are public health physicians, nurse-practitioners, and a few full-time clinic nurse-midwives who are not Women's Hospital staff In addition, referrals are received from private clinics and practitioners throughout the county Women who are on Medi-Cal (California's Medicaid program) can give birth in any hospital that has a Medi-Cal contract irrespective of where they received their prenatal care Approximately 10% of women admitted to the birth center have had no prenatal care

The NBC is located on the eighth floor of Women's Hospital, three floors above the high-risk labor and delivery unit and four floors above the neonatal intensive care unit The NBC consists of six birth rooms and three postpartum rooms The birth rooms range in size from 186 to 325 square feet, with a private adjacent bathroom Each birth room contains a birthing bed, rocker, fetal monitor delivery equipment, and infant resuscitation unit. The postpartum rooms contain four beds All babies room in" with the mother because there is no separate nursery The sparsely decorated birth rooms are functional although in dramatic contrast to the homelike atmosphere in many other hospitals (3 9, 13)

Admission Practices

The NBC caseload could be described as mixed risk Mann used

to define a population that exc... ve of some risk states, yet at the same time inclusive of other risks 14) Women are examined by the nurse-midwife or the obstetric resident in the main admitting room Women without identified problems are encouraged to remain at home during latent labor and are not admitted to the NBC until active labor is diagnosed—that is, regular uterine contractions have been established and the cervix is dilated at least 4 cm After careful evaluation of their overall risk status, women of all ages are admitted to the NBC if they meet selection criteria (Appendix A) and if bed availability and staffing permit. This may include women with class A 1 diabetes, a prior cesarean birth, grand multiparity, and anemia It is estimated that another 5% to 10%, or 10 to 20 women a month would qualify for admission if all women who met selection criteria could be admitted Whereas many alternative birth centers are chosen by women as a birth option (3, 6, 7, 9), women are admitted to the NBC simply because they fulfill the selection criteria. Therefore, most women in this setting do not have prior awareness of the special characteristics of the NBC

Staffing

At present, there are 31 CNMs on staff occupying 26 full-time equivalent positions Half of the full-time staff has two years or less of experience, the other half ranges in experience from three to 17 years, with a median of nine years From 1981 to 1992 47 nurse-midwives completed a one to three-month internship in this setting; 10 were eventually hired as staff The nurse-midwife intern acts as an additional person on the shift and does not take the place of a staff CNM

Two CNMs are on duty on the unit at times working either 12- or 24-hour shifts In addition to CNMs, there are five to six registered nurses per shift and ancillary support personnel Two pediatric nurse practitioners are responsible for evaluating the newborns during the day Generally, there are nine admissions and eight births per day on the NBC, the average number of postpartum mothers and newborns in the birth center is 12 per day

Nurse-midwife students of the USC Education Program are present on the ward for 10 weeks each year For the student's first two intrapartum clinical shifts, the faculty's sole responsibility is to precept the student; thereafter, the faculty works as the second nurse-midwife on duty while proctoring the student. Other students are present on the NBC, including an occasional advanced intrapartum student from another nurse-midwifery program, an occasional medical student for an observation experience, and more often, nursing students from six area schools who are assigned with the NBC nurses The most experienced CNM serves as a resource person on the unit, but integral to the smooth functioning of the ward is the philosophy of team work and mutual responsibility among the nurse-midwifery and nursing staff

Philosophy of Care and Clinical Practices

Women admitted to the NBC are encouraged to have the support person(s) of their choice present throughout labor and delivery The support person is not required to attend childbirth education classes Children may be present, those under five years of age must be accompanied by an adult other than the support person

On admission, women have a 20-minute evaluation of fetal condition via electronic fetal monitoring If maternal and fetal assessments are normal and labor status permits, the woman is encouraged to ambulate and monitoring is performed intermittently Internal monitoring with a fetal scalp electrode and intrauterine pressure catheter is instituted only as indicated Generally if the woman is in bed the fetal monitor is used continuously Given the mixed-risk population and an intrapartum postpartum, and neonatal caseload that could total 30 patients, intermittent auscultation throughout labor and delivery is impractical

Oral fluids are permitted and encouraged throughout labor Depending on labor status, fetal condition and patient desire, available hospital food may also be consumed Intravenous fluids are not used routinely but are administered as fetal and maternal condition warrants Analgesic and ataractic medications are available, however, they are not often used in this setting because of the nurse-midwifery management philosophy that promotes pain relief strategies such as showering, ambulation, position changes, and emotional support as primary interventions Local or pudendal anesthesia is available on the NBC, women desiring or requiring regional anesthesia are transferred from the NBC to the high-risk unit. Oxytocin is not used for labor augmentation on the birth center, instead, alternative techniques such as ambulation position changes, and breast stimulation with the electric pump are practiced.

After birth, mother and baby are stabilized in the birth room for approximately two hours They are then moved to a postpartum room on the NBC, where the typical hospital stay is 12 to 24 hours Newborns return two to three days after discharge for a routine examination by the pediatric nurse practitioners in the follow-up clinic located on the NBC Phone calls are made as reminders, and the cord clamp is purposefully left in place by the newborn staff to encourage return visits At this time, consultation with a neonatologist or referral to a pediatric specialty clinic is obtained if necessary; otherwise the newborn is given a routine appointment in two weeks at a Los Angeles County clinic Women are instructed to return to the main admitting room of Women's Hospital

BEST AVAILABLE COPY

BEST AVAILABLE COPY

should problems develop after discharge All postpartum mothers are given an appointment for a four-week family planning visit at either Women's Hospital or one of the county clinics Visiting nurse and public health referrals are made if the social situation necessitates additional follow-up

Complications and Emergencies

Women who develop complications of labor or require regional anesthesia or oxytocin are transferred to the traditional high-risk labor and delivery ward, where continuing care is provided by the resident team Obstetric and pediatric residents can be summoned to the NBC via direct phone lines and are able to respond to any emergency within 3–5 minutes An emergency elevator can be accessed if rapid transport is needed. About three to four times per week, when staffing permits, a CNM is assigned to a 12-hour shift in this high-volume, high-risk setting While assigned there, the CNM may have a variety of roles, including providing care to women transferred from the NBC

Criteria for transfer from the NBC to the high-risk labor and delivery unit are listed in Appendix B These criteria have undergone only minor revisions over the past 12 years In 1988, the selection criteria were expanded to allow women with intrapartum hematocrits of 28% to 30% to labor and deliver on the NBC Previously, women with a hematocrit of < 30% were transferred to the high-risk unit. In 1989, the 2-hour time limit was deleted with regard to failure to progress during active labor as a sole reason for transfer The time limit did not reflect the more liberal approach to labor management that was actually in practice at the time when nurse-midwives were more routinely instituting alternatives such as showers, ambulation and breast stimulation to augment labor rather than automatically transferring the woman to the high risk floor Diagnostic criteria for pregnancy-induced hypertension and preeclampsia were revised in 1989, increasing blood pressure and proteinuria baselines from 130/90 or > 1+ to 140/90 or > 2+ In 1991, when amnioinfusion was introduced to the birth center to dilute thick meconium, thick meconium was deleted as an automatic reason for transfer

Data Collection

Data are manually recorded in the service delivery log book and later entered on computer by one of the nurse-midwifery staff members using a program specifically designed to record log book information In 1990, when the computerized system was installed, the Nurse-Midwifery Clinical Data Set was evaluated for appropriateness in this setting (15) Because the Data Set is geared toward the comprehensive care model, it was determined to be less useful than the customized program in this episodic care setting

METHODS

The method used to analyze selected outcomes in this descriptive report was a retrospective records review Data were derived from a variety of hospital sources Admission and transfer data, and labor and birth outcome data were found in the nurse-midwifery delivery log book the annual reports of the nurse-midwifery service, the hospital delivery log book, and annual delivery statistics maintained by Women's Hospital's Medical Information Services cesarean statistics were available from Women's Hospital's Division of Maternal-Fetal Medicine Newborn outcome data were available in a data set previously collected by the pediatric nurse practitioner service Admission, birth, and transfer frequency data were available from the annual reports of the nurse midwifery service as compiled from the delivery log book from 1981 to 1992, however, complete data were not available from other sources for the entire 12-year period Transfer outcome data were available from 1985 to 1992, data about intrapartum transfer indications were available from 1988 to 1992, demographic information and labor and birth data were available from 1990 to 1991, and postpartum maternal transfer indications, neonatal transfer data, and newborn follow-up data were available from 1982 to 1986 Significance levels were considered but not determined because of the retrospective nature of the data and, therefore, the inability to statistically define causal factors

An effort was made to address the reliability of the data recorded in the nurse-midwifery delivery log book, the primary data source for this study because one of the main limitations of the retrospective design is data reliability A systematic random sampling of 174 charts, 124 from 1991 and 50 from 1986, was made Ten charts from 1991 (6 1%) and 16 charts from 1986 (32%) were not located by Medical Information Services overall, 148 of the requested charts (85 1%) were located The log book data for 34 variables were compared with the medical record The 1991 log book data were also compared with data recorded in the nurse-midwifery computerized data base Results indicated an overall log book accuracy rate of 96% No attempt was made to verify the reliability of the data gathered by the medical or nurse-practitioner service

RESULTS

Demographic characteristics of women who gave birth on the birth center in 1990 and 1991 are presented in Table 1 As presumed the population was made up of primarily Hispanic women between the ages of 18 and 35 who had received some prenatal care most had previously given birth and experienced a term pregnancy Although the data pre

TABLE 1
Selected Demographic and Clinical Characteristics of Women Whose Births Occurred on NBC, 1990–1991 (N = 6,109)

Demographics	n	*Percentage*
Age		
< 18	409	6 7
18–34	5,329	87.2
≥ 35	371	6 1
Race		
Hispanic	5 771	95
Asian	85	1 0
Black	59	1 0
White	62	1 0
Unknown	132	2 0
Parity		
0	1 681	28
1	1,784	29
2–4	2,334	38
≥ 5	310	5
No prenatal care	579	9 5
Gestational age		
< 38 wk	756	12 4
38–41 wk	5,021	82 2
≥ 42 wk	332	5 4

serted here comprise only 20% of all women who delivered on the NBC over the study years, there have been no major shifts in the birth center population over the last 12 years

Table 2 summarizes the available NBC admission, delivery, and transfer data annually from 1981 to 1992 From June 1981 through December 1992 there were 36,410 intrapartum admissions and 30,311 births on the NBC These births accounted for 15% of the 196,420 births in Women's Hospital during the same period During all study years, the intrapartum transfer rate to the high-risk labor and delivery unit was 17%, and there were no intrapartum maternal or fetal deaths among all NBC admissions The transfer rate for women admitted to the NBC from 1985 to 1992 was 13 1%, and the primary cesarean birth rate for all women admitted was 1 8% (469/25,890) This number does not include the six women (6/307) admitted to the birth center with a previous cesarean birth, who failed trial of labor and required a repeat cesarean birth The overall operative birth rate (cesarean, forceps, and vacuum extraction births) for all NBC admissions was 4% The hospital primary cesarean rate during these same years was 10%

Tables 1 and 3 highlight some of the labor and birth outcomes of more than 6,000 women who gave birth on the NBC in 1990 and 1991 The highlights include the following 28% of the births were from nulliparous women most women experienced unmedicated labors, < 2% had perineal trauma beyond a second-degree laceration, and more than half had no perineal trauma at all, most infants were of normal birth weight although over 20% of infants were exposed to meconium-stained amniotic fluid, Apgar scores of less than 8 at 5 minutes were rare During these same 2 years, there were 526 women who were transferred from the NBC to the high-risk unit, 338 of the women transferred (64%) were nulliparas

Newborn outcome data were systematically gathered by the pediatric nurse practitioners from January 1982 through December 1986 During those 5 years, 13,297 infants were managed by the pediatric nurse practitioners Of these infants, 12,396 were born in the birth center, and 901 were born in the high-risk unit When nurse-midwives attended labors and births in the high-risk unit, they had the option of transferring the mother and newborn to the NBC if they were deemed appropriate for early discharge Of the 13,297 infants, 10,373 (78%) were discharged from the NBC, and 2,924 infants (22%) were transferred to the normal nurseries Only one third (899) of the infants transferred to the normal nurseries had medical problems The other two thirds (1,822) were transferred because the mother was not a candidate for early discharge Indica-

TABLE 2
Women's Hospital (WOH) Births and Normal Birth Center (NBC) Admissions, Births, and Transfers from 1981 to 1992

			NBC Births		*Transfers from NBC*		*Cesarean Births*			*Forceps/Vacuum Extraction Births*		
Year	*WOH Births*	*NBC Admissions*	n	*% WOH Births*	n	*% NBC Admits*	n	*% NBC Transfers*	*% NBC Admits*	n	*% NBC Transfers*	*% NBC Admits*
1981	14 713	905	706	5	199	22						
1982	14 854	3 208	2 317	16	891	28						
1983	16 565	3 171	2 359	14	812	26						
1984	16 562	3 236	2 439	15	797	25						
1985	18 141	3 207	2 557	14	650	20	68	10 5	2 1	114	17 5	3 6
1986	17 147	3 103	2 514	15	589	19	59	10	1 9	81	14	2 6
1987	16 383	3 072	2 502	15	570	18 5	91	16	3	66	11 5	2 1
1988	16 462	3 064	2 658	16	406	13	70	17	2 3	62	15 5	2
1989	18 147	3 468	3 086	17	382	11	64	17	1 9	74	19	2 1
1990	18 094	3 475	3 224	18	251	7	46	18	1 3	66	27	1 9
1991	14 818	3 160	2 885	19 5	275	9	36	13	1 1	61	22	1 9
1992	14 544	3 341	3 064	21	277	8	41	15	1 2	66	24	2
Total	196 420	36 410	30 311	15	6 099	17	475	14	1 8	590	17 4	2 3

BEST AVAILABLE COPY

TABLE 3
Selected Labor and Birth Outcomes at NBC, 1990–1991 (*N* = 6,109)

Labor and Birth Outcomes	n	*Percentage*
Medications in labor		
None	5,683	93
Mependine	259	4 3
Hydroxyzine	167	2 7
Penneum		
Intact	3,493	57 2
Episiotomy	311	5 1
1st- or 2nd-degree laceration	2,128	34 8
3rd- or 4th-degree laceration	109	1 8
Unknown	68	1 1
Meconium stained amniotic fluid		
None	4,684	77
Thin	870	14
Thick	514	8 3
Unknown	41	0 7
Apgar score		
< 8 at 5 min	27	0 4
Birth weight		
< 2,500 gm	61	1
2,500–4,000 gm	5,566	91
4,001–4,500 gm	445	7 3
> 4,500 gm	37	0 7

tions for maternal transfer to the routine postpartum ward are listed in Table 4 There were 203 newborns (1 5%) who required admission to the neonatal intensive care unit. The most frequently encountered problems were respiratory distress, severe congenital anomalies, meconium aspiration, and polycythemia. Table 5 summarizes the reasons for transfer of newborns from the birth center to the normal nurseries and neonatal intensive care unit.

After they were discharged from the NBC, 8,814 newborns (85%) returned for their appointment in the follow-up clinic There were 173 newborns (1 3%) who required readmission to the hospital during the first week of life. Table 5 summarizes the reasons for readmission to the hospital, with jaundice as the primary indication for hospitalization No readmitted newborn died

As intrapartum transfers declined from 1985–1992 (see Table 2), there was a concomitant decrease in the proportion of NBC admissions who had cesarean births Operative vaginal births surpassed cesarean births as the most frequent method of intervention in 1989 This trend continued through 1992 In addition there was a steady increase in the proportion of women who experienced an operative birth after transfer from the NBC to the high-risk labor and delivery unit (Table 2) This comparison can be illustrated by looking at two 4-year periods From 1985 through 1988, 18% of all women admitted to the NBC were transferred and among all transfers 13% had cesarean births, and 15% had operative vaginal births By contrast, from 1989 through 1992 9% of all women admitted to the NBC were transferred, and among those transferred 16% had cesarean births and 22 5% had operative vaginal births

As previously noted, the intrapartum transfer rate to the high-risk labor and delivery unit from 1985 to 1992 was 13 1% Three distinct declines were observed in the transfer rate They occurred between 1984 and 1985, 1987 and 1988, and 1989 and 1990 (Figure 1) In 1985 when nurse-midwives began triaging obstetric patients in the main admitting room, the intrapartum transfer rate decreased from 25% to 20% and the number of women discharged home undelivered from the NBC dropped from 0 9% to 0 5% Before 1985 all laboring women were examined by the resident in the main admitting room and dispositioned for admission to the NBC or the high risk unit or discharged to home The subsequent declines in intrapartum transfers that occurred between 1987 and 1988 and 1989 and 1990 can not be attributed to a singular event rather they coincided with several changes in admission and transfer

TABLE 4
Indications for Maternal Transfers From NBC to Routine Postpartum Floors, 1982–1986 (Total *N* of NBC Postpartum Women = 13,297)

Indication	n *(1 822)*	*% Transfers*	*% Total Postpartum Women (13 7)*
Anemia	614	34	4 6
Bilateral tubal ligation	346	19	2 6
3rd- or 4th-degree laceration	278	12 5	1 7
Fever (≥ 101 anytime or 100 4 × 2 after 24 h)	131	7 2	1 0
Postpartum hemorrhage	115	6 3	0 9
Pregnancy induced hypertension	102	5 6	0 7
Positive syphilis serology	84	4 6	0 6
Medical problem	33	1 8	0 25
Substance abusing mother	31	1 7	0 2
Other	136	7 5	1 0

BEST AVAILABLE COPY

TABLE 5
Indications for Neonatal Transfer from NBC to Neonatal Intensive Care Unit and Normal Nursery, and Newborn Readmissions, 1982–1986 (N = 13,297)

Reasons	n	% *Neonatal Transfers*	% *NBC + High Risk Unit Births*
Total NBC + high risk unit births	13,297		
NBC births	12 396		93
Infants admitted after birth in high risk unit increase load	901		7
NBC to neonatal intensive care unit			
Respiratory distress	43	21	0 3
Congenital anomalies	39	19	0 3
Meconium aspiration	33	16	0 3
Polycythemia	30	15	0 2
Hyperbilirubinemia	20	10	0 15
Rule out sepsis	18	9	0 1
Low birth weight/small for gestational age Depressed baby/low Apgar Hypoglycemia Prematurity Hypothermia	20	10	0 15
Total	203		1 5
NBC to normal nursery for neonatal problem			
Hyperbilirubinemia	512	57	3 9
Cardiac murmurs	83	9 2	0 6
Respiratory distress symptoms	51	6 0	0 4
ABO incompatibility	48	5 3	0 35
Rule out sepsis	47	5 3	0 35
Poor feeder	38	4 2	0 3
Polycythemia	27	3 0	0 2
Other	89	10	0 7
Total	899		6 8
Infants discharged from NBC and readmitted to hospital within first week of life			
Jaundice	145	84	1 09
Rule out sepsis	12	7 0	0 09
Dehydration	8	4 5	0 06
Other	8	4 5	0 06
Total	173		1 3

criteria specifically regarding anemia, pregnancy-induced hypertension and preeclampsia, and failure to progress (see the preceding section on Complications and Emergencies)

Table 6 highlights reasons for intrapartum transfers from 1988 to 1992 The 2 2% decrease in rate for failure to progress accounted for 36% of the total decrease in transfers between 1988 and 1990, when transfers decreased from 13 3% to 7 2% In addition, there was a 1 4% decrease in transfers for pregnancy-induced hypertension and a 1% decrease in transfers for abnormal fetal heart tracings and "other" Women are placed in the "other" category if they have historical, physical, laboratory, or diagnostic test results identified after admission that warrant transfer to the high-risk unit.

DISCUSSION

Lower cesarean birth rates are common among women who are of lower socioeconomic status (16), are of Hispanic ethnicity (17, 18), have no health insurance or are insured by Medicaid (17–19), give birth in a government-owned hospital (19), or receive nurse-midwifery care (20) Thus, a largely indigent, Hispanic population receiving care in an inner-city hospital birth center staffed by nurse-midwives would be expected to have a low cesarean birth rate The literature also suggests that low operative intervention rates may occur as a result of selectively screening women for delivery (11, 21–23), something that has been practiced and perfected in this setting for more than 10 years The characteristics of the client population and the delivery setting should be kept in mind when evaluating the reported outcomes The findings are deserving of more in-depth discussion so that the practice characteristics in this nurse-managed care setting can be well un

BEST AVAILABLE COPY

TABLE 6
NBC Admissions, Intrapartum Transfers, and Reasons for Transfers to High-Risk Unit, 1988–1992

				Reasons for Intrapartum Transfers									
		Intrapartum Transfers		Failure to Progress		Abnormal Fetal Heart Rate		Pregnancy Induced Hypertension		Fever		Other	
Year	NBC Admits	n	%	n	%	n	%	n	%	n	%	n	%
1988	3,064	406	13 3	184	6 0	89	2 9	54	1 8	20	0 7	59	1 9
1989	3,468	382	11 0	187	5 4	87	2 5	25	0 7	10	0 3	73	2 1
1990	3 475	251	7 2	133	3 8	66	1 9	14	0 4	9	0 3	29	0 8
1991	3,160	275	8 7	138	4 4	79	2 5	18	0 6	6	0 2	34	1 0
1992	3,341	277	8 3	115	3 4	81	2 4	11	0 3	10	0 3	60	1 8

derstood, especially in light of the size of this experience, which not only resulted in extremely low cesarean and operative birth rates, but also in no intrapartum maternal or fetal mortality, infrequent maternal or neonatal morbidity, infrequent use of technological intervention, and high accuracy in the selection of mothers and newborns who would experience normal labors and births

When women are screened on admission in labor, two distinct nurse-midwifery caseloads emerge (22, 23), either a "comprehensive" caseload or an "episodic" one A comprehensive caseload consists of women who have been followed prenatally and continue to be managed either solely by the nurse-midwife or in consultation with the physician during the intrapartal period The episodic caseload consists of women who are screened on admission in labor, and the management of their care is assumed by the nurse-midwife if they are appropriate candidates Most nurse-midwife services follow the comprehensive care model but, in this setting, as in other similar high-volume settings, the episodic care model is more common

By selectively screening women on admission in labor the potential for or the absence of complications is taken into consideration and the nurse-midwife can choose whether to manage a woman s care Ordinarily this choice does not exist in the comprehensive care model the nurse midwife remains with the client through birth, despite problems that may have been identified or anticipated on admission When this occurs, an increased level of co-management with physicians is often available. This increased potential for intrapartum problems is reflected in birth outcomes of the comprehensive care group Results of this study should be compared with data from similar 'episodic' care outcomes and not with other birth centers or services that practice under the comprehensive care model.

This episodic model of care has been examined and has been the subject of both descriptive and comparative studies In a descriptive study of nurse-midwifery care in a tertiary setting at Jackson Memorial Hospital in Florida, Scupholme (22) found that the rate of cesarean births and outlet forceps was lower in the episodic group when compared with the comprehensive care group Nurse-midwives provided care to both groups The cesarean birth rate was 1 3% (73/5,623) and 8 2 [illegible] (57/690), respectively; the rate of outlet forceps was 1 8% (101) and 3 8% (26) for the respective groups The overall cesarean birth rate at Jackson Memorial was 17% Sharp and Lewis noted comparable birth outcomes among the episodic (n = 6,671) and comprehensive (n = 4,095) case loads at Grady Memorial Hospital where the cesarean rate was 0 2% and 8 1%, respectively (23) Because Grady, Jackson Memorial, and LAC+USC Women's Hospital are institutions that care for predominantly vulnerable populations it is especially interesting to see the simi

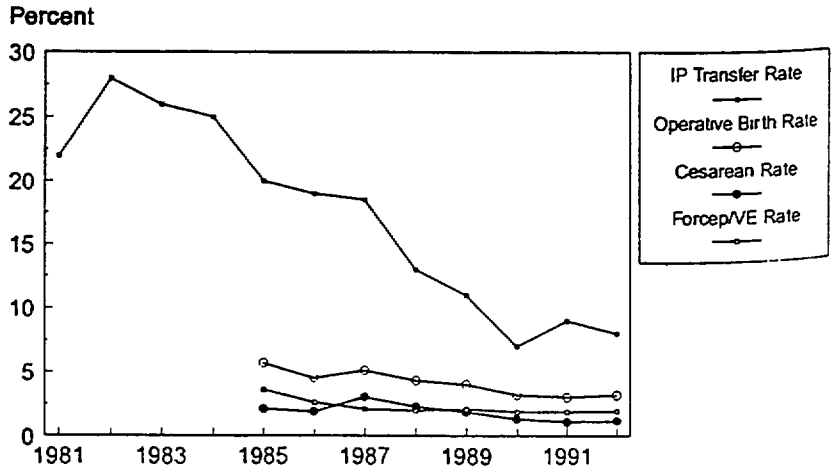


FIGURE 1
Intrapartum transfer and operative birth rates among all NBC admissions 1981–1992

lanty in birth outcomes for the episodic care groups managed by nurse midwives at these institutions The major differences between the groups are that Grady and Jackson Memorial serve a predominantly African American population (84% and [illegible]%, respectively), whereas the population at Women's Hospital is predominantly Hispanic.

The question remaining is whether the low operative birthrates associated with episodic care are due to selective screening, nurse-midwifery care or both Two prospective studies compared nurse-midwife and house staff birth outcomes Slome et al, addressing this issue in a study done in the early 1970s at the University of Mississippi Medical Center, found that low-risk women randomized to either nurse-midwifery or house-staff care had similar cesarean birth rates, but the rate of low-forceps births was three times higher ($P < .05$) in the housestaff group (24) The study by Chambliss et al, which took place at Women's Hospital in the early 1990s, randomized women who met NBC admission criteria to either midwifery or house-staff care (21) Results of their study verified that a low cesarean birthrate can be achieved by nurse-midwives or house staff when very specific selection criteria are used. Chambliss et al also reported that there was no significant difference in cesarean birthrates (5/234 versus 1/253, respectively) between the two groups, but the total operative intervention rate was statistically significant ($P < .006$) primarily as a result of the number of forceps and vacuum births in the house staff group (18 versus 0) Furthermore this study reported a significantly higher rate of episiotomies, third and fourth-degree lacerations, and use of analgesics and oxytocics in the house staff group Both studies suggested that the higher incidence of forceps births may have been attributable to teaching purposes In addition, Slome et al noted that the application of forceps may be considered a more routine procedure by physicians than by nurse-midwives

Even if the significantly higher operative vaginal birth rate among the house-staff group is attributed to teaching purposes, the significantly higher rate of episiotomies, third- and fourth-degree lacerations, and use of analgesics and oxytocics cannot be ignored The greater incidence of these interventions in the cited study and the very low analgesic medication and episiotomy rates reported in this study suggest that there are philosophic differences between nurse-midwives and physicians The American College of Nurse Midwives advocates the appropriate use of technology in childbirth by emphasizing in philosophy statements and clinical statements that childbirth is a normal process and that interventions should be used only when the benefits of such technology outweigh the risks (25) In this institution, these philosophic and clinical statements influence the nurse-midwives to incorporate into their practice alternatives such as showers, ambulation, position changes, and breast stimulation, rather than instituting oxytocics at the first sign of protraction or arrest of labor, or before analgesics are used The statements also influence nurse-midwives to use expectant management in labor rather than strict adherence to time limits

Another area in which nurse-midwifery practice differs from medical practice is the policy on ingestion of fluids and food for women selected for birth center care Increasingly in the literature, the practice of restricting fluids and food in laboring women has been questioned The policy of restricting fluids and food is particularly unreasonable for women who are at low risk for surgical intervention and have not received narcotics (26–30) Aspiration is most often associated with general anesthesia and improper anesthetic technique Although many obstetricians and anesthesiologists advocate treating all laboring women as if they were at high risk for aspiration, it is clear from the literature that there are levels of risk. Withholding food and fluids on the NBC is unreasonable because the population is at negligible risk for aspiration for three reasons First, the cesarean birth rate of the birth center over the last eight years has averaged only 1 8%, second, epidural anesthesia has significantly decreased the use of general anesthesia, and third, in the last 12 years there has never been an incident of aspiration among more than 36,000 women admitted to the birth center

From 1985 to 1992, decreases in intrapartum transfers were associated with concomitant decreases in the rates of operative intervention The assessment skills of the nurse-midwife working in the emergency room and the labor management decisions and interventions employed by the nurse-midwives working at the birth center undoubtedly influenced the decline in both transfers and operative interventions A further drop in the transfer rate occurred when nurse-midwives exercised more latitude in prolonged labor management, along with other factors such as the posting of weekly statistics and increased experience of the nurse-midwifery staff

The decrease in intrapartum transfers that occurred when nurse-midwives were primarily responsible for triaging laboring women in the main admitting room was attributed to their familiarity with admission criteria and greater selectiveness in whom they sent to the NBC The decline in the number of women discharged home undelivered undoubtedly occurred because many nurse-midwives have prior experience as labor and delivery nurses, and are therefore more proficient at differentiating latent from active labor than are the residents Posting of flow sheets that recorded the daily number of NBC admissions births and intrapartum transfers to the high-risk floor, as well as reasons for transfer

and the transfer rate, was initiated in 1988, and provided an opportunity for informal self- and peer evaluation and also provided the service with statistical information that could be used to critically evaluate care

Additional contributing factors in the observed decline in intrapartum transfers may be improved skills among staff and the previously mentioned change in criteria for failure to progress Failure to progress accounted for 48% of all intrapartum transfers from the birth center between 1988 and 1992 (Table 6) The most common indication for intrapartum transfer in this study and in similar settings where oxytocin, forceps, or vacuum extractors are not used, is labor dystocia (3, 5, 7, 26, 31) Although it is the most common reason for transfer, it is also the most responsive to alternative interventions and supportive, unhurried care

Expectant management requires the practitioner to assess whether the woman is in latent or active labor Although the preference is to admit women in active labor to the birth center, the diagnosis of active versus latent or false labor is often made over time Peisner and Rosen found that 40% of women were still in latent labor at 4 cm cervical dilatation (32) To make a diagnosis of secondary arrest of dilation or failure to progress, the woman must be in active labor Eliminating arbitrary time limits allowed nurse-midwives the freedom to await the onset of active labor and to try alternatives when labor became protracted or arrested, as long as mother and fetus were in good condition It is likely that an expectant approach and adjunctive measures in nurse-midwifery management for failure to progress influenced the decline in transfer rates In addition, because the proportion of cesarean and operative vaginal births increased by more than 10% among those transferred whereas the overall transfer rate decreased by 9%, the authors conclude that over time the nurse-midwives became more adept at determining need for medical intervention (Table 2)

In the future, a prospective randomized study for failure to progress that compares nurse-midwifery interventions such as ambulation and breast stimulation versus oxytocin may be undertaken to increase understanding of the role of expectant management, safe time parameters for the use of expectant management, and the effects of oxytocin versus expectant management on neonatal and maternal outcomes and operative birthrates Ongoing research projects include assessing the effectiveness of breast stimulation for labor augmentation, use of amnioinfusion to improve abnormal fetal heart rate tracings, and birth outcomes of women admitted to the NBC with a history of a cesarean birth These ongoing and future studies are part of a revised mission to include clinical research in this well-established nurse-midwifery service and education program—a mission that is shared with the other medical and nursing departments

CONCLUSION

This article demonstrates the excellent outcomes that can be achieved when nurse-midwives, working collaboratively and cooperatively with obstetricians, neonatologists, resident physicians, pediatric nurse-practitioners, and nurses, provide episodic care in a birth center setting Our data support the notion that nurse-midwives practicing in this episodic care setting are highly successful in selecting a population appropriate for birth-center care Data presented here represent the largest reported longitudinal experience of nurse-midwifery care in a single setting and indicate that both the selection process and the nature of the intrapartum management can result in low rates of intervention, intrapartum transfer and operative birth without compromising outcomes

At LAC + USC Women's Hospital we have the opportunity to provide nurse midwifery care to a select population in a tertiary setting where ordinarily only high-tech care is considered possible Women get the level of care they need and deserve, from the provider most appropriate to render the care needed. Because many women experience normal labors and births, nurse-midwives, pediatric nurse-practitioners, and nurses are able to provide most of their care while specialists and resident physicians focus on mothers and newborns with more complex medical needs Our multidisciplinary experience with nurse-midwives and nurses providing substantial leadership in the delivery of maternity care services should serve as a model for those who are searching for a means to provide safe, alternative birth experiences and decrease the length of hospital in-patient stays for predominantly low-income mothers and infants in tertiary settings

The authors would like to thank Martha Kayne CNM, and Lisa Cummins Harrington CNM, for their contributions to this article and N Katherine Brown for editorial assistance We would also like to acknowledge the consultation and technical support provided by the Maternal and Child Health Program and nurse midwifery faculty of the Boston University School of Public Health.

Thanks are extended to the following people who helped to establish the Normal Birth Center and whose leadership support and encouragement were instrumental to the outcomes described in this article Former directors of the Nurse Midwifery Service Diane Angelini CNM, EdD and Nancy Bolles CNM, MS Former clinical coordinators of the Nurse Midwifery Service Susan Hus CNM, MS Joslyn Walton CNM MS Susa Joy CNM MS and Ruth Turnquist Mielke CNM MS nurse manager of the Normal Birth Center Mary Barrett RN former nurse manager Beverly Croswell RN Paulette Nakamura RN Linda Wynsma RN Taree Page RN and Lisa Garber RN director of obstetrics and consultant to the Nurse Midwifery Service Richard Paul MD former consultants to the Nurse Midwifery Service Lawrence Platt MD and

BEST AVAILABLE COPY

Frey Phelan MD JD neonatal consultant for Normal Birth Center Nancy Edwards MD and pediatric nurse practitioner Sue Keiper RN MSN, and past administrators of Women s Hospital William Weitekamp Martha Gailif and Connie Diaz

Thanks are also given to the residents the persons primarily responsible for the birth outcomes of the women transferred from the Normal Birth Center to the high risk labor and delivery and the pediatric nurse practitioner staff for their care of the newborns and all the nurses, whose care and support of laboring women and belief in nurse midwifery care is fundamental to the successes of the birth center

This article stands as a tribute to all of the staff nurse midwives nurse midwifery students, and nurse-midwife interns who have been a part of the 12-year history of the Normal Birth Center and whose dedication to women is reflected in the positive outcomes described in this article.

Finally to the 36 410 women who came to Women s Hospital for their labor and birth. It is to you we owe our greatest thanks. Together we learned to believe in the normal process of birth—but it is you who were our most courageous teachers.

REFERENCES

1 Haire DB Elsberry CC Maternity care and outcomes in a high-risk service the North Central Bronx hospital experience Birth 1991,18 33–7

2 Varney H Nurse-midwifery 2nd ed Boston Blackwell, 1987 7

3 Barton JJ, Rovner S, Puls K, Read PA. Alternative birthing center experience in a teaching obstetric service Am J Obstet Gynecol 1980,137 377–84

4 DeVries RG Image and reality an evaluation of hospital alternative birth centers J Nurse Midwifery 1983 28 3–9

5 Hewitt MA Hangsleben KL Nurse midwives in a hospital birth center J Nurse Midwifery 1981 26 21–9

6 Hoffman K, Lorkovic M Raybum W Goodlin R. Alternative birth centers a four year experience at the University of Nebraska Medical Center Nebraska Med J 1987 August:286–8

7 Laube DW Experience with an alternative birth center in a university hospital J Reprod Med 1983 28 391–6

8 Rollins AJ, Kaplan JA Ratkay ME Goodlin RC Shaw JS Wennberg RP A homestyle delivery program in a university hospital J Fam Pract 1979,9 407–14

9 Schmidt J The first year at Stanford University s family birth room Birth Fam J 1980 7 169–74

10 American Hospital Association Survey of Obstetric and Newborn Services—1989 Chicago Hospital Data Center and the Section for Maternal and Child Health, May 1990 1–2

11 Platt LD Angelini DJ Paul RH, Quilligan EJ Nurse-midwifery in a large teaching hospital Obstet Gynecol 1985 66 816–20

12 DeVane DM Richwald GA, Elfman S, Gallegos AA, Uretzky SA. Babies and mothers at risk. perinatal needs assessment for Los Angeles County Burbank (CA) March of Dimes Birth Defects Foundation Southern California Chapter October 1990 13

13 Chapman MG Jones M, Springs JE, De Swiet M, Chamberlain GVP The use of a birthroom a randomized controlled trial comparing delivery with that in the labour ward. Br J Obstet Gynaecol 1986 93 182–7

14 Mann R. San Francisco General Hospital nurse-midwifery practice the first thousand births Am J Obstet Gynecol 1981 140 676–82

15 American College of Nurse Midwives Nurse midwifery clinical data set—1990 Washington, DC ACNM, 1990

16 Gould JB, Davey B, Stafford RS Socioeconomic differences in rates of cesarean section N Engl J Med 1989,321 233–9

17 Stafford RS Sullivan SD Gardner LB Trends in cesarean section use in California 1983 to 1990 Am J Obstet Gynecol 1993 168 1297–302

18 Taffel SM Placek PJ Moien M Kosary CL 1989 U S cesarean section rate steadies—VBAC rate rises to nearly one in five Birth 1991 18 73–7

19 Taffel SM Placek PJ Kosary CL U S cesarean section rates 1990 an update Birth 1992 19 21–2

20 Baruffi G Strobino DM, Paine LL. Investigation of institutional differences in primary cesarean birth rates J Nurse Midwifery 1990 35 274–81

21 Chambliss LR Daly C Medeans AL Ames M, Kayne M Paul R The role of selection bias in comparing cesarean birth rates between physician and midwifery management Obstet Gynecol 1992 80 161–5

22 Scupholme A Nurse-midwives and physicians a team approach to obstetrical care in a perinatal center J Nurse Midwifery 1982 27 21–7

23 Sharp ES, Lewis LE A decade of nurse midwifery practice in a tertiary university-affiliated hospital J Nurse Midwifery 1984 29 353–65

24 Slome C Wetherbee H Daly M, Christensen K, Meglen M, Thiede H Effectiveness of certified nurse-midwives a prospective evaluation study Am J Obstet Gynecol 1976,124 177–82

25 American College of Nurse Midwives ACNM position statement on the appropriate use of technology in childbirth Washington DC ACNM 1991

26 Rooks JP, Weatherby NL, Ernst EKM The national birth center study part III—intrapartum and immediate postpartum and neonatal complications and transfers postpartum and neonatal care, outcomes and client satisfaction J Nurse Midwifery 1992,37 361–97

27 Broach J Newton N Food and beverages in labor Part II the effects of cessation of oral intake during labor Birth 1988,15 88–92

28 Elkington KW At the water's edge where obstetrics and anesthesia meet. Obstet Gynecol 1991 77 304–8

29 Ludka L, Roberts CC Eating and drinking in labor a literature review J Nurse Midwifery 1993,38 199–207

30 O Reilly SA Perrone Hoyer PJ Low-risk mothers oral intake and emesis in labor J Nurse Midwifery 1993 38 228–35

31 Scupholme A McLeod AGW Robertson EG A birth center affiliated with the tertiary care center comparison of outcome Obstet Gynecol 1986 67 598–603

32 Peisner DB Rosen MG Transition from latent to active labor Obstet Gynecol 1986 68 448–51

BEST AVAILABLE COPY

APPENDIX A

Admission Criteria for the Normal Birth Center September 1992

- Gestational age > 36 to < 42 completed weeks
- Gestational age ≥ 43 weeks with reactive nonstress test and amniotic fluid index ≥ 10 cm
- Estimated fetal weight 2,500 to 4,000 gm
- Low-risk class A-1 diabetes
  1. Regular attendance at clinic with normal fasting blood sugar (FBS < 105) documented in prenatal records within last month
  2. Without history of overt diabetes, antepartum stillbirth, or traumatic delivery due to macrosomia
- One prior cesarean section (C/S) with
  1. Documented low transverse uterine scar and patient desire for trial of labor in NBC
  2. Undocumented uterine scar with history of uncomplicated vaginal birth after cesarean

Exclusions Clients with the Following Are Ineligible for Admission

- Anemia (hematocrit < 28%)
- Parity > 8
- Previous C/S with the following
  1. Undocumented uterine scar, no prior vaginal birth after cesarean
  2. Low vertical or classical uterine scar
  3. More than one C/S
- Previous difficult delivery
- Weight > 225 lb
- Hypertension 140/90
- Proteinuria > 2+
- Positive syphilis serology, untreated
- Client in custody
- Spontaneous rupture of membranes
  1. Not in labor
  2. Signs or symptoms of amnionitis
- At-risk class A-1 diabetics including history of
  1. Previous overt diabetes
  2. Prior antepartum stillbirth
  3. Traumatic delivery due to macrosomia
- Abnormal vaginal bleeding
- Multiple gestation
- Temperature > 99 6°F
- Unidentifiable presenting part
- Station > −3 for multiparas, > −2 for primiparas
- Thick meconium
- Acute or chronic medical condition
- Nonvertex presentation

APPENDIX B

Intrapartum and Postpartum Transfer Criteria 1992

Fetal

- Abnormal fetal heart rate pattern indicative of fetal distress that is unresponsive to alleviating interventions

Maternal

- Evidence of amnionitis
- Development of pregnancy induced hypertension/preeclampsia
- Request or need for regional anesthesia
- Hematocrit < 28% on admission
- Hemorrhage prior to delivery
- Excessive blood loss at delivery or fourth stage—and symptomatic
- Prolonged second stage (more than 2 or 3 hours)
- Failure to progress during active labor
- Clients who, after evaluation do not comply with admission criteria
- Client request for medical management

Exclusion Criteria for 12-Hour Discharge

- Abnormal physical examination
- Medical, surgical, or psychiatric problem
- Estimated blood loss > 750 mL
- Hematocrit < 30%
- Marked episiotomy discomfort severe bruising or edema
- Temperature > 100 4°F during hospitalization or > 99 4°F at 12 hours
- Unable to ambulate easily and/or care for self and infant
- Inability to void
- Third- or fourth-degree laceration

BEST AVAILABLE COPY

American Journal of Obstetrics and Gynecology

Founded in 1920

volume 160 *number* 5 *part* 1 MAY 1989

CLINICAL SECTION

Clinical Opinion

Episiotomy: Can its routine use be defended?

John M Thorp, Jr, MD, and Watson A Bowes, Jr, MD
Chapel Hill North Carolina

Episiotomy is routinely used before delivery in the United States The rationale for routine episiotomy is based on two foundation arguments that episiotomy reduces perineal trauma and that it prevents subsequent pelvic relaxation A careful review finds little evidence to support these arguments Episiotomy may predispose the gravid woman to third and fourth-degree lacerations Efforts should be directed to determine whether episiotomy is beneficial (AM J OBSTET GYNECOL 1989 160 1027 30)

Key words Episiotomy childbirth trauma third- and fourth-degree lacerations pelvic relaxation

Episiotomy commonly precedes vaginal delivery in the United States In 1979 62 5% of vaginal deliveries were accomplished with this procedure In nulliparous women the episiotomy rate rises to 80% Reported benefits include a decrease in perineal trauma and prophylaxis against pelvic relaxation This article analyzes the data that support routine use of this technique

History

Episiotomy is a relatively new phenomenon It was first suggested by Ould in 1742 as an aid in difficult vaginal deliveries Broomall advocated its routine use in 1878 as a procedure that would prevent perineal ruptures [1]

During the nineteenth century there was much interest in the prevention of perineal trauma at the time of vaginal delivery In 1855 Ritgen presented 4875 deliveries with only 190 perineal tears Within this group only one patient had a laceration extending into the anal sphincter This remarkable record was accomplished by a procedure called scarification (a series superficial circumferential vaginal incisions) Scarification was used in 7% of deliveries with special attention to the delivery of the head and shoulders Ritgen[2] admonished the physician to strive for complete protection for the perineum" and warned against dismissing his findings as much ado about a perineal tear"

It was not until 1920 after articles were published by DeLee[3] and Pomeroy[4] that routine use of episiotomy began This coincided with the move of deliveries from the home to the hospital with a change in attendants from midwives to physicians with family sizes diminishing and with an increase in cesarean deliveries [1] The fact that this trend included routine use of episiotomy was not hailed as an advance by all J Whitridge Williams remarked after DeLee s presentation in 1920 that he disagreed with everything DeLee said [5] Unfortunately this debate did not initiate scientific inquiry Subsequent reports focused on whether midline or mediolateral episiotomy was better Advocates of the midline approach won the battle in the United States and today it is the usual technique in this country

Foundation arguments

The case for routine episiotomy rests on two foundation arguments that episiotomy reduces perineal trauma and that it prevents subsequent pelvic relaxation

From the Division of Maternal Fetal Medicine Department of Obstetrics and Gynecology School of Medicine The University of North Carolina
Reprint requests Watson A Bowes Jr MD CB# 7570 214 MacNider Chapel Hill NC 27599 7570

BEST AVAILABLE COPY

Table I Third and fourth degree lacerations after midline episiotomy*

Study	No of patients	% with third and fourth-degree lacerations
Giles (1930)	500	3 2
Nuggent (1935)	20	10 0
Chang (1943)	635	0 5
Kaltreider (1948)	15 167	4 5
Ingraham (1949)	9 170	5 0
Smith (1951)	1 500	1 9
McNulty (1953)	6 577	0 9
Jacobs (1960)	5 358	3 0
Dodek (1963)	890	0 4
Harris (1970)	7 477	13 0
Beynon (1974)	1 938	13 5
Coats (1980)	163	23 9
TOTAL	49 395	6 5

*Modified from reference 1 Complete bibliography available on request.

Table II Third and fourth degree lacerations without episiotomy*

Study	No of patients	% with third fourth degree lacerations
Ritgen (1855)	4 875	0 0
Child (1919)	58	5 2
Nugent (1935)	72	6 4
Brendel (1979)	29	0 0
Gaskin (1980)	801	0 5
Malcki (1980)	379	1 0
Schmint (1980)	102	0 0
Cranch (1981)	799	3 6
Arauso (1982)	2 447	0 0
Buekens et al (1985)	15 237	0 9
Blownal (1985)	13 500	0 4
Sleep and Grant[10] (1986)	457	0 0
Gass et al (1986)	205	0 0
TOTAL	38 961	1 4

*Complete bibliography available on request

Prevention of trauma The only commonly reported marker of severe pelvic trauma in the literature is third and fourth-degree lacerations Lesions of the upper vagina and anterior introitus are consistently underreported[1]

Tables I and II illustrate the incidence of third- and fourth-degree lacerations with and without midline episiotomy respectively From these cumulative data it appears that midline episiotomy is not associated with a decrease in third- and fourth-degree lacerations

We prospectively studied routine use of episiotomy and found that in nulliparous women this procedure predisposed women to third- and fourth-degree lacerations The lacerations were more pronounced in nulliparous women who were delivered of infants >3400 gm No third- or fourth-degree laceration occurred when episiotomy was not performed[6]

Gass et al[7] did a retrospective study in which they matched 205 pairs of women for age parity and birth weight. The women in one group were delivered with midline episiotomy whereas patients in the other were not If episiotomy is assumed to be equivalent to a second-degree laceration then women in the group without episiotomy had less perineal trauma No third or fourth-degree laceration occurred without an episiotomy[7]

In 1985 Buekens et al[8] investigated the relationship of episiotomy to third-degree perineal tears in 21 278 deliveries With an episiotomy rate of 28 4% and with the mediolateral approach third-degree tears occurred in 1 4% of deliveries with episiotomy and in 0 9% of deliveries without This difference was significant ($p < 0\ 01$) When a subsample of spontaneous occipitoanterior deliveries were reviewed and after the infants were stratified by birth weight and the mothers by parity there was no relation between episiotomy and third-degree tears The authors concluded that routine episiotomy does not prevent trauma to the anal sphincter or rectum[8]

Blondel and Kaminski[9] found despite an increase in the episiotomy rate from 8 1% to 37 1% in their hospital from 1972 to 1982 that the incidence of third-degree lacerations did not change In analyzing their experience from 1981 they found that the incidence of third degree lacerations was increased in women who had undergone episiotomy The authors concluded that these findings were similar to the observations of Buekens group[8] Both studies used data to analyze mediolateral episiotomy If the midline approach had been used with its propensity for extension into the rectum even more third and fourth-degree lacerations could have occurred

The literature on mediolateral episiotomy discusses trauma other than third or fourth-degree lacerations The West Berkshire Perineal Management Trial was a randomized controlled study of mediolateral episiotomy[10] Patients were placed into two groups the restrictive group in which episiotomy was used only for fetal indications and the liberal group in which episiotomy was used to prevent perineal tears One thousand patients were enrolled the episiotomy rate was 10% in the restrictive group and 51% in the liberal group Only one case of severe trauma to the upper one third of the vagina occurred in either group The authors state that there is no evidence that trauma is more extensive in the restrictive group[10]

There is little evidence to support the argument that episiotomy limits perineal trauma There are some data to suggest that the procedure predisposes the gravid woman to third and fourth degree lacerations

Prophylaxis against pelvic relaxation *William Obstetrics* in defense of episiotomy states It can be said

with certainty that since the era of in-hospital deliveries with episiotomy there has been an appreciable decrease in the number of women subsequently hospitalized for treatment of symptomatic cystole rectocele uterine prolapse and stress incontinence Although the two phenomena are associated there are few scientific data to claim that episiotomy has caused less pelvic relaxation However most proponents of this argument cite the 1935 study by Aldridge and Watson [10] They compared 2800 deliveries in primigravid women during two time periods 1920 to 1925 and 1929 to 1934 The women in the later time period had more frequent use of "midline episiotomy and prophylactic forceps " The authors concluded that vaginal and pelvic floor injuries were markedly diminished in women who had episiotomies and forceps deliveries

In the Aldridge and Watson study [11] follow-up was done at 6 weeks by observers not blinded to the mode of delivery The criteria for "pelvic floor injury" were not described or standardized No statistical analysis was performed The use of forceps was a confounding variable The overall episiotomy rate was 23% which is one third of the present rate They had an abdominal delivery rate of only 3% which confounds extrapolation of these data to modern obstetrics Aldridge and Watson clearly identify their bias toward the interventionist school of DeLee and Pomeroy and state that "the comparison of physical findings is not entirely fair or accurate [11]

Gainey[12] presents the most convincing data that episiotomy can prevent subsequent pelvic relaxation He compared two groups of 1000 women The first group was delivered with episiotomy performed late" only "when there were signs of impending laceration " The second group was delivered by outlet forceps over a right mediolateral episiotomy performed "early " Gainey evaluated all the women at 2 months to 10 years after their deliveries Evaluation consisted of recording damage to the urogenital diaphragm the levators and vaginal wall attachments His results included several findings greater damage in all areas in patients delivered without episiotomy increased damage on successive deliveries in both groups and equivalent incidence of stress urinary incontinence and uterine descencus between the two groups [12]

Although Gainey s work is impressive with objective definitions of pelvic damage it remains open to criticism First there is the confounding variable of forceps delivery which every patient in the second group underwent Even the discussants of his work debated whether this had any impact and whether episiotomy alone would obtain similar benefits Second the observer was not blinded as to the mode of delivery thereby interjecting biases into the asssessment Third the two groups being compared were very different and as with the Aldridge and Watson study [11] an attempt was made to compare women delivered in different decades There is no mention of the length of the second stage of labor or abdominal delivery rate The percentage of women who were actually symptomatic from this pelvic damage" cannot be determined No comment is made about dyspareunia or stool incontinence

Another major issue is the timing and depth of episiotomy necessary to prevent pelvic relaxation Both original and modern advocates urge incising the perineum when the vertex reaches the pelvic floor, stressing incision of the levator bundle before any distention of these muscles Few modern episiotomies fulfill this objective most are done after marked distention of the levators and perineum If DeLee s premise is accepted [3] then episiotomy must be performed early to prevent subsequent relaxation

Modern studies

Recent studies attempt to determine the effects of childbirth and common obstetric procedures on the function of pelvic and anal musculature Snooks et al [13] report pudendal nerve damage in 40% of women who have vaginal deliveries No damage was noted in women after abdominal delivery Forty percent of this damage will persist at 8 weeks post partum Prolonged second stage forceps deliveries, delivery of an excessively large infant and third-degree perineal lacerations were positively correlated with increased pudendal nerve latency Midline episiotomy had no effect on pudendal nerve function Snooks et al suggest that pelvic relaxation and urinary or fecal incontinence that develop after vaginal delivery result from this damage to the pudendal nerve Although they suggest that obstetricians should use techniques that may protect the pelvic floor and its nerve supply," they do not identify which techniques to use Their work does not support midline episiotomy as an effective technique for preventing such damage

Haadem et al [14] studied rectal sphincter function in 63 women after "rupture of the perineum into the rectum Only five of these deliveries were preceded by episiotomy Half of these patients had significant morbidity incontinence with flatus dyspareunia and pain with bowel movements Fourteen had anal pressure profilometry and these women had significantly less strength in the anal sphincter The Haadem study suggests that lacerations involving the rectum result in more long term anal dysfunction than is commonly recognized

Using a simple perineometer Goudon and Lougue[15] failed to demonstrate a significant difference in perineal function at 1 year after abdominal delivery vaginal delivery with episiotomy vaginal delivery over intact

perineum or without second lacerations or forceps deliveries or in nulliparous control women Perineal muscle function was found to be dynamically related to regular exercise done by the individual and not to mode of delivery

In the West Berkshire perineal management trial [10] there were no differences at 3 months post partum in the incidence of stress urinary incontinence between the liberal and restricted groups Follow-up at 3 years failed to demonstrate prevention of urinary incontinence by liberal use of episiotomy [16]

In conclusion despite its common application there is little evidence to support routine use of episiotomy This procedure may well increase the incidence of third and fourth-degree lacerations There are few data to support the premise that this procedure prevents pelvic relaxation Too many changes (such as diminishing family size, more frequent use of abdominal deliveries, shorter second stages) have occurred to attribute to episiotomy the credit for the decrease in pelvic relaxation over the last 50 years Efforts should be directed toward objectively ascertaining whether routine episiotomy is truly beneficial

REFERENCES

1 Thacker SB Bantu HD Benefits and risks of episiotomy an interpretive review of the English literature 1860-1980 Obstet Gynecol Surv 1983 36 322 38
2 Ritgen G Concerning his method for protection of the perineum Monatschr Geburtskunde 1855 6 21 see English translation by Wynn RM Am J Obstet Gynecol 1965 93 421 33
3 DeLee JB The prophylactic forceps operation Am J Obstet Gynecol 1920 1 34 9
4 Pomerov RH Shall we cut and reconstruct the perineum for every primipara Am J Obstet Dis Women [illegible] 1918 78 211
5 Taylor ES Comment on episiotomy and third [illegible] tears Obstet Gynecol Surv 1985 41 229 30
6 Thorp JM Jr Bowes WA Jr Brame RG Cefalo R [illegible] use of midline episiotomy effect on perinatal [illegible] Obstet Gynecol 1987 70 260 2
7 Gass MS Dunn C Stys SJ Effect of episiotomy on the frequency of vaginal outlet lacerations J Reprod Med 1986 31 240-4
8 Buekens P Lagasse R Dramaix M Wollast E Episiotomy and third degree tears Br J Obstet Gynaecol [illegible] 820 3
9 Blondel B Kaminski M Episiotomy and third degree tears Br J Obstet Gynaecol 1985 92 1297 8
10 Sleep J Grant A Garcia J Elbourne D Spencer J Chalmers I West Berkshire perineal management trial Br Med J 1984 289 587 90
11 Aldridge AN Watson P Analysis of end results of labor in primiparas after spontaneous versus prophylactic methods of delivery Am J Obstet Gynecol 1935 30 [illegible] 65
12 Gainey NL. Postpartum observation of pelvis tissue damage further studies Am J Obstet Gynecol 1955 [illegible] 800 7
13 Snooks SJ Swash M Setchell M et al Risk factors in childbirth causing damage to pelvic floor innervation Br J Surg 1985 72(suppl)15 8
14 Haadem K Dahlstrom J Lennart L, et al Anal sphincter function after delivery rupture Obstet Gynecol [illegible] 70 53 7
15 Gordon H Logue M Perineal muscle function after childbirth Lancet 1985 2 123
16 Sleep J Grant A West Berkshire perineal management trial three year follow up Br Med J 1987 295 749-51

Amniotic band syndrome. Reevaluation of its pathogenesis

Charles Lockwood, MD, Alessandro Ghidini, MD, Roberto Romero, MD, and John C. Hobbins, MD

Boston Massachusetts and New Haven Connecticut

Amniotic band syndrome is a poorly defined entity characterized by protean fetal malformations and disruptions The pathogenic theory widely accepted in the obstetric literature is that the formation of fibrous amniotic bands is the initiating event in the disorder and is responsible for subsequently pathologic conditions A critical review of the recent clinical and experimental literature appears to contradict this hypothesis Evidence suggests that amniotic band syndrome results from a multifactorial process in which vascular compromise specifically hemorrhage is the principal pathogenic stimulus and that the fibrous bands are a late reparative event of little or no pathogenic significance (Am J Obstet Gynecol 1989,160 1030 3)

Key words Amniotic band syndrome etiology pathogenesis

From the Division of Maternal Fetal Medicine Department of Obstetrics and Gynecology Tufts University School of Medicine Boston and Yale University School of Medicine

Reprint requests Charles Lockwood MD Department of Maternal Fetal Medicine Tufts University School of Medicine St Margaret's Hospital for Women 90 Cushing Ave Boston MA 02122

BEST AVAILABLE COPY

SPECIAL ARTICLE

OUTCOMES OF CARE IN BIRTH CENTERS

The National Birth Center Study*

JUDITH P ROOKS C N M M S, M P H, NORMAN L WEATHERBY, PH D,
EUNICE K M ERNST, C N M, M P H, SUSAN STAPLETON, C N M M S N
DAVID ROSEN, M P H, M P A, AND ALLAN ROSENFIELD, M D

Abstract We studied 11 814 women admitted for labor and delivery to 84 free standing birth centers in the United States and followed their course and that of their infants through delivery or transfer to a hospital and for at least four weeks thereafter The women were at lower-than-average risk of a poor outcome of pregnancy according to many but not all of the recognized demographic and behavioral risk factors

Among the women 70 7 percent had only minor complications or none 7 9 percent had serious emergency complications during labor and delivery or soon thereafter such as thick meconium or severe shoulder dystocia One woman in six (15 8 percent) was transferred to a hospital 2 4 percent had emergency transfers Twenty-nine percent of nulliparous women and only 7 per cent of parous women were transferred but the frequency of emergency transfers was the same The rate of cesarean section was 4 4 percent There were no maternal deaths

The overall intrapartum and neonatal mortality rate was 1 3 per 1000 births The rates of infant mortality and low Apgar scores were similar to those reported in large studies of low risk hospital births

We conclude that birth centers offer a safe and acceptable alternative to hospital confinement for selected pregnant women particularly those who have previously had children and that such care leads to relatively few cesarean sections (N Engl J Med 1989 321 1804 11)

BIRTH centers are nonhospital facilities organized to provide family-centered maternity care for women judged to be at low risk of obstetrical complications The first birth centers were developed to serve rural communities In 1975, the Maternity Center Association established the first urban birth center in New York City [1] As of 1987, at least 240 other centers had opened although many subsequently closed, primarily because of the liability-insurance crisis Most states now regulate birth centers by licensure, a program of accreditation has been established, and the services of birth centers are covered by most health care insurance plans

Safety is the major concern Previous studies of birth centers have been retrospective and relatively small [2-14] In 1982 an Institute of Medicine committee concluded that reliable information about the relative safety and efficacy of all birth settings was lacking It recommended research to include "well-conducted prospective descriptive and observational studies "[15] Statements from the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists discouraged the use of birth centers until better data were available [16] Because few poor outcomes would be expected among women who had been screened to exclude those with recognizable high-risk conditions, a large study was needed to describe the outcomes of birth-center care accurately The National Birth Center Study was designed to respond to the recommendations of the Institute of Medicine committee and to address the concerns of the American College of Obstetricians and Gynecologists and the American Academy of Pediatrics It is a nationwide prospective descriptive study of the care provided in free-standing birth centers This report examines the labor, delivery, follow-up care, and outcomes of 11,814 women who were admitted in labor to 84 birth centers from mid-1985 through 1987

METHODS

Recruitment of Birth Centers

The National Association of Childbearing Centers maintains a master list of U S birth centers known to its staff In early 1985 the association invited all 134 centers on its list to participate in the study which was due to begin in June of that year Six centers that opened or became known to the association during the remainder of 1985 or during 1986 were also asked to join the study Of the centers invited to participate 89 centers in 35 states actually did Between November 1986 and July 1987 80 of these centers were visited in order to evaluate their data collection procedures and the completeness and reliability of their data The remaining nine centers either had not yet entered the study or had closed before the site visits were completed Data from these nine centers were included in the analyses Five centers were excluded from the study before the analysis of data because the site visits showed that either the staff had not enrolled all their patients or the data from their clinical records were not sufficiently consistent with recorded observations Thus this study is based on data from 84 birth centers

In early 1987 we obtained lists of all birth centers known to the health authorities of 45 states Before obtaining these lists the National Association of Childbearing Centers knew of 140 centers of which only 8 were located in the five states that did not provide the information requested The state authorities listed 20 free standing

From the Center for Population and Family Health (J P R N L W D R) and the Faculty of Medicine (A R) the School of Public Health Columbia University New York and the National Association of Childbearing Centers Perkiomenville Pa (E K M E S S) Address reprint requests to Ms Ernst at the National Association of Childbearing Centers R D 1 Box 1 Perkiomenville PA 18074

Supported by the W K Kellogg Foundation the John A Hartford Foundation and the Maternity Center Association

*The following persons were members of the National Birth Center Study Advisory Committee Anita Barbey Bennetts C N M Dr P H Portland Oreg Judith Fullerton C N M Ph D University of California at San Diego Merwyn R Greenlick Ph D Kaiser Permanente Center for Health Research Portland Oreg Robert Israel M S National Center for Health Statistics Department of Health and Human Services Hyattsville Md John Kennell M D Case Western Reserve University School of Medicine Cleveland Phyllis Leppert C N M M D Ph D Rochester General Hospital Rochester N Y Thomas Mack M D University of Southern California School of Medicine Los Angeles and Charles S Mahan M D Department of Health and Rehabili

list Of the combined total of 160 centers known to either the state authorities or the association 84 (52 5 percent) were included in this study

Sixty of the 84 centers were operated by certified nurse midwives 11 by obstetrician gynecologists 6 by family practitioners or other physicians 3 by licensed or lay midwives 3 by obstetrician gynecologists and certified nurse midwives and 1 by a team of certified nurse midwives and lay midwives As compared with the centers studied other birth centers known to be in operation from 1985 through 1987 were more likely to be located in Western states to be run by lay midwives or physicians other than obstetricians to serve many low income clients and to be unaccredited and unlicensed by the state

Data Collection and Analysis

The staff members at the participating centers told each prospective patient about the study and indicated that although the patient would not be identified personally data about her pregnancy and care would be included If a woman did not want information about her pregnancy to be so used she was free to terminate her relation with the birth center However none did so The procedure used to protect the privacy of the study subjects was approved by the research committee of the Maternity Center Association

Data on each woman in the study were recorded on a prenumbered four part form Each participating center was given enough forms to serve the total number of clients it anticipated over a one year period Part I was used to collect demographic data and information on risk factors and was completed after the first prenatal visit Part II which included information about prenatal care and complications was completed either when the woman was admitted to the birth center for intrapartum care or when she discontinued her care before such admission Part III asked for information on care and complications during labor and birth and immediately afterward the circumstances of and reasons for any transfer to a hospital and care received during hospitalization by those transferred it was completed at discharge from the hospital or birth center Part IV covered care and complications during the postpartum and neonatal periods and the mother s evaluation of her own care at the birth center it was completed when she returned at four to six weeks for her postpartum examination Of the women who were transferred to hospitals during or immediately after labor and delivery 60 percent returned to the birth centers for a postpartum visit Information about the time required to transport women or their infants to a hospital was collected for a sample of 20 percent of the women who were transferred (387 women) The centers made special efforts to follow the care of infants who were in fair or poor condition at discharge from the birth center

Information was gathered on the occurrence and severity of 29 specific intrapartum and immediate postpartum and neonatal complications Each complication was assigned a score of 1 to 3 to indicate its seriousness with respect to the risk of death or permanent damage The complications were also scored from 1 to 3 to reflect the need for an urgent transfer to hospital care Complications that received a score of 3 on both scales such as the presence of thick meconium or sustained fetal distress were regarded in this analysis as serious emergencies that occurred in the birth center The scoring system (available on request) was based on current literature and the advice of the study s advisory committee and other experienced clinicians

The collection of data in each center was supervised by a designated staff member who had been trained in regional group meetings and with whom frequent contact was maintained by telephone The forms were completed by the care providers The completed forms were returned monthly read by optical scanning edited for inconsistency or incompleteness and updated after the centers were contacted for corrections Selected data from the five excluded centers were examined to determine whether the exclusions had influenced the major results of the study

Study Subjects

Initial and ongoing screening and triage are an underlying princi

were never admitted to birth centers for intrapartum care Referral to a hospital for prenatal complications was the main reason (in 2507 women) for the discontinuation of birth center care Other women discontinued such care because their centers closed or the women moved changed their minds were not pregnant or had abortions This paper describes the results in the remaining 11 814 women (66 2 percent of those initially enrolled) who were actually admitted to birth centers for intrapartum care All health outcomes reported include those of the women and infants who were transferred from the birth centers to hospitals during or soon after labor and delivery as well as those of the women who gave birth in the centers

Results

Prenatal Screening and Referral

The women who received intrapartum care in the 84 birth centers made an average of 11 3 prenatal visits to the centers All but 2 6 percent had at least four visits Twenty-nine percent had complications of some type during prenatal care The most common complications were urinary tract infections, anemia, and transient hypertension

Characteristics of the Women

Table 1 compares the women admitted to the birth centers for labor with all women who gave birth in the United States in 1986, according to nine demographic and behavioral variables associated with perinatal risk, as well as the gestational age and birth weight of their infants The women who used birth centers were less likely than their counterparts in the general population to smoke, drink alcohol, or be black, unmarried, poorly educated, or under 18 years of age, although a higher proportion of the birth-center patients were Hispanic (Four centers accounted for more than 80 percent of the Hispanic women) The patients at the birth centers were more likely to have finished college and somewhat less likely to be poor or in a parity grouping associated with high risk — that is, with a first baby or a sixth or subsequent pregnancy The birth-center patients were less likely to have started prenatal care during the first trimester but were also less likely to have waited until the last trimester Almost all the women had adequate diets during pregnancy, 1 5 percent reported the use of marijuana or other illegal drugs

Birth Weight and Gestational Age

The birth center patients had fewer preterm or low birth-weight babies and a higher proportion of large infants than their counterparts in the general population Most birth-center patients who had preterm labor or intrauterine growth retardation had been referred directly to hospitals and therefore were not included among the women in this report Thus, the low incidence of low birth weight in this study cannot be interpreted to result from the prenatal care at the birth centers

Type of Practitioner

Certified nurse midwives or students of nurse midwifery provided care during 78 6 percent of the labors and 80 6 percent of the births that occurred in the

BEST AVAILABLE COPY

Table 1 Characteristics of 11 814 Women Admitted to Birth Centers in Labor 1985 to 1987 and of All U S Women Who Gave Birth in 1986

Characteristic	Women in Birth Centers	All Women Who Gave Birth
	percent	
Age (yr)		
<18	2 3	4 7
18–34	89 9	88 3
≥35	7 8	7 0
Years of education*		
<12	12 4	15 5
12	32 3	43 7
13–15	23 5	22 1
≥16	31 8	18 7
Unmarried	12 3	23 4
Race or ethnicity‡		
Non Hispanic white	78 4	68 1
Black	3 9	16 5
Hispanic	16 3	11 0
Other	1 3	4 4
Low economic status§	24 9	27 0
Parity		
0	39 3	41 6
1	33 4	33 0
2–4	25 8	23 7
5–10	1 5	1 7
Trimester of first prenatal care¶		
1st	61 7	75 9
2nd	34 9	18 1
3rd or no care	3 4	6 0
Cigarettes/day during pregnancy‖		
None	90 3	74 5
1–10	5 9	12 0
≥11	3 8	13 5
Drinks/wk during pregnancy‖		
None	88 7	60 9
<3	10 8	35 9
≥3	0 5	3 2
Gestational age of infants (wk)		
<37	2 4	10 0
38–41	86 2	76 3
≥42	11 4	13 7
Birth weight of infants (g)*		
<2501	0 8	6 8
2501–4000	82 8	82 1
>4000	16 4	11 1

Data are from the National Center for Health Statistics [17]

*Among women over 18 years of age

‡Estimated for all U S women who gave birth from the 1980 and 1986 U S Census and vital-registration data (and Ventura S National Center for Health Statistics personal communication)

§Data on all U S women who gave birth are from the *Federal Register* [18]

¶Data on women in birth centers exclude women who transferred to birth-center care after receiving some antepartum care through another provider

‖Data refer to 1980 birth cohort as studied by Prager et al [19]

*The distribution of U S births includes births <2500 g in the low birth weight category whereas the birth-center data are divided to include birth weights <2501 g in the lowest category

care during 9 9 percent of the labors and 16 0 percent of the deliveries at the birth centers Midwives who were not certified nurse midwives cared for 3 8 percent of the women in labor and 3 0 percent during birth Registered nurses managed 7 7 percent of the labors and 0 4 percent of the births

Intrapartum Care

Only 1 3 percent of the women had artificial rupture of membranes or were given oxytocin to induce labor Forty two percent were given some treatment to augment the forces of labor 32 4 percent had artificial rupture of membranes before 5 cm of cervical dilatation received oxytocin However 10 5 percent of all women in labor were diagnosed as having failure to progress instead of stimulating their labors with oxytocin the centers transferred 83 3 percent of these women to hospital care

Fifty-two percent of the women had fewer than four vaginal examinations 14 7 percent had intravenous infusions and 9 3 percent had enemas The fetal heart rate was monitored by portable Doppler ultrasonography in 87 2 percent of the women, in 7 5 percent the fetus was monitored electronically (internally in 1 1 percent) All but 5 0 percent drank or ate while in labor at the birth center, 43 4 percent took showers, baths, or both, and 34 6 percent were given body massage Ninety-seven percent were accompanied by friends or family members, often including young children

Twenty-four percent of the nulliparous women and 6 2 percent of the parous women received an analgesic, tranquilizer, or sedative during labor Three percent of the women were given anesthetics other than local infiltration for an episiotomy or for repair of laceration Pain relief was inadequate in 2 4 percent of the women, 66 2 percent of whom were transferred to hospitals

Of the women who gave birth in the centers, 99 4 percent had spontaneous vaginal deliveries Vacuum extractors were used to assist delivery in 0 4 percent and forceps were used in 0 2 percent Forty-three percent of the women were in an upright or semiupright position for delivery (37 8 percent sitting, 3 6 percent squatting, and 0 8 percent standing), 29 0 percent were on their sides and 21 3 percent were supine or in the lithotomy position

More than a third of the women (34 2 percent) delivered with an intact perineum, and 17 6 percent had an episiotomy without a laceration The remaining women had lacerations 45 7 percent had first- or second-degree, 1 6 percent had third-degree, and 0 8 percent had fourth-degree lacerations

Complications in the Birth Centers

Twenty percent of the women and their babies had no complications during labor, delivery, or the immediate postpartum and neonatal period Another 50 8 percent had complications that posed no inherent risk of death or permanent damage, such as transient fetal distress, failure to progress, maternal temperature below 37 8°C, less than fourth-degree perineal lacerations and minor congenital anomalies Somewhat more serious complications, such as maternal temperature above 37 8°C birth weight above 4499 g moderate shoulder dystocia retained placenta and hypertension occurred during labor and delivery in 21 3 percent of the women

One or more serious emergency complications occurred in the birth centers in 7 9 percent of the mothers or their infants Table 2 shows the frequency of these serious emergency complications and the percentages of the women or infants with each type of complication who were transferred to hospitals Each

BEST AVAILABLE COPY

Table 2 Incidence of Serious Emergency Complications in Birth Centers and Transfer Rate for Women and Infants with Each Complication

Complication	Incidence	Transfers to Hospitals
	no (%)	no (%)
Labor		
Thick meconium	484 (4 1)	210 (43 4)
Sustained fetal distress	211 (1 8)	132 (62 6)
Abruptio placentae	24 (0 2)	5 (20 8)
Prolapsed cord	4 (0 03)	4 (100 0)
Delivery or immediate postpartum		
Postpartum hemorrhage requiring transfer	50 (0 5)	50 (100 0)
Severe shoulder dystocia	15 (0 15)	2 (13 3)
Nonvertex presentation diagnosed at birth	6 (0 06)	1 (16 7)
Multiple gestation diagnosed at birth	4 (0 04)	1 (25 0)
Postpartum eclampsia	1 (0 01)	1 (100 0)
Immediate neonatal		
Cyanosis	66 (0 7)	25 (37 9)
Intrauterine pneumonia or other infection	57 (0 6)	32 (56 1)
5-Minute Apgar score <7	55 (0 5)	27 (49 1)
Great effort required to establish respirations	38 (0 4)	10 (26 3)
Serious congenital anomaly	38 (0 4)	17 (44 7)
Suspected aspiration of meconium	21 (0 2)	17 (81 0)
Birth weight <2001 g	6 (0 06)	1 (16 7)
Total†	928 (7 9)	437 (47 1)

For complications during labor percentages are based on data for all 11 814 women admitted to birth centers in labor minus small but varying numbers of women for whom information was missing For complications during delivery and the immediate postpartum and neonatal periods percentages are based on the 10 350 births that occurred in or on the way to birth centers or on the way to hospitals minus small but varying numbers of women for whom information was missing

†The total number of mothers or infants with emergency complications is less than the sum of the incidence rates for each complication because 119 women had two or more serious emergency complications

immediate hospital care for optimal treatment" according to the scoring system developed for this analysis However, only 47 1 percent of the women or infants were actually transferred When serious complications occur close to the time of birth, there may not be enough time to transfer the patient until after the crisis has passed, then, if the complication has been managed successfully, there may be no need for transfer The numbers and percentages shown in the table include only complications that occurred in the birth centers and thus do not include the low Apgar scores of infants born in hospitals after a transfer

We looked for associations between the occurrence of serious emergency complications and the presence of either recognized demographic and behavioral risk factors or specific prenatal complications None of these factors were predictive of complications in this population, which had already been screened during prenatal care

Intrapartum Immediate Postpartum and Newborn Transfers

Of the 11 814 women admitted to birth centers for intrapartum care 15 8 percent were transferred to hospitals during labor and birth Table 3 (mother or infant) timing of the transfer, and urgency Three fourths of the transfers took place before delivery (11 9 percent of the women admitted to birth centers for intrapartum care) 57 5 percent of the transfers before delivery were attributed to failure to progress, 13 4 percent to the presence of meconium in the amniotic fluid, and 10 0 percent to fetal distress In addition 0 8 percent of the postpartum mothers and 1 7 percent of the newborn infants were transferred Hemorrhage and a retained placenta were the two most frequent reasons for the transfers of postpartum mothers, respiratory distress was the usual reason for the transfers of newborns Of the total number of mothers and infants, 2 4 percent were transferred under circumstances that the care provider considered to constitute an emergency Among the sample of 387 women and newborns for whom information was collected on the time required to complete a transfer, 39 7 percent of those considered to have emergency complications were in transit for fewer than 6 minutes, and 13 7 percent were in transit for more than 15 minutes

Nulliparity was associated with an increased likelihood of transfer 28 9 percent of the nulliparous women or their infants were transferred, but only 7 3 percent of the parous women The transfer rates were similar among parous women of higher or lower parity Failure to progress accounted for 52 0 percent of the transfers of nulliparous women and 20 9 percent of the transfers of parous women Fifteen percent of 4610 nulliparous women were transferred for this reason, as compared with 1 5 percent of 7121 parous women

Cesarean Sections

The overall rate of cesarean section was 4 4 percent The most common reasons for performing a cesarean section were failure to progress (64 8 percent), fetal distress or the presence of meconium in the amniotic fluid (16 5 percent), and a nonvertex presentation (4 6 percent) The percentage of nulliparous women who had cesarean sections was 9 9 percent 8 2 percent for failure to progress and 1 7 percent for other reasons Among the parous women, 0 6 percent had cesarean sections because of failure to progress and 0 2 percent for other reasons Among 1405 women trans-

Table 3 Transfers among 11 814 Women Admitted to Birth Centers for Intrapartum Care According to Timing Subject (Mother or Infant) and Determination of Emergency Status

Timing and Subject	No (%) of Transfers	
	Emergency	All
Before delivery	177 (1 5)	1405 (11 9)
1st Stage of labor	111 (0 9)	1119 (9 5)
2nd Stage of labor	66 (0 6)	263 (2 2)
Stage unknown	0 (0 0)	23 (0 2)
After delivery	83 (0 7)	294 (2 5)
Maternal transfers	42 (0 4)	100 (0 8)
Newborn transfers	41 (0 4)	194 (1 7)
Timing unknown	24 (0 2)	170 (1 4)
All	284 (2 4)	1869 (15 8)

BEST AVAILABLE COPY

ferred to hospitals before delivery 37 1 percent had cesarean sections

Among the women who had cesarean sections 115 (22 percent) had eaten solid food during labor None of them aspirated the contents of the stomach while under anesthesia The expected incidence of such aspiration (about 1 per 2000 in patients who underwent general anesthesia[20]) is such that the practice of eating during labor must still be questioned despite the absence of complications observed in this sample

Patient Satisfaction

Of the women who received intrapartum care in birth centers and were not transferred, 75 7 percent completed evaluations of their care Of these, 98 8 percent stated that they would recommend the center to friends, and 94 0 percent indicated that they would use the birth center in another pregnancy Of the women who were transferred, 54 1 percent completed evaluations, 96 9 percent said they would recommend the birth center, and 83 3 percent said they would return to the center for a subsequent birth

Follow-up

Eighty-three percent of the women had a postpartum examination or other visit at the center four to six weeks after the birth Among the 2046 women who did not make such a visit (17 3 percent), all but 26 had babies who were in good condition at discharge from the birth center or hospital We tried to determine whether any of these 26 infants had died but were unable to obtain at least a part of the necessary information about each infant, in most instances because the birth center had closed, key staff members had moved, and the log book linking the study numbers to the records of the individual mothers could not be located However, staff members at the seven centers that had cared for the mothers of 14 of these infants certified that their centers had never had an intrapartum stillbirth or a maternal or neonatal death Five of the remaining 12 infants were born in hospitals after the mothers had been transferred because the labor failed to progress, 3 others were transferred as neonates for respiratory distress but had normal birth weights and five-minute Apgar scores of 7 or higher Although the lack of identifying information precluded a review of their hospital records, it is unlikely that any of these eight infants died Four infants remain for whom a safe neonatal outcome cannot be demonstrated one whose mother was transferred to the hospital during labor because of thick meconium but not as an emergency two born in birth centers and not transferred, and one born in a birth center and then transferred to a hospital

Outcomes

Apgar scores and mortality rates were used as measures of final outcome There were 11 814 mothers and no maternal deaths Among the babies 0 6 percent had five minute Apgar scores below 7 There were 11 826 births and a total of 15 intrapartum or neonatal deaths of which 7 were due to the presence of lethal congenital anomalies (Table 4) The rate of intrapartum death (stillbirth) was 0 4 per 1000 births (0 3 if the deaths from lethal congenital anomalies are excluded) (Table 5) The neonatal mortality rate was 0 8 per 1000 births (0 3 if the lethal congenital anomalies are excluded) The overall mortality rate including intrapartum and neonatal deaths, was 1 3 per 1000 births (0 7 if the lethal anomalies are excluded) The circumstances leading to the eight deaths not associated with lethal congenital anomalies are shown in Table 4

Discussion

We believe that despite the lack of a control group this descriptive study provides meaningful results in the context of historical data on low-risk hospital birth The difficulties of obtaining an appropriate control group for a large prospective study of alternative birth settings are discussed in the 1982 report of the Institute of Medicine "Research Issues in the Assessment of Birth Settings"[15]

Table 5 shows the outcomes in this study and in five earlier studies of low-risk hospital deliveries[21] Although the studies span a period of 17 years no time trend is apparent Most of the reduction in neonatal mortality during this period has been due to the improved survival of preterm infants with low birth weight,[26] who were excluded from each of the hospital studies Although no group of hospital patients is completely comparable to the women in our study, the other studies excluded not only low birth-weight infants but also twins, nonvertex presentations, repeat cesarean sections, and women with ma

Table 4 Intrapartum and Neonatal Deaths among 11 826 Infants (Including 12 Sets of Twins) of Mothers Receiving Intrapartum Care at Birth Centers

Category of Death	Number
Total intrapartum and neonatal	15
From lethal congenital anomalies (1 intrapartum 6 neonatal)	7
From other causes	8
Intrapartum	2
Term pregnancy partial placenta previa abruption (died in birth center)	
Term pregnancy transfer during first stage of labor because of thick meconium and sustained fetal distress (died in hospital)	
Post term pregnancy placental abruption (died in birth center)	
Post term pregnancy mother had low grade fever and pre eclampsia during labor (died in birth center)	
Neonatal	
Term pregnancy sustained fetal distress transferred during first stage of labor born in hospital with intrauterine pneumonia and pneumothorax (died in hospital)	
Term pregnancy prolonged rupture of membranes born in birth center developed respiratory distress transferred pneumonia with hyaline membrane disease (died in hospital)	
Post term pregnancy thick meconium and sustained fetal distress transferred during first stage of labor born in hospital five minute Apgar score of 3 (died in hospital)	
Term pregnancy uncomplicated labor born in birth center five minute Apgar score of 10 death at one week of age autopsy revealed no cause of death (died at home)	

BEST AVAILABLE COPY

Table 5 Outcomes in Five Studies of Low Risk Hospital Births and in the National Birth Center Study

Source of Data	No of Births	No of Deaths per 1000 Births			Infants with Five Minute Apgar Scores <7	Births by Primary Cesarean Section
		Intrapartum	Neonatal	Total		
					percent	
Beth Israel Hospital Boston 1969–1975 [1]	12 055					
Lowest risk women						
With monitoring		Unreported	1 1	Unavailable	—	—
Without monitoring		Unreported	0 5	Unavailable	—	—
Community hospital Cincinnati 1974–1975						
Normal pregnancies						
All	4 144	1	3 4	4 3	—	—
With monitoring	2,293	0	0 9	0 9	—	—
National Natality Survey 1980 (low risk births) [3]	2 935	Unreported	2 5	Unavailable	1	8 4
University of Illinois and 11 surrounding hospitals 1982–1985 [4]						
Uncomplicated term births						
All	8 135	0	2 1	2 1	0 8	8 3
Without anomalies		0	1 9	1 9		
Uncomplicated post term births						
All	3 457	0	2 6	2 6	1 7	17 6
Without anomalies		0	2 1	2 1		
Parkland Memorial Hospital Dallas 1982–1985 [5]	14 618	0	1	1	0 2	—
84 U.S birth centers 1985–1987‡						
Infants of women admitted for intrapartum care						
All	11 826	0 4 (5)	0 8 (10)	1 3 (15)	0 6	4 4
Without anomalies		0 3 (4)	0 3 (4)	0 7 (8)		
Term births						
All	9 871	0 2 (2)	0 7 (7)	0 9 (9)	0 6	4 1
Without anomalies		0 2 (2)	0 3 (3)	0 5 (5)		
Post-term births§						
All	1 306	1 5 (2)	2 3 (3)	3 8 (5)	1 2	7 3
Without anomalies		1 5 (2)	0 8 (1)	2 3 (3)		

*Monitoring denotes electronic fetal monitoring and anomalies denotes lethal congenital anomalies

†Values in parentheses are actual numbers of deaths

‡The number of term and post-term births shown for the birth centers is less than the total number of births because gestational age was unknown for 649 infants The number of term and post term deaths is also less than the total number of deaths because one preterm infant died of a congenital anomaly

§Births after 42 or more weeks of gestation

jor medical or prenatal complications Neutra et al stratified 15,846 live births at Beth Israel Hospital in Boston into five categories of risk [21] The data shown are for the group at lowest risk and exclude deaths from congenital abnormalities Amato's 4144 "normal" patients included only 57 percent of the maternity patients at a community hospital in Cincinnati [22] He also excluded women with meconium-stained amniotic fluid or a postmature infant and those who had had stimulation with oxytocin or prolonged rupture of the membranes The National Natality Survey conducted in 1980 by the National Center for Health Statistics was based on a probability sample of 9941 live births in the United States during that year [23] Besides the exclusions listed earlier the survey file was culled to exclude mothers who smoked more than 10 cigarettes per day had more than three alcoholic drinks per week, had fewer than four prenatal visits or were unmarried black or under 18 years old (Keppel K National Center for Health Statistics personal communication) Eden et al screened 60,456 births at 12 hospitals in a midwestern perinatal referral network to identify 11 592 uncomplicated term and post term pregnancies in [illegible] identified 42 percent of 34,995 births at Parkland Memorial Hospital, in Dallas, as low risk [25]

The proportion of low Apgar scores and the total mortality rate among infants born to women attending birth centers were in the same range as those in the five earlier studies Our findings differed in two ways The rate of cesarean section in the birth-center patients was roughly half that in the two studies that reported such information, and half the deaths in our study that were not caused by congenital anomalies occurred intrapartum, whereas there was only one intrapartum death in the three other studies that reported on this outcome The higher incidence of intrapartum stillbirth at the birth centers was offset by a lower incidence of neonatal death, and the overall likelihood of a poor outcome was not higher among the infants of birth-center patients It is possible that in a hospital the ability to deliver rapidly a fetus that is in distress during labor shifts some deaths from the intrapartum to the neonatal period

We examined several sources of error that could have biased our findings We do not know the outcomes of four infants and cannot exclude the possibility that one or more of them may have died If all four [illegible] would increase by 0 3

BEST AVAILABLE COPY

[illegible] study [illegible] higher than the rate at [illegible] restrictive centers had been retained in the study, the total mortality rate would have increased by another 0 3 per 1000 births If in addition the four infants were assumed to have died [illegible] rate would have reached 1 9 per [illegible] within the range reported for [illegible] risk hospital births

The birth centers included in this study may be safer than those [illegible] Centers not known to the National Association of Childbearing Centers have less access to continuing education relevant to the safety of birth-center care and may be less influenced by national standards Fewer of the nonparticipating centers were licensed or accredited Although the majority of birth centers in the United States participated in this study, they are probably unrepresentative of all birth centers in the same way that academic medical centers are unrepresentative of all hospitals Among the five studies of low-risk hospital births, the lowest mortality rates were reported by the two academic medical centers

As in most other multicenter studies, the data were collected by the care providers Although this procedure creates a potential for bias, the findings during the site visits, the congruence between the study data and information from sample clinical records from each center, and the internal consistency of the data suggest that the data are reliable

We found the neonatal mortality rate to be lower than that reported in previous multicenter studies of birth centers Bennetts and Lubic reported a neonatal mortality rate of 4 6 per 1000 births among 1938 women cared for in 11 nurse-midwifery centers from 1972 through 1979 [12] Eakins and Richwald found 4 neonatal deaths per 1000 births among 2002 admissions to 16 birth centers in California in 1984 [13] The National Association of Childbearing Centers calculated a neonatal mortality rate of 2 5 per 1000 deliveries from reports of births at 102 birth centers in 1983 [14] The lower rate in our study may indicate a trend toward greater safety, reflecting the implementation of state regulation and licensure, accreditation, peer review, and programs of continuing education within the past five years

The birth centers used few invasive uncomfortable, or restrictive procedures and took many measures to provide comfort and support to the women during labor Although in individual cases specific procedures and treatments are beneficial or necessary each carries potential risk [7,33] Further study is needed to evaluate the effect of the birth-center approach on health outcome, cost, and patient satisfaction

The combination of good outcomes and few cesarean sections found in this study is not unique and has been reported in studies of hospital-based nurse midwifery care[54-61] and at the National Maternity Hospital in Dublin Ireland [62-64] The latter has achieved [illegible] cute the [illegible] protocol [illegible] of cervical dilatation [illegible] less than [illegible] comparable nulliparous woman In our study the outcomes were achieved in free standing birth centers

Birth centers offer a savings in cost[6,66] and minimize the rate of cesarean section [illegible] rural populations that are too [illegible] to support [illegible] hospital obstetrical unit They may be located in rural areas and can be designed to suit the needs of particular communities Because they are small [illegible] generally nonbureaucratic, they may overcome social and emotional barriers that contribute to the [illegible] of care facilities by some groups of women [illegible]

Few innovations in health service promise [illegible] cost, greater availability, and a high degree of satisfaction with a comparable degree of safety The results of this study suggest that modern birth centers can identify women who are at low risk for obstetrical complications and can care for them in a way that provides these benefits

We are indebted to Dr Anita Barbey Bennetts who helped design the data-collection forms to Mr Michael Putnick and Mr John Santamaria of Vector Systems Corporation Philadelphia where the data were computerized and edited and to the midwives physicians nurses and others at the birth centers who collected the data assisted in the site visits and provided additional information in response to our many requests

References

1 Lubic RW Ernst EK The childbearing center an alternative to conventional care Nurs Outlook 1978 26 754-60
2 Faison JB Pisani BJ Douglas RG Cranch GS Lubic RW The childbearing center an alternative birth setting Obstet Gynecol 1979 54 57
3 Murdaugh SA Experiences of a new migrant health clinic Women Health 1976 1 25-9
4 Neilson I Nurse midwifery in an alternative birth center Birth Fam J 1 [illegible] 4 24-7
5 McCallum WT The Maternity Center at El Paso Birth Fam J 1979 6 [illegible] 66
6 Dejong RN Jr Shy KK Carr KC An out-of hospital birth center [illegible] university referral Obstet Gynecol 1981 58 703 7
7 Cohen RL A comparative study of women choosing two different childbirth alternatives Birth 1982 9 13 9
8 Reinke C Outcomes of the first 527 births at the Birthplace in Seattle Birth 1982 9 231 8
9 Eakins PS The rise of the free standing birth center principles and practice Women Health 1984 9 49-64
10 Scupholme A McLeod AG Robertson EG A birth center affiliated with the tertiary care center comparison of outcome Obstet Gynecol 1986 67 598 603
11 Feldman E Hurst M Outcomes and procedures in low risk birth [illegible] comparison of hospital and birth center settings Birth 1987 14 18 24
12 Bennetts AB Lubic RW The free standing birth centre Lancet 1 378 80
13 Eakins PS Richwald GA Free standing birth center in California [illegible] cost medical outcome and issues Berkeley California Department Health and Human Services 1986
14 National Association of Childbearing Centers Birth center update NACC News 1985 2 4 17
15 Committee on Assessing Alternative Birth Settings Institute of Medicine Division of Health Sciences Policy and National Research Council Commission on Life Sciences Research issues in the assessment of birth [illegible] report of a study Washington D C National Academy Press [illegible]
16 Guidelines for perinatal care 2nd ed Elk Grove Village Ill American Academy of Pediatrics 1988 61
17 National Center for Health Statistics Advance report of final natality statistics 1986 Monthly vital statistics report Vol 37 No 3 Suppl Washington D C Government Printing Office 1988 (DHHS publication (PHS) 88 1120)
18 Department of Health and Human Services Annual update of the [illegible] income guidelines Fed Regist 1987 52 5340 1

BEST AVAILABLE COPY

21 Neutra R Frankenberg SE Greenland S Friedman EA Effect of fetal monitoring on neonatal death rates N Engl J Med 1978 299 324-6

22 Amato JC Fetal monitoring in a community hospital a statistical analysis Obstet Gynecol 1977 50 269 74

23 [illegible] KC [illegible] RI Placek P Method and response [illegible] 1960 [illegible] natality and fetal mortality surveys Vital and health statistics [illegible] Washington D C Government Printing Office [illegible] publication no (PHS) 86-[illegible]

24 [illegible] PD [illegible] S Winegar A Spellacy WN Perinatal characteristics of [illegible] postdate pregnancies Obstet Gynecol 1987 69 296-9

25 [illegible] Cunningham FG Nelson S et al A prospective comparison of selective and universal electronic fetal monitoring in 34 995 pregnancies N Engl [illegible] 1986 315 615-9

26 Committee Study the Prevention of Low Birthweight Division of Health Promotion and Disease Prevention Institute of Medicine Preventing low birthweight Washington D C National Academy Press 1985

27 Schifrin BS Iatrogenic fetal distress Int Anesthesiol Clin 1973 11 119-40

28 *Idem* Fetal heart rate patterns following epidural anaesthesia and oxytocin infusion during labour J Obstet Gynaecol Br Commonw 1972 79 332 9

29 Kaminski HM Stafl A Altman J The effect of epidural analgesia on the frequency of instrumental obstetric delivery Obstet Gynecol 1987 69 770-3

30 Lehmann DK Mabie WC Miller JM Jr Pernoll ML The epidemiology and pathology of maternal mortality Charity Hospital of Louisiana in New Orleans 1965 1984 Obstet Gynecol 1987 69 833-40

31 Golub MS Eisele JH Jr Donald JM Obstetric analgesia and infant outcome in monkeys neonatal measures after intrapartum exposure to meperidine or alfentanil Am J Obstet Gynecol 1988 158 1219 25

32 Levine MG Holroyde J Woods JR Jr Siddiqi TA Scott M Miodovnik M Birth trauma incidence and predisposing factors Obstet Gynecol 1984 63 792 5

33 Borgatta L Piening SL Cohen WR Association of episiotomy and delivery position with deep perineal laceration during spontaneous delivery in nulliparous women Am J Obstet Gynecol 1989 160 294-7

34 Friedman EA Effects of labor and delivery on the fetus In Cohen WR Friedman EA eds Management of labor Rockville Md Aspen Systems 1983 307 20

35 Maisels MJ Rees R Marks K Friedman Z Elective delivery of the term fetus an obstetrical hazard JAMA 1977 238 2036-9

36 Banta HD Thacker SB Assessing the costs and benefits of electronic fetal monitoring Obstet Gynecol Surv 1979 35 627-42

37 Haverkamp AD Orleans M Langendoerfer S McFee J Murphy J Thompson HE A controlled trial of the differential effects of intrapartum fetal monitoring Am J Obstet Gynecol 1979 134 399-412

38 Brinsden PR Clark AD Postpartum haemorrhage after induced and spontaneous labour Br Med J 1978 2 855-6

39 Hack M Fanaroff AA Klaus MH Mendelawitz BD Merkatz IR Neonatal respiratory distress following elective delivery a preventable disease? Am J Obstet Gynecol 1976 126 43 7

40 Richards MP The induction and acceleration of labour some benefits and complications Early Hum Dev 1977 1 3 17

41 Singhi S Chookang E Hall JS Kalghatgi S Iatrogenic neonatal and maternal hyponatraemia following oxytocin and aqueous glucose infusion during labour Br J Obstet Gynaecol 1985 92 356-63

42 Friedman EA Sachtleben MR Wallace AK Infant outcome following labor induction Am J Obstet Gynecol 1979 133 718 27

45 Martell M Belizan JM Nieto F Schwarcz R Blood acid base balance at birth in neonates from labors with early and late rupture of membranes J Pediatr 1976 89 963 7

46 Hamilton RR Webster AC Haemodynamic effects of induction of epidural [illegible] in labour Can J Anaesth 1985 [illegible]

[illegible] Jr Obstetric medication and infant outcome [illegible] Soc Res Child Dev 1970 35(4)

[illegible] Bow WAJ Brame RG Cefalo [illegible] effect on perineal trauma Obstet Gynec 1987 70 200 2

[illegible] Hydration in labor — is routine intravenous hydration necessary? [illegible] Midwifery 1986 31 17 -6

50 Keppel AB The use of intravenous fluids during labor Birth 1988 15 75-9

51 Singhi SC Chookang E Maternal fluid overload during labour transplacental hyponatraemia and risk of transient neonatal tachypnoea in term infants Arch Dis Child 1984 59 1155-8

52 Dumoulin JG Foulkes JE Ketonuria during labour Br J Obstet Gynaecol 1984 91 97 8

53 Carmen S Neonatal hypoglycemia in response to maternal glucose infusion before delivery J Obstet Gynecol Neonatal Nurs 1986 15 319 23

54 Platt LD Angelini DJ Paul RH Quilligan EJ Nurse midwifery in a large teaching hospital Obstet Gynecol 1985 66 816-20

55 Sharp ES Lewis LE A decade of nurse midwifery practice in a tertiary university affiliated hospital J Nurse Midwifery 1984 29(6) 353-65

56 Stewart RB Clark L Nurse midwifery practice in an in hospital birthing center 2050 births J Nurse Midwifery 1982 27(3) 21-6

57 Brucker MC Muellner M Nurse midwifery care of adolescents J Nurse Midwifery 1985 30 277 9

58 Schorfheide AM Nurse midwives and obstetrician a team approach in private practice revisited a 5 year report J Nurse Midwifery 1982 27(6) 12 5

59 Nichols CW The Yale nurse midwifery practice addressing the outcomes J Nurse Midwifery 1985 30(3) 159-65

60 Schreier AC The Tucson nurse midwifery service the first four years J Nurse Midwifery 1983 28(6) 24-30

61 Hewitt MA Hangsleben KL Nurse midwives in a hospital birth center J Nurse Midwifery 1981 26(5) 21 9

62 O Driscoll K Foley M Correlation of decrease in perinatal mortality and increase in cesarean section rates Obstet Gynecol 1983 61 1 5

63 O Driscoll K Foley M MacDonald D Active management of labor as an alternative to cesarean section for dystocia Obstet Gynecol 1984 63 485-90

64 O Driscoll K Foley M MacDonald D Stronge J Cesarean section and perinatal outcome response from the House of Home Am J Obstet Gynecol 1988 158 449 52

65 Blue Cross and Blue Shield of Greater New York Maternity Center Association s Childbearing Center 1976-1977 cost analysis New York Health Affairs Research 1978

66 Health Insurance Association of America The cost of having a baby Washington D C Health Insurance Association of America 1987

67 Curry MA Access to prenatal care key to preventing low birthweight report of Consensus Conferences Kansas City Mo American Nurses Association 1987 28-32

68 Institute of Medicine Prenatal care reaching mothers reaching infants Washington D C National Academy Press 1988 75-6

BEST AVAILABLE COPY

SPECIAL ARTICLES

A PROSPECTIVE COMPARISON OF SELECTIVE AND UNIVERSAL ELECTRONIC FETAL MONITORING IN 34,995 PREGNANCIES

KENNETH J LEVENO, M D , F GARY CUNNINGHAM, M D , SHERYL NELSON, R N , MICKI ROARK, R N , M LYNNE WILLIAMS, R N , DAVID GUZICK, PH D , M D , SHARON DOWLING, R N , CHARLES R ROSENFELD, M D , AND ANN BUCKLEY, R N

Abstract We investigated the effects of using intrapartum electronic fetal monitoring in all pregnancies as compared with using it only in cases in which the fetus is judged to be at high risk Predominant risk factors included oxytocin stimulation of labor, dysfunctional labor abnormal fetal heart rate or meconium-stained amniotic fluid This prospective alternate-month clinical trial took place over a 36-month period during which 34 995 women gave birth. In alternate months, either 7 (for "selective monitoring") or 19 (for "universal monitoring") fetal monitors were made available in the labor and delivery unit During the "selective" months 6420 of 17,409 women (37 percent) were electronically monitored, as compared with 13 956 of 17,586 women (79 percent) during the "universal months "

Universal monitoring was associated with a small but significant increase in the incidence of delivery by cesarean section because of fetal distress, but perinatal outcomes as assessed by intrapartum stillbirths low Apgar scores, a need for assisted ventilation of the newborn admission to the intensive care nursery, or neonatal seizures were not significantly different

We conclude that not all pregnancies and particularly not those considered at low risk of perinatal complications need continuous electronic fetal monitoring during labor (N Engl J Med 1986, 315 615-9)

abst only

CONTINUOUS intrapartum electronic monitoring of the fetal heart rate is considered by many clinicians to be superior to intermittent auscultation The principal benefit claimed for continuous surveillance is earlier detection of fetal distress, which can reduce the frequency and severity of perinatal asphyxia. When electronic fetal monitoring was first introduced into clinical practice, it was typically reserved for use in pregnancies with complications [1] More recently, the use of such continuous monitoring during labor has been advocated for all pregnancies, including those at low risk for perinatal complications [2,3] Indeed, in 1978 it was estimated that at least two thirds of pregnancies in the United States were electronically monitored during labor [4] However, not all researchers agree that electronic monitoring is beneficial.[5-8] This study was designed to ascertain whether the introduction of universal electronic monitoring at a hospital would improve perinatal results, as compared with those obtained under its prevailing policy of monitoring only in high-risk pregnancies During this three-year investigation, an alternate-month study design was used to compare the differences in perinatal outcome between universal and selective electronic fetal monitoring in 34,995 deliveries

METHODS

Parkland Memorial Hospital in Dallas is a tax supported institution whose obstetrics department serves indigent women The nearly 60 obstetrics–gynecology house officers are supervised by the faculty of the Department of Obstetrics and Gynecology of the University of Texas Southwestern Medical School

A study of universal electronic fetal monitoring which was approved by the institutional review board began October 1 1982 Nurses attending each delivery completed a perinatal data sheet and research nurses assessed the data for consistency and completeness before electronic storage The prevailing policy of using monitoring only in high-risk pregnancies (selective monitoring) was determined before the study and the indications for use (in descending order of importance) were induction or augmentation of labor with oxytocin, dysfunctional labor abnormal fetal heart rate the presence of meconium in the amniotic fluid and other complications of pregnancy including hypertension vaginal bleeding prolonged pregnancy, diabetes the presence of twins breech presentation and preterm labor Women with complications were transferred into a five bed labor intensive care unit, where most electronic fetal monitoring was employed Throughout the investigation a maximum of seven portable electronic monitors were available during the selective monitoring months

During the alternate universal monitoring months 12 additional monitors were installed in routine labor rooms (these monitors were stored in a locked room during the selective monitoring months) Thus a total of 19 monitors were available in alternate months for the 20-bed labor unit During the universal monitoring months the policy was to use a monitor for every pregnancy in which the fetus was considered viable

Other than monitor placement there were no differences in the standards of care during the alternate months In the labor intensive care unit nursing personnel were constantly in attendance at a patient nurse ratio of 2 1 Oxytocin was given by nurses according to a written protocol Women assigned to single bed labor rooms were visited by nurses at least every 30 minutes to review the progress of labor and to measure the fetal heart rate by intermittent auscultation with a hand held Doppler device or by visual inspection of the monitor tracing During the universal monitoring months women with pregnancy complications that would in the absence of a clinical trial have resulted in transfer to the labor intensive care unit continued to be transferred

Statistical Analysis

Statistical analyses were performed with the chi square test or Fisher s exact test of probability two tailed P values of 0 05 or less were considered significant

RESULTS

Selected demographic characteristics of the 34,995 mothers and their infants are summarized in Table 1

From the Departments of Obstetrics and Gynecology and Pediatrics University of Texas Southwestern Medical School Dallas Address reprint requests to Dr Leveno at the Department of Obstetrics and Gynecology University of Texas Southwestern Medical School 5323 Harry Hines Blvd Dallas TX 75235

BEST AVAILABLE COPY

During the 18 selective-monitoring months, 17,409 women gave birth to 17,571 infants (162 sets of twins) A total of 6420 pregnancies (37 percent) were considered to involve a high risk and were thus electronically monitored During the 18 months in which universal monitoring was employed, 17,586 women gave birth to 17,759 infants (173 sets of twins), and 13,956 of the pregnancies (79 percent) were monitored Pregnancies that were not electronically monitored during the universal-monitoring months were analyzed for protocol variance After the exclusion of pregnancies in which fetal death occurred before the arrival of the mother at the labor unit, cesarean sections had been scheduled, or birth occurred within 60 minutes of admission, there were 14,913 eligible pregnancies, of which 94 percent received continuous monitoring The mean patient nurse ratios during the selective-monitoring months (2 12 1) and the universal-monitoring months (2 16 1) were similar, and the ranges of those ratios (1 8 to 2 5) were identical

Table 1 Demographic Factors in 34,995 Pregnancies Resulting in Deliveries at Parkland Memorial Hospital during the 36-Month Study *

Factor	Alternate Month Monitoring Group	
	Selective	Universal
	% of pregnancies	
Ethnic group		
White	27	28
Black	39	38
Hispanic	31	31
Other	3	3
Age (yr)		
≤19	35	35
20–24	38	39
25–29	19	17
≥30	8	9
Parity		
Nulliparous	39	40
Multiparous	61	60
Prenatal care	81	82
Birth weight (g)		
500–999	0 8	0 8
1000–1500	1 2	1 1
1501–2000	2.3	2 5
2001–2500	7 2	7 2
≥2501	88 5	88 4

*There were no significant demographic differences between the selective-monitoring and the universal monitoring study groups

Obstetrical Complications and Practices

The two arms of the study had nearly equal and not significantly different proportions of pregnancies with complications, including maternal hypertension (12 and 13 percent, respectively, in the selective-monitoring and universal-monitoring groups), breech presentation (3 percent in each group), twins (1 percent in each group), and birth weight less than 2500 g (11 percent in each group) Fewer women were transferred to the labor intensive care unit during the universal-monitoring months than during selective monitoring months (30 vs 32 percent, P<0 01), however, abnormalities in fetal heart rate were detected more frequently during universal monitoring (12 vs 10 percent, P<0 01)

Table 2 Indications for Primary Cesarean Sections

Indication	Study Group		P Value
	Selective Monitoring (N = 17 409)	Universal Monitoring (N = 17,586)	
	no (%) of cases		
Fetal distress†	369 (2 1)	454 (2 6)	<0 01
Labor problems‡	854 (4 9)	848 (4 8)	NS
Breech	297 (1 7)	364 (2 1)	<0 01
Multiple gestation	80 (0 1)	93 (0 1)	NS
Other	177 (1)	174 (1)	NS
Total	1777 (10 2)	1933 (11)	<0 05

NS denotes not significant.

†Denotes fetal distress in single fetuses with cephalic presentations

‡Includes cephalopelvic disproportion failure to progress failure of forceps procedure or failure of induction attempt.

The incidences of induction (7 percent in both groups) or augmentation (7 percent in both) of labor with oxytocin, forceps delivery (4 percent), and repeat cesarean sections (7 vs 8 percent in the selective- vs the universal-monitoring months) were not significantly different in the two groups As Table 2 shows, the total number of first cesarean sections increased during the universal-monitoring months This was due principally to an increase in the number of procedures performed because of cephalic presentations with fetal distress and because of breech presentations

Perinatal Outcome

As Table 3 shows, the neonatal and perinatal mortality rates in the two study groups were not significantly different The stillbirth rate was significantly lower during the universal-monitoring months but this was because more fetuses were found to be dead when the mother arrived in the labor and delivery unit Specifically, these fetuses had no detectable heart activity, as confirmed by real-time sonog

Table 3 Comparison of Perinatal Mortality during Selective and Universal Monitoring

Category	Selective Monitoring	Universal Monitoring	P Value
	no (rate)		
Total births	17 571	17 759	—
Total stillbirths	186 (10 6/1000)	148 (8 3/1000)	<0 05
Fetuses dead before arrival at labor and delivery unit	161	118	0 0
Live births	17 385	17 611	—
Neonatal deaths	113 (6 5/1000)	114 (6 5/1000)	NS
Perinatal deaths	299 (17/1000)	262 (14 8/1000)	NS

NS denotes not significant

BEST AVAILABLE COPY

Table 4 Comparison of Types of Outcome That Suggested Fetal Asphyxia in Selective Monitoring Months and Universal Monitoring Months

Outcome	Selective Monitoring	Universal Monitoring	P Value
	no of cases (% or rate)		
Fetuses alive upon admission to labor and delivery unit	17 410	17 641	—
Fetal deaths in labor and delivery (≥500 g)	25 (1 4/1000)	30 (1 7/1000)	NS
Assisted ventilation of neonate	1259 (7 2%)	1315 (7 5%)	NS
Five minute Apgar score ≥5	293 (1 7%)	296 (1 7%)	NS
Neonates admitted to intensive care nursery	428 (2 5%)	460 (2 6%)	NS
Neonates with seizures	45 (2 6/1000)	53 (3/1000)	NS

*NS denotes not significant

raphy if there was any question about the time of death

Types of infant outcome that may have reflected fetal asphyxia are listed in Table 4 These were identified in fetuses who were alive on arrival at the labor and delivery unit and thus reflected at-risk fetuses The incidence of fetal deaths was not significantly different in the two study groups, and there were no significant differences in the other types of outcome [illegible]

Table 5 contains information on fetuses who died in the labor and delivery unit and who weighed more than 700 g and had no malformations In these cases, fetal heart activity was detected on arrival at the labor and delivery unit, but such activity was absent at birth There were eight such stillbirths during the selective-monitoring months three of the fetuses had been monitored, and four were delivered by cesarean section because of fetal distress In 6 of 12 cases of stillbirths that occurred during the universal-monitoring months, labor was not monitored because the fetuses were considered too immature to survive All six weighed less than 900 g In the remaining six cases, monitoring was performed, and five of the stillborn infants were delivered by cesarean section because of fetal distress In the sixth case, fetal distress was diagnosed but the mother refused to give permission for a cesarean section

Effects of Universal Monitoring in Low-Risk Pregnancies

During both the selective-monitoring and the universal-monitoring months, 42 percent of the pregnancies were considered to have a low risk, a low-risk pregnancy was defined as involving a single fetus in a cephalic presentation, spontaneous, uncomplicated labor, and a birth weight that exceeded 2500 g

As Table 6 shows, abnormalities in the fetal heart rate were identified almost three times more frequently during the universal-monitoring months Although universal fetal monitoring was associated with a two fold increase in cesarean sections performed because of fetal distress, the measures of infant outcome were not significantly different from those observed during selective monitoring These results were unchanged when recalculations were done after exclusion of the 408 women (5 6 percent) who were not monitored during the universal-monitoring months

Discussion

The establishment of a pathophysiologic basis for the interpretation of the fetal heart rate,[9] coupled with a concern that conventional auscultation was less than ideal in detecting fetal distress, stimulated great interest in electronic monitoring In 1968, the first clinical electronic monitor became available, and in 1970 Paul and Hon reported that such monitoring reduced both cesarean sections for fetal distress and perinatal asphyxia [10] Numerous investigators have since cited the advantages and disadvantages of the procedure, and by 1978, nearly two thirds of the women in labor in the United States were being electronically monitored, although there was still no proof that the practice was either beneficial or harmful [11] For example, although some investigators[1 12 13] have reported decreases in the number of intrapartum stillbirths with the use of electronic monitoring, others[5-8] have not observed such a reduction In 1980, the National Institutes of Health concluded that, although few randomized studies had been conducted, high-risk pregnancies should be monitored but that monitoring may not be necessary for those at low risk [14]

Since 1974, we have conducted electronic monitoring in high-risk pregnancies, and we wish to empha-

Table 5 Stillbirths during Labor and Delivery in Which the Birth Weight Exceeded 700 g and There Were No Malformations According to Monitoring Period

Selective Monitoring Months				Universal Monitoring Months			
Birth Weight	Monitor	Cesarean Section	Findings	Birth Weight	Monitor	Cesarean Section	Findings
g				*g*			
835	No	Yes	Unexplained	760	No	No	EGA 22 wk
1100	No	No	EGA 25 wk	780	No	No	Abruption
1140	Yes	No	Cord accident	830	No	No	EGA 24 wk
2430	Yes	Yes	Abruption	850	No	No	EGA 25 wk
2835	No	Yes	Uterine rupture	870	No	No	EGA 23 wk
3285	Yes	Yes	Abruption	880	No	No	EGA 24 wk
3310	No	No	Postmaturity	980	Yes	Yes	Cord accident
3640	No	No	Ketoacidosis no labor	1350	Yes	No†	Cord accident
				2010	Yes	Yes	Cord accident
				2500	Yes	Yes	Hydrops
				3200	Yes	Yes	Diabetes
				4030	Yes	Yes	Unexplained

EGA denotes estimated obstetrical gestational age in cases in which the fetus was considered too immature to survive
†Permission to perform a cesarean section was refused

BEST AVAILABLE COPY

Table 6 Effects of Selective versus Universal Monitoring in 14 618 Low Risk Pregnancies *

Outcome	Selective Monitoring (N = 7330)	Universal Monitoring (N = 7288)	P Value†
	no (%) of cases		
Abnormal fetal heart rate	196 (2 7)	551 (7 6)	<0 01
Cesarean section for fetal distress	28 (0 4)	64 (0 9)	<0 01
Intrapartum fetal deaths	0 (0)	0 (0)	NS
Neonatal deaths	5 (0 1)	4 (0 1)	NS
Assisted ventilation of newborn	102 (1 4)	119 (1 6)	NS
Five minute Apgar score ≤5	14 (0 2)	18 (0 2)	NS
Admission to intensive care nursery	17 (0 2)	25 (0 3)	NS
Neonates with seizures	3 (0 04)	1 (0 01)	NS

*The difference in the number of pregnancies in each monitoring group was not significant
†NS denotes not significant

size that many pregnancies that were considered to have a low risk at the onset of labor were subsequently assigned to a high-risk category and electronically monitored Since monitoring of some type during labor is imperative in all patients, intermittent monitoring is, in effect, a "screening" procedure for fetuses considered to be at low risk, and the purpose of this study was to determine whether continuous monitoring was superior The introduction of universal monitoring had no significant effect on infant outcome at our hospital Specifically, the incidence of intrapartum stillbirth was not significantly reduced, and other factors that reflect fetal welfare, including five-minute Apgar scores, assisted ventilation at birth, the need for neonatal intensive care, death, and seizures, were not significantly different We realize, of course, that it is impossible to identify all the infants who will have neurologic handicaps on the basis of only the perinatal factors that we assessed

Electronic monitoring has been reported both to increase[15 16] the frequency of cesarean sections and to have no effect on it [17 18] In the current study, universal monitoring was associated with a more frequent identification of abnormalities in fetal heart rate and a small but significantly increased number of cesarean sections that were performed because of fetal distress At Parkland Hospital, the diagnosis of fetal distress tends to be made on clinical grounds For example, any abnormalities in the heart rate in the presence of thick meconium or in the presence of known fetal risks, such as post-term status or fetal growth retardation, are considered evidence of fetal distress or jeopardy However, abnormal fetal heart rates, although predictive of perinatal asphyxia, do not preclude the birth of a healthy infant [19 20]

Another impetus for this investigation was concern about the medicolegal implications[21] of our prevailing policy of selective monitoring In an extensive review of the legal issues involved Gilfix[22] concluded that "physicians who employ auscultation may not be ble for failure to use electronic fetal monitoring the results of our investigation support this view least in low-risk pregnancies

Our policy before this study was to transfer wom with high-risk pregnancies, including those in wh abnormalities in the fetal heart rate were found sites where personnel were in constant attendan During the universal-monitoring months, more abn malities of fetal heart rate were detected, but few women (30 vs 32 percent) were transferred to labor intensive care unit Although this difference w small (only 2 percent, or 215 women), we cannot p clude the possibility that the potential advantage universal monitoring may have been diminished this change in obstetrical management

In conclusion, the results of this clinical trial in cate that universal fetal monitoring changed obstet cal practices but did not significantly improve pen natal outcome Abnormalities in fetal heart rate were observed more frequently in low-risk pregnancies du ing universal monitoring, and this observation wa associated with the performance of more cesarean se tions because of fetal distress Our policy of provid constant nursing atttendance during labor in selected high-risk pregnancies tended to be contravened in universal monitoring We conclude that not all pre nancies, particularly not those at low risk of compli tions, need continuous electronic fetal monitoring du ing labor

We are indebted to Dr Ron Anderson chief executive officer Parkland Memorial Hospital for his support to the many nur and house officers whose diligence and cooperation made this in tigation possible to Dr Norman F Gant who was instrumenta facilitating the study and to Ms Lynne McDonnell for expert rial assistance

References

1 Yeh S-Y Diaz F Paul RH Ten year experience of intrapartum fetal monitoring in Los Angeles County/University of Southern California Medical Center Am J Obstet Gynecol 1982 143 496-500
2 Parer JT FHR monitoring answering the critics Contemp Ob Gyn 1981 17(6) 163-74
3 Sykes GS Molloy PM Johnson P Sturrat GM Turnbull AC Fetal distress and the condition of newborn infants Br Med J 1983 287 94
4 Obstetrical practices in the United States Hearing before the Subcommittee on Health and Scientific Research 95th Congress 2nd Session Committee on Human Resources April 17 1978
5 Kelso IM Parsons RJ Lawrence GF Arora SS Edmonds DK An assessment of continuous fetal heart rate monitoring in labor a randomized trial Am J Obstet Gynecol 1978 131 526-32
6 Haverkamp AD Thompson HE McFee JG Cetrulo C The clinical use of continuous fetal heart rate monitoring in high risk pregnancy Am J Obstet Gynecol 1976 125 310-20
7 Wood C Renou P Oats J Farrell E Beischer N Anderson I A randomized trial of fetal heart rate monitoring in a low risk obstetric population Obstet Gynecol 1981 141 527 34
8 Haverkamp AD Orleans M Langendoerfer S McFee J Murphy J Thompson HE A controlled trial of the differential effects of intrapartum fetal monitoring Am J Obstet Gynecol 1979 134 399-412
9 Freeman RK Garite TJ Fetal heart rate monitoring Baltimore Williams & Wilkins 1981 2
10 Paul RH Hon EH A clinical fetal monitor Obstet Gynecol 1970 [illegible]
11 Banta HD Thacker SB Assessing the costs and benefits of electronic fetal monitoring Obstet Gynecol Surv 1979 34 627 42
12 Erkkola R Gronroos M Punnonen R Kilkku P Analysis of intrapartum fetal deaths their decline with increasing electronic fetal monitoring Acta Obstet Gynecol Scand 1984 63 459 62

90

BEST AVAILABLE COPY

13 Mueller Heubach E MacDonald HM Joret D Portman MA Edelstone DI Caritis SN Effects of electronic fetal heart rate monitoring on perinatal outcome and obstetric practices Am J Obstet Gynecol 1980 137 758 63
14 Consensus Development Conference of the National Institute of Child Health and Human Development III Predictors of intrapartum fetal distress In Antenatal diagnosis Bethesda Md National Institutes of Health 1973 1 195 (NIH publication no 79 1973)
15 Hughey MJ LaPata RE McElin TW Lussky R The effect of fetal monitoring on the incidence of cesarean section Obstet Gynecol 1977 49.513 8
16 Lee WK Baggish MS The effect of unselected intrapartum fetal monitoring Obstet Gynecol 1976 47 516-20
17 Gabert HA Stenchever MA The results of a five year study of continuous fetal monitoring on an obstetric service Obstet Gynecol 1977 50 275 9
18 Boehm FH Davidson KK Barrett JM The effect of electronic fetal monitoring on the incidence of cesarean section Am J Obstet Gynecol 1981 140 295 8
19 Beard RW Filshie GM Knight CA Roberts GM The significance of the changes in the continuous fetal heart rate in the first stage of labour J Obstet Gynaecol Br Commonw 1971 78 865 81
20 Krebs HB Petres RE Dunn LJ Segreti A Intrapartum fetal heart rate monitoring IV Observations on elective and nonelective fetal heart rate monitoring Am J Obstet Gynecol 1980 138 213 9
21 Graham AR Trial labor following previous cesarean section Am J Obstet Gynecol 1984 149 35-45
22 Gilfix MG Electronic fetal monitoring physician liability and informed consent Am J Law Med 1984 10 31 90

RELATION OF PRIVATE OR CLINIC CARE TO THE CESAREAN BIRTH RATE

ROBERTA HAYNES DE REGT, M D , HOWARD L MINKOFF, M D , JOSEPH FELDMAN, DR P H , AND RICHARD H SCHWARZ, M D

Abstract The rising rate of cesarean births in the United States has been the focus of academic attention as well as attention from the media during the past decade Although there is a consensus about the indications for cesarean delivery that have led to the increased rate (dystocia malpresentation, fetal distress and previous cesarean delivery) the influence of other key factors such as whether the patient received care from a private physi- through a hospital clinic, has not been established eview of 65,647 deliveries in four Brooklyn hospitals between 1977 and 1982 we found that private physicians performed significantly more cesarean sections than house officers and attending physicians Private patients giving birth to their first child were significantly more likely than clinic patients to undergo cesarean delivery if dystocia, malpresentation or fetal distress was diagnosed, and private patients with one or more previous deliveries were significantly more likely to undergo cesarean delivery if dystocia or malpresentation was diagnosed Private patients had fewer perinatal deaths which were concentrated among infants with birth weights under 2000 g but the infants of private patients had a significantly higher rate of low Apgar scores and birth injuries than the infants of clinic patients (N Engl J Med 1986, 315 619-24)

THE cesarean birth rate in the United States tripled during the 1970s, reaching a nationwide average of 15 2 percent in 1978[1] and continuing to rise thereafter The Consensus Development Conference of the National Institute of Child Health,[1] along with several studies,[2 7] have identified four indications as responsible for most of the increase in operative deliveries dystocia, malpresentation, fetal distress, and previous cesarean delivery

Although changing protocols,[8-11] as well as geographic,[12 13] social,[14 15] and demographic factors,[5 16] have been mentioned as contributing to the increasing rate of cesarean births, few studies have focused on the influence of whether the patient receives care from a private physician or through a hospital clinic Although some investigators have noted a higher rate of cesarean deliveries among private patients and have suggested that differences in the cesarean birth rate between private and clinic patients are related to socioeconomic status,[15 18] others have reported comparable rates for private and clinic patients [16]

No cause has been established for any differences found in the cesarean birth rate between private and patients The need to investigate the influence of "service status" — that is, whether patients are cared for by private physicians or in hospital clinics and by house officers — on the cesarean birth rate was stated by Phillips,[14] who noted that "studies into the significance of other causes for physician bias [concerning choosing a mode of delivery] are urgently needed Such further studies could benefit from a separation of data between private and service [clinic] patients "

Because a difference has been found in the rates of operative delivery for private and clinic patients within our own institution, we performed a retrospective review of deliveries occurring over a period of six years at four Brooklyn hospitals, looking specifically for differences between private and clinic patients in cesarean birth rate, demographic characteristics, indications for surgery, management protocols, and neonatal outcome

METHODS

All deliveries of single infants weighing more than 500 g at four Brooklyn hospitals participating in the Obstetrical Statistical Cooperative between 1977 and 1982 were reviewed The numbers of deliveries in these hospitals were as follows Downstate Medical Center 11 112 Maimonides Medical Center 24 016 Brooklyn Cumberland Hospital 24 989 and Coney Island Hospital 5530 Copies of all 65 647 obstetrical charts from the participating institutions were reviewed by investigators at the institutions after the patients were discharged The information extracted from these records included demographic data such as age and race and medical data such as medical history course of labor and whether patients

From the Department of Obstetrics and Gynecology and the Department of Preventive Medicine State University of New York–Health Science Center at Brooklyn Address reprint requests to Dr de Regt at the Department of Obstetrics and Gynecology Mount Sinai Services City Hospital Center at Elmhurst 79-01 Broadway Elmhurst NY 11373

A COMPARISON OF SKIN-TO-SKIN CONTACT AND RADIANT HEATERS IN PROMOTING NEONATAL THERMOREGULATION

Judith A Fardig, C N M , M S N

ABSTRACT

This prospective study compared standard newborn care under radiant heat with two methods of warming babies that provided immediate parent–infant contact. Fifty-one mother–infant dyads were randomly assigned to three treatment groups Control group babies had no skin-to-skin contact with their mothers during the study period One group of experimental infants began skin-to-skin contact after completion of initial nursing care in a radiant heater The second group of experimental babies had the earliest, most continuous skin-to-skin contact with their mothers and were never under radiant heat. Skin temperatures of all 51 newborns were noted every 3 minutes for 45 minutes using an electronic thermometer Rectal temperatures were also taken at 21 and 45 minutes after birth Results supported the hypothesis that body temperatures would be warmest in experimental babies given the earliest skin-to-skin contact, less warm in experimental infants beginning skin to-skin contact after initial nursing care and coolest in control babies given no skin-to-skin contact with their mothers ($p < 0.001$) Significantly more control than experimental newborns had skin and rectal temperatures below the neutral thermal range at 21 and 45 minutes of life High delivery room temperature and drying babies well immediately after birth did not differ significantly among the three groups but were found to be positively correlated with neonatal body temperature for the sample as a whole

INTRODUCTION

Most expectant parents anticipate an emotionally satisfying and medically safe childbirth experience Each family, nurse-midwife, and physician will have a unique perspective on the relative values of emotional and medical needs and the compromises necessary to attain them

It is a premise of nurse-midwifery care that the two goals need not be mutually exclusive Hence in a setting emphasizing high technology in perinatal care the nurse-midwife is especially challenged in working with parents to achieve a safe and fulfilling birth which facilitates maternal and paternal attachment to the child

One facet of the potential conflict between safety and emotional satisfaction is the manner of handling the infant immediately after birth It is standard procedure at many hospitals to rapidly clamp and cut the umbilical cord in order to expedite the newborn's transfer to a radiant-heated crib There, the baby will be dried and given the initial nursing care and evaluation These procedures frequently take place beyond the range of vision of the mother on the delivery table and consume at least 5 to 10 minutes Sometimes the snugly wrapped infant will then be held aloft or brought over so the mother can see her baby's face Upon request she may be allowed to hold her baby for a while More often, the newborn is left in the radiant heater away from the delivery table while everyone is busy with the mother Parents who request immediate and continuous skin-to-skin contact with their child from the moment of birth find themselves in conflict with medical and nursing personnel who feel it is their responsibility to protect the neonate from heat loss in the cold drafty delivery room The more relaxed atmosphere of birthing rooms may provide a solution for some, but for those who must or choose to use the delivery room, it is questionable whether the current method of minimizing neonatal heat loss is actually the most effective

Address correspondence to Judith A. Fardig 3115 S W 12th Avenue Apt #308 Portland Oregon 97201

Perhaps the mother's body would be an equally good heat source, as well as promoting maternal–infant bonding even for those who have not been educated to seek this The essential clinical problem is to develop ways to safely minimize newborn heat loss that optimize parent–infant contact. If there is no significant difference in temperatures of normal babies dried and given their initial nursing care while in skin-to-skin contact with their mothers compared with those cared for under radiant heat, then there would be justification for allowing mothers to hold their healthy babies immediately after birth

NEONATAL THERMOREGULATION

Some decrease in temperature is an inevitable part of adjustment to extrauterine life Under usual delivery room conditions deep body temperature of the newborn falls two to three degrees centigrade The decline is most rapid in the initial minutes after birth and is about 0 1°C per minute for core and 0 3°C per minute for skin temperature, corresponding to a heat loss of approximately 200 calories per kilogram of body weight each minute [1]

The four principal mechanisms by which heat loss occurs as the baby emerges from the warm intrauterine environment into the comparatively cold delivery room are evaporation radiation convection, and conduction Evaporative losses occur rapidly as the newborn s wet skin is exposed to the dry air-conditioned delivery room Exhalation of amniotic fluid from the lungs and respiratory tract can also contribute to evaporative heat losses [2] Radiant losses occur when heat transfers from the body surface to cooler objects not in actual contact with the baby, such as cold walls, windows, and incubator surfaces [3] Convective losses are enhanced by air currents passing over the infant's skin Air-conditioning, administration of cold oxygen, and movement of personnel in and out of the delivery room contribute to this form of heat loss Finally thermal energy is lost by conduction to cooler objects touching the baby's skin, such as cold towels, blankets, instruments, diapers, and weighing scales [3]

Normal, full-term babies are true homeotherms who respond actively to changes in environmental temperature They attempt to modify heat losses by several mechanisms shivering and voluntary muscle activity to increase heat production,[4] changing posture to a more flexed position to decrease total exposed skin surface constricting cutaneous vessels to prevent core body heat from reaching the skin through vascular channels [3] and nonshivering thermogenesis

Chemical or nonshivering thermogenesis is a metabolic process mediated by norepinephrine that allows oxygen consumption to be raised without increased muscular activity Heat thus generated warms the blood circulating through deposits of brown fat and maintains temperature of the body core [5] Heat is transferred along an internal gradient from the core to the body surface modulated by vasoconstriction, and then along an external gradient from the skin to the environment controlled largely by environmental conditions [4]

In order for a drop in body temperature not to occur in the delivery room the neonate would have to increase heat production by more than threefold [6] It is unlikely that infants are able to defend themselves by added heat production during the first few minutes after birth because of the transient hypoxia accompanying even a perfectly normal birth Any degree of hypoxia tends to depress the metabolic response to cold [7] Healthy infants will recover from the relative birth asphyxia by increasing respiratory carbon dioxide elimination in order to compensate for metabolic acidosis By 15' to 30 minutes after birth, normal newborns are able to increase oxygen consumption in response to cold stimuli and thereby utilize their primary heat-producing mechanism of nonshivering thermogenesis [7]

A neutral thermal environment has been defined by several researchers [1,5 8–10] as the set of thermal conditions, including ambient air and radiating surface temperatures, relative humidity, and air flow, at which oxygen consumption and heat production are lowest, thus imposing minimal metabolic stress on the newborn Criteria for a neutral thermal environment include a core (esophageal, colonic, or deep rectal) temperature of 97 7 to 99 5°F (36 5–37 5°C) an abdominal skin temperature of 96 8 to 99 5°F (36 0–37 5°C), and a core-to-skin gradient not greater than 1 0°F (0 5°C) Environmental conditions allowing thermal neutrality are most easily appraised by measuring skin temperature over areas not noted for deposits of brown fat. Skin temperature receptor sites are the primary monitors of environmental temperature and regulators of endogenous energy production [5] Core temperature is much slower to respond to environmental changes

The lowest environmental temperature at which oxygen consumption remains within the minimal resting range is designated the critical temperature Normal delivery room conditions are well below the critical temperature even for a healthy full term neonate without clothes or blankets [11]

All babies experience some drop in temperature immediately after birth If cold stress is allowed to develop without intervention the newborn s ability to compensate will begin to fail A downward spiral of tachypnea

Judith A Fardig is a graduate of Oberlin College and the Women s Health Care Specialist program of Harbor U C L A Medical Center She completed the three year program at Yale University in May 1979 and was awarded a M S N in nurse midwifery

fatigue bradycardia deepening hypoxia and metabolic acidosis hypoglycemia hyperbilirubinemia and interference with certain clotting factors may be set up Premature babies are at much greater risk for developing these complications because of their larger body surface to mass ratio, thin skin scanty subcutaneous tissue and fatty insulation, inability to shiver or perspire, and less active metabolic tissue mass [12] Such a vicious cycle is unlikely to be set up in a normal term infant during the course of hospital care Nevertheless, knowledge of such possible sequelae has prompted numerous attempts to find effective ways of minimizing cold stress after birth

Current approaches to decreasing cold stress by blocking the four main avenues of loss include 1) evaporation—drying the head and body of the baby as soon as possible after delivery, replacing wet towels with warm, dry ones, swaddling in plastic wrappers, 2) conduction—putting warmed blankets between the infant's body and cold surfaces, swaddling in warmed blankets or plastic wrappers, 3) convection—covering the baby with blankets or plastic placing in an incubator out of drafts especially during transportation between delivery room and nursery, warming oxygen before any needed administration, 4) radiation—placing the newborn under radiant heat lights, keeping cribs, incubators, and radiant warmers away from cold outside walls and windows, using double-walled incubators [4]

Little published research has been done to evaluate whether skin-to-skin contact with a parent could provide the newborn in the delivery room with a neutral thermal environment In an unpublished Master's study Thomas[13] compared the temperatures of newborn babies receiving skin-to-skin contact with infants kept under radiant heat in the delivery room Twelve mother–infant dyads were randomly assigned to each group Results supported the hypothesis that experimental group babies would regain body temperature and stabilize in a neutral thermal environment at least as well as babies in the control group An important finding of the study was that newborns given the earliest skin-to-skin contact with their mothers warmed at a significantly faster rate than babies who had not yet received the intervention

A three-group after-only experiment, which partially replicated and extended Thomas's study, was designed to test the following hypothesis There will be significant differences in body temperature among three groups of infants Neonatal core and skin temperatures will be lowest in control group babies given no skin-to-skin contact with their mothers in the first 45 minutes after birth, significantly higher in Group I experimental babies given skin-to-skin contact with their mothers after completion of initial nursing care, and highest in Group II experimental infants given the earliest skin-to-skin contact with their mothers

MATERIALS AND METHODS

The sample was a convenience sample of women expected to deliver their babies between May 15 and August 11, 1978, at Yale-New Haven Hospital under the care of a certified nurse-midwife, resident in obstetrics, or obstetrician in private practice The population from which the sample was drawn included all prenatal patients of the following groups who deliver at Yale-New Haven Hospital two clinics, Yale-New Haven Hospital Women's Clinic and Young Mothers' Program one prepaid health plan, and eight private practices

In addition to informed consent of the subject and clearance by the nurse-midwife or obstetrician criteria for participation in the study included

1 low-risk patient with an uncomplicated antenatal course complications contraindicating participation in the study included maternal diabetes mellitus thyroid disease cardiac disease hypertension acute or severe chronic lung or renal disease, drug addiction alcoholism, moderate to severe pre-eclampsia Rh isoimmunization, poor obstetrical history with previous fetal demise or stillbirth, previous cesarean section multiple gestation, vaginal bleeding or a suspected growth-retarded fetus
2 term pregnancy between 38 and 42 weeks gestation with a normal vaginal delivery anticipated
3 normal intrapartum course, contraindications to continued participation included fetal distress indicated by severe variable or late heart-rate decelerations, meconium-stained amniotic fluid maternal oral temperature above 99 0°F, prolonged rupture of membranes greater than 18 hours at time of delivery
4 normal vaginal delivery with or without episiotomy or low forceps but excluding delivery by vacuum extraction or midforceps rotation
5 normal newborn with estimated weight of at least 2500 grams, spontaneous cry, and Apgar scores at 1 and 5 minutes of at least seven

Fifty-one mother-baby dyads met all criteria for continuation in the project and constituted the final sample There were 17 pairs in each experimental group

When a patient meeting the prenatal criteria by chart review and corroboration of the nurse-midwife or physician was admitted to the labor and delivery unit of Yale-New Haven Hospital, she was contacted by the researcher about the study If the woman gave informed consent to participate in the study, she and her baby were randomly assigned to either the control group or to one of the experimental groups by blind drawing of one of three numbers with replacement Both the couple and their caregiver were told how the baby would be handled after delivery

ning the temperature study to be certain there were no major conflicts in expectations

The study was conducted primarily in the three delivery rooms of Yale-New Haven Hospital Patients giving birth in the Birth Room or the cesarean-section delivery room were not included in the study

Prior to each use, the Surg-a-Temp electronic thermometer was calibrated according to the manufacturer's instructions A sterile, disposable Mon-a-Therm temperature sensor was attached to the electronic thermometer and then taped to the infant's left side, lateral to the umbilicus as soon as possible after birth An aluminum-backed adhesive foam reflector was placed over the end of the temperature sensor to prevent interference with accurate readings from either the radiant lights or the mother's body heat. Skin temperature was read on the dial of the electronic thermometer by the researcher and recorded every 3 minutes for 36 minutes At 21 and 45 minutes, in addition to skin temperature, a deep core temperature was obtained by inserting a standard mercury-filled glass thermometer into the infant s rectum for 3 minutes Delivery room temperature was recorded from a wall-mounted thermometer as each subject entered the room

The protocol for Group I (first experimental group) was to place the baby on the mother s abdomen immediately after delivery head down on a sterile towel The researcher dried the baby and applied the temperature sensor to the abdomen while the nurse-midwife or physician suctioned the baby s mouth and nose if needed with a bulb syringe and clamped and cut the umbilical cord The neonate was then transferred by the researcher to the radiant heated Kreiselman crib for the remainder of the initial nursing care to be given by the staff nurse This care consisted of further drying of the skin and scalp as needed 1 and 5 minute Apgar scoring any needed oropharyngeal suctioning final cord clamp application, securing of the identification bracelet and taking footprints The skin sensor frequently needed reinforcing with one or two additional strips of Derma-clear nonallergenic tape After the 5 minute Apgar score, the nude infant was placed by the researcher on the mother's bare chest so that the temperature sensor did not rest against her Both were covered with blankets previously warmed in the radiant heater the baby's two cotton receiving blankets and a cotton bath blanket.

The procedure for Group II (second experimental group) was the same as in Group I except that instead of transfer to the radiant heater, the neonate was placed by the researcher directly on the mother s bare chest after the cord was cut. All initial nursing care was done by the staff nurse while the baby and mother were in skin-to-skin contact covered as much as possible by warmed blankets

Group III (control group) babies were carried directly to the radiant-heated crib as soon as the umbilical cord was cut without being placed on the mother s abdomen after birth The temperature sensor was applied to the baby's left side as previously described The staff nurse gave the initial nursing care double-wrapped the baby in warm blankets, and showed the parents their child If the mother or father requested to hold the swaddled baby they could do so Otherwise the infant was kept under radiant heat lights until transfer from the delivery room

Babies in all groups were transferred wrapped in blankets and in bed with their mothers from the delivery room to the recovery room at the completion of all repair and cleanup procedures after delivery

RESULTS

There were no significant differences among the three groups on any of the following characteristics the mother s age race marital status gravidity number of previous term pregnancies premature babies, abortions or living children, the number of weeks gestation or pediatrician's estimate of gestational age length of the first second or third stage of labor milligrams of Vistaril, Demerol or Nisentil given to the mother for analgesia type of anesthesia for delivery mother's highest temperature in labor; delivery room temperature length of time spent in the delivery room whether or not an episiotomy was performed sex, weight, or length of the baby, whether or not the baby was dried well, or Apgar scores of the baby at 1 and 5 minutes after birth

The hypothesis that neonatal core and skin temperatures would be lowest in control group babies receiving no skin-to-skin contact, significantly higher in experimental babies given skin-to-skin contact with their mothers after initial nursing care and highest in the group of experimental infants given the earliest skin-to-skin contact was supported The repeated measures analysis of variance for both skin and rectal temperatures showed a significant main effect for the experimental variable A Scheffé test showed that babies in the second experimental group (Group II) had significantly warmer skin temperatures than babies in Groups I and III Group I babies were significantly warmer than control (Group III) infants on skin temperature measurements The Scheffe test for differences in rectal temperature showed Groups I and II to be significantly warmer than the control group There were no significant differences between the two experimental groups Table 1 summarizes these data

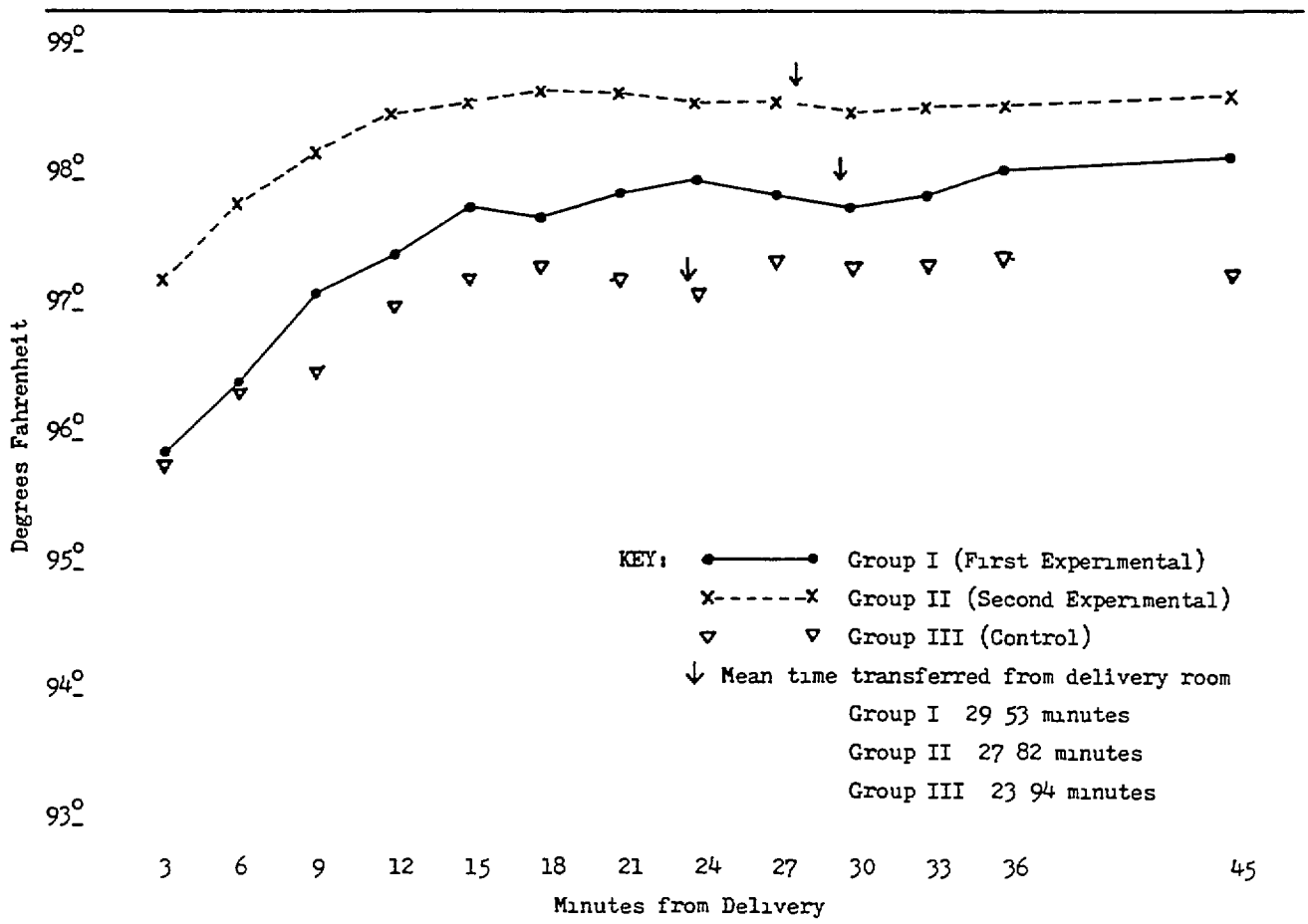
Figure 1 illustrates the mean skin temperatures of the treatment groups at 3-minute intervals from 3 to 45 minutes after birth There was a consistent increase in temperature in all three groups until about 18 minutes of age after which it tended to stabilize Most babies (7/17 in

TABLE 1
Results of analysis of variance for repeated measures of skin and rectal temperatures for the three groups[a]

Means for the three groups (averaged over time)	*Results of the analysis of variance*					*Results of group comparisons*	
	Source	*Sum of squares*	*df*	*Mean square*	*F*		
Skin temperatures (in degrees Fahrenheit)	between groups	214 934	2	107 467	11 649***	I vs II	0 837**
						I vs III	0 547*
	error	442 813	48	9 225		II vs III	1 384***
First experimental $\bar{X}_{(I)}$ = 97 551	time	171 621	12	14 302	34 385***		
Second experimental $\bar{X}_{(II)}$ = 98 388	group by time	11 100	24	0 463	1 112 n s		
Control $\bar{X}_{(III)}$ = 97 004	time by error	239 575	576	0 416			
Rectal temperature (in degrees Fahrenheit)	between groups	36 597	2	18 298	18 940***	I vs II	0 468 n s
						I vs III	0 970*
	error	46 375	48	0 966		II vs III	1 438**
First experimental $\bar{X}_{(I)}$ = 98 426	time	0 795	1	0 795	10 167**		
Second experimental $\bar{X}_{(II)}$ = 98 894	group by time	0 055	2	0 027	0 350 n s		
Control $\bar{X}_{(III)}$ = 97 456	time by error	3 751	48	0 078			

[a] Note. *$p < 0.05$ **$p < 0.01$ ***$p < 0.001$

FIGURE 1
Mean skin temperatures of Groups I II and III by time



Group I, 10/17 in Group II and 9/17 in Group III) experienced a drop in skin temperature during the period of transfer from the delivery room to the recovery room The mean number of minutes after delivery at which this transfer occurred was 29 53 for Group I, 27 82 for Group II, and 23 94 for Group III

An analysis of variance of the three groups was also done for each time frame at which temperatures were recorded Significant differences were followed by Scheffe tests Table 2 summarizes significant differences among mean skin temperature measurements for the groups at each of 13 times Table 3 compares mean rectal temperatures of the three treatment groups at 21 and 45 minutes after delivery When examined in this way, Group II was always significantly warmer than Group III Babies in this second experimental group had significantly warmer skin temperatures than babies in the other experimental group (Group I) at 3 6 12, 18, and 30 minutes The differences between the two experimental group means approached statistical significance at the 0 05 level for skin temperature measurements at 9 15 27 minutes No significant differences in rectal temperatures were noted between the two experimental groups Control group (Group III) infants were significantly cooler than Group I newborns for both rectal temperature measurements and for skin temperature measurements at 24 and 45 minutes after delivery There was also a trend, approaching significance at the 0 05 level for Group III babies to have cooler skin temperature measurements than those in Group I at 21, 27, 33, and 36 minutes

There were no significant differences among the groups in core-to-skin gradient at either 21 or 45 minutes Means for all three treatment groups were well under 1 0°F At 21 minutes after birth three babies in Group I, one in Group II, and four in Group III had a core-to-skin gradient greater than 1 0°F When repeated at 45 minutes one infant in Group I, none in Group II, and three in Group III had such a large core-to-skin gradient

TABLE 2
Comparison of mean skin temperatures by time intervals for the three treatment groups[a]

Time (min after birth)	*Means for the three groups[b] (Fahrenheit)*				*Results of group comparisons*		
	$\bar{X}_{(I)}$	$\bar{X}_{(II)}$	$\bar{X}_{(III)}$	*F value*	*I vs II*	*I vs III*	*II vs III*
3	95 947	97 176	95 788	7 801**	1 229**	0 159 n s	1 388**
6	96 423	97 753	96 382	5 471**	1 329*	0 042 n s	1 371*
9	97 118	98 165	96 500	7 115**	1 047 n s	0 618 n s	1 665**
12	97 353	98 494	96 976	7 453**	1 141*	0 377 n s	1 518**
15	97 753	98 565	97 188	6 864**	0 812 n s	0 565 n s	1 377**
18	97 712	98 653	97 318	7 042**	0 941*	0 394 n s	1 335**
21	97 941	98 647	97 182	10 027**	0 706 n s	0 759 n s	1 465***
24	98 012	98 576	97 118	12 026**	0 564 n s	0 894*	1 458***
27	97 912	98 618	97 276	10 667**	0 706 n s	0 636 n s	1 342***
30	97 788	98 547	97 312	9 587**	0 759*	0 476 n s	1 235***
33	97 929	98 553	97 323	8 521**	0 624 n s	0 605 n s	1 229***
36	98 059	98 565	97 418	7 469**	0 506 n s	0 641 n s	1 147**
45	98 223	98 741	97 271	10 717**	0 517 n s	0 953*	1 470***

[a] Note *$p < 0 05$ **$p < 0 01$ ***$p < 0 001$
[b] $\bar{X}_{(I)}$ = first experimental group $\bar{X}_{(II)}$ = second experimental group $\bar{X}_{(III)}$ = control group

TABLE 3
Comparison of mean rectal temperatures by time intervals for the three treatment groups[a]

Time (min after delivery)	*Means for the three groups[b] (Fahrenheit)*	*Results of the analysis of variance*					*Results of group comparisons*	
		Source	*Sum of squares*	*df*	*Mean square*	*F*		
21	$\bar{X}_{(I)}$ = 98 547	total	42 987	50			I vs II	0 424 n s
	$\bar{X}_{(II)}$ = 98 970	between groups	18 819	2	9 409	18 688**	I vs III	1 023**
	$\bar{X}_{(III)}$ = 97 523	within groups	24 168	48	0 504		II vs III	1 447***
45	$\bar{X}_{(I)}$ = 98 306	total	43 186	50			I vs II	0 512 n s
	$\bar{X}_{(II)}$ = 98 818	between groups	17 834	2	8 917	16 883**	I vs III	0 918**
	$\bar{X}_{(III)}$ = 97 388	within groups	25 352	48	0 528		II vs III	1 430***

Note *$p < 0 05$ **$p < 0 01$ ***$p < 0 001$
[b] $\bar{X}_{I}$ = first experimental group $\bar{X}_{II}$ = second experimental group $\bar{X}_{III}$ = control group

Significant differences were noted among the groups regarding the number of babies having core and skin temperatures below the thermoneutral range at 21 and 45 minutes Among Group I newborns at 21 minutes only one had an abdominal skin temperature below the neutral range, and none had a rectal core temperature below 97 7°F, at 45 minutes one had a low skin temperature and four had rectal temperatures lower than the thermoneutral zone Only one baby in Group II had a temperature below the neutral thermal range at either time He had a rectal temperature of 97 6°F at 45 minutes All other measurements for babies in this second experimental group were above minimum levels for thermal neutrality at both 21 and 45 minutes after birth

Among the 17 control group (Group III) infants seven had low skin temperatures and 12 had rectal temperatures below neutral thermal levels at 21 minutes of age by 45 minutes five remained less than 96 8°F for skin temperature and 13 showed low rectal temperatures See Table 4 for a summary of chi squares showing the significant differences among the groups

In this sample of babies, the only intervening variable that was highly correlated with abdominal skin temperature was delivery room temperature This was statistically significant for temperatures taken at 3, 6, 9, 12, 15, 18 21, 24, 27, and 30 minutes after delivery ($p < 0\ 05$) In these cases, a positive correlation existed between the warmth of the delivery room and the temperature of the baby Delivery room temperature did not differ significantly among the three treatment groups (F value 2 133, n s) and thus did not covary with the main effect of the experimental intervention Within each group and for the sample as a whole however, a higher temperature in the delivery room was correlated with higher skin temperatures of babies in the first 30 minutes of life

Although the protocols for all three groups called for the babies to be dried thoroughly, it quickly became apparent during conduct of the study that not all babies were well-dried during the first few minutes of life This was due in large part to variations in style and priorities of the delivery room nurses who had charge of the drying of all Group III (control) infants and any Group I babies who needed further drying after being transferred from their mothers abdomens to heated cribs for nursing care The reluctance of the researcher to loosen the grip of admiring parents on their just-born offspring also accounted for some experimental babies not being thoroughly dried

Babies were described on the data sheet as being either dried well or not dried well in the first 3 minutes of life

TABLE 4
Babies meeting minimum criteria for neutral thermal environment[a]

	Group I	Group II	Group III	χ^2
Skin temperatures at 21 min				
Neutral range	16	17	10	12 750**
Below neutral	1	0	7	
Skin temperatures at 45 min				
Neutral range	16	17	12	7 933*
Below neutral	1	0	5	
Rectal temperatures at 21 min				
Neutral range	17	17	5	31 385**
Below neutral	0	0	12	
Rectal temperatures at 45 min				
Neutral range	13	16	4	20 091**
Below neutral	4	1	13	

[a] Note *$p < 0\ 05$ **$p < 0\ 01$ ***$p < 0\ 001$

TABLE 5
Mean skin and rectal temperatures of babies dried well and not dried well after birth[a]

Time (min after delivery)	Mean temperatures: Dried well	Mean temperatures: Not dried well	Results of t tests
3	96 622	95 540	2.996**
6	97 208	96 000	2 811**
9	97 678	96 260	3 524***
12	98 014	96 633	3 773***
15	98 130	97 127	2 892**
18	98 150	97 280	2 508*
21 (skin)	98 230	97 187	3 344**
21 (rectal)	98 497	97 987	1 832 n s
24	98 153	97 300	2 819**
27	98 180	97 347	2 915**
30	98 147	97 247	3 344**
33	98 189	97 327	3 061**
36	98 272	97 393	3 201**
45 (skin)	98 330	97 473	2 668*
45 (rectal)	98 364	97 707	2 406*

Note *$p < 0\ 05$ **$p < 0\ 01$ ***$p < 0\ 001$

Those considered "not dried well still had wet heads or a body surface that had not been completely wiped off at the time of the first temperature reading There was no significant difference among the three study groups regarding the proportion of babies dried well and not dried well However, for the sample as a whole, babies who were dried well had significantly higher skin temperatures at all times than babies who were not dried well The well-dried infants had significantly higher rectal temperature measurements at 45 minutes, but not at 21 minutes, than babies who were not thoroughly dried Drying had an earlier and more pronounced impact on differences in skin temperature than rectal temperature measurements Table 5 summarizes these data

DISCUSSION

The findings of the study corroborate and strengthen the results of Thomas's 1978 investigation of newborn thermoregulation The results of this clinical experiment clearly demonstrate that rapid drying of the neonate followed by skin-to-skin contact with the mother under a warm blanket can be a safe and effective way to provide normal babies with a neutral thermal environment in the delivery room This is a simple protocol, requiring no special equipment, which could be implemented by any hospital

In the present study standard care in a radiant-heated crib did not provide the majority of control babies with a neutral thermal environment. Infants who received the earliest most continuous skin-to-skin contact all had skin temperatures within limits for thermal neutrality and all but one had a normal rectal temperature also Newborns given skin-to-skin contact with their mothers had fewer negative fluctuations in skin temperature than control babies The earlier skin-to-skin contact was initiated with the mother, and the more continuous it was, the warmer the neonate was maintained

Infants in all three groups experienced a drop in skin temperature during transfer from the delivery room to the recovery room, despite being covered by blankets Most babies' heads were exposed, allowing the sensitive thermal sensors of their faces to react to the strong convection currents generated by the rapid trip down the hall Once settled again, most babies' temperatures rose Infants in the second experimental group had a smaller loss of heat during this transfer and a quicker recovery of skin temperature than babies in the other groups

The experimental protocol for promoting heat conservation in newborns was designed to minimize losses through four mechanisms Evaporative losses were reduced by rapidly drying the infant after delivery, even before the umbilical cord was cut. Positioning the baby on the mother's bare chest provided a source of radiant heat from her body and decreased radiant losses from the baby to cold walls, windows, and the metal surfaces of the Kreiselman crib Skin-to-skin contact with the mother also eliminated major heat losses through conduction to cold objects The warmed blankets covering both mother and baby protected the infant well from convection currents Neonates in the radiant heaters, even when wrapped in blankets appeared much more vulnerable to cooling by convection currents in the drafty delivery room

Skin-to-skin contact was demonstrated to be a physiologic method of warming newborns that avoided the risks of hypothermia hyperthermia and other potential hazards of radiant heaters Further study of these heaters has been recommended to the Food and Drug Administration to establish whether or not routine use of such equipment in delivery rooms poses a serious risk of dehydration burns and cataracts or retinal lesions from emissions [14] Skin-to-skin contact is a safe alternative demonstrated to be more effective in the present study that radiant heaters in providing healthy term infants with a neutral thermal environment

In addition to the thermal benefits of skin-to-skin contact, the close proximity of the baby to the parents gave them an early opportunity to become acquainted A newborn's first physiologic reactivity period spans the initial 30 to 60 minutes after birth With the mother holding the baby throughout this period, the parents were able to take advantage of their baby's heightened arousal and responsiveness to make eye contact, explore, and soothe the baby Parents in the experimental groups expressed great appreciation for the chance to hold their baby closely so soon after birth Bonding behavior was not systematically studied during the present experiment. Whether the attachment process between these mothers and their infants differs in any way from the control group remains to be examined in further research

Although significant differences in newborn temperatures were shown in this series of 51 babies replication of the study with even larger numbers would strengthen the findings A postpartum study comparing skin-to-skin contact and incubators as methods of rewarming cool babies would be a logical extension of the research Other methods of handling newborns, such as the LeBoyer bath and the use of an electric heating pad over mother and infant also merit study regarding effects on thermoregulation

Skin-to-skin contact with the mother can provide a healthy term baby with a highly effective way of maintaining body heat Parents who desire immediate and continuous skin-to-skin contact with their baby in the delivery room can be supported in this request by nurse midwives physicians and nurses without fear of causing the baby cold stress

The author wishes to acknowledge the assistance of Nancy Hedlund R N Ph D Carol Ostler C N M M S N and Winnie Thomas C N M. M S N during the planning conduct, and evaluation of the study

REFERENCES

1 Adamsons K Jr The role of thermal factors in fetal and neonatal life Pediatr Clin North Am 13 599–619 (1966)

2 Nalepka CD Understanding thermoregulation in newborns J Ob Gynecol Neonatal Nur 5 17–19 (1976)

3 Lutz L, Perlstein P Temperature control in newborn babies Nur Clin North Am 6 15–23 (1971)

4 Williams JK Lancaster J Thermoregulation of the newborn Am J Maternal Child Nurs 1 355–360 (1976)

5 Motil KJ, Blackburn MG Temperature regulation in the neonate a review of the pathophysiology of thermal dynamics and methods for environmental control Clin Pediatr 12 634–639 (1973)

6 Miller DL, Oliver TK. Body temperature in the immediate neonatal period the effect of reducing thermal loss Am J Obstet Gynecol 94 964–969 (1966)

7 Gandy GM, et al Thermal environment and acid base homeostasis in human infants during the first few hours of life J Clin Invest 43 751–758 (1964)

8 Oliver TK Jr Temperature regulation and heat production in the newborn Pediatr Clin North Am 12 765–779 (1965)

9 Hey EN Katz G The optimum thermal environment for naked babies Arch Dis Child 45 328–334 (1970)

10 Silverman WA, Parke P Keep him warm Am J Nur 65 81–84 (1965)

11 Hey EN The relationship between environmental temperature and oxygen consumption in the newborn baby J Physiol 200 589–603 (1969)

12 Yashiro K et al Preliminary studies on the thermal environment of low birth weight infants J Pediatr 82 991–994 (1973)

13 Thomas WW Newborn thermoregulation and early bonding Unpublished manuscript Yale University School of Nursing New Haven Conn 1978

14 Committee on Environmental Hazards Infant radiant warmers Pediatrics 61 113–114 (1978)

BIBLIOGRAPHY

Adamsons K Jr The role of thermal factors in fetal and neonatal life *Pediatr Clin North Am* 13 599–619 (1966)

Adamsons K Jr Gandy GM James LS The influence of thermal factors upon oxygen consumption of the newborn human infant J Pediatr 66 (3) 495–507 (1965)

Adamsons K Jr Towell ME. Thermal homeostasis in the fetus and newborn Anesthesiology 26 531–548 (1965)

Aherne W Hull D Brown adipose tissue and heat production in the newborn infant. J Pathol 91 223–234 (1966)

Aikens RM Hats and lamps in the prevention of neonatal hypothermia Nur Mirror Midwives J 144 65–66 (1977)

Baum JD Keeping babies warm Bull Am College Nurse-Midwives 16 39–45 (1971)

Baum JD Scopes JW The silver swaddler device for preventing hypothermia in the newborn Lancet 1 672 (1968)

Besch NJ et al The transparent baby bag a shield against heat loss N Engl J Med 284 (3) 121–124 (1971)

Bruck K. Temperature regulation in the newborn infant Biol Neonate 3 65–119 (1961)

Bruck K Parmalee AH Jr Brück M Neutral temperature range and range of 'thermal comfort in premature infants Biol Neonatorum 4 32–51 (1962)

Buetow KC Klein SW The effect of maintenance of normal skin temperature on survival of infants of low birth weight. Pediatrics 34 163–170 (1964)

Chadd MA, Gray OP Hypothermia and coagulation defects in the newborn Arch Dis Child 47 819–821 (1972)

Committee on Environmental Hazards Infant radiant warmers Pediatrics 61 (1) 113–114 (1978)

Dahm LS James LS Newborn temperature and calculated heat loss in the delivery room Pediatrics 49 (4) 504–513 (1972)

Daily WJR Klaus M Meyer HBP Apnea in premature infants monitoring incidence heart rate changes and an effect of environmental temperature Pediatrics 43 (4) 510–518 (1969)

Day RL et al Body temperature and survival of premature infants Pediatrics 34 171–181 (1964)

de Chateau P The importance of the neonatal period for the development of synchrony in the mother infant dyad—a review Birth Family J 4 10–23 (1977)

Du JNH Oliver TK Jr The baby in the delivery room a suitable microenvironment J Am Med Assoc 207 (8) 1502–1504 (1969)

Eoff MJF Meier RS Miller C Temperature measurement in infants Nurs Res 23 (6) 457–460 (1974)

Fisher DA Oddie TH Makoski EJ The effect of environmental temperature on thyroid adrenal and water metabolism in the newly born human infant Pediatrics 37 (4) 583–591 (1966)

Friedman F Adams FH Emmanouilides G Regulation of body temperature of premature infants with low energy radiant heat J Pediatr 70 270–273 (1967)

Gandy GM et al Thermal environment and acid base homeostasis in human infants during the first few hours of life J Clin Invest 43 751–758 (1964)

Glass L Silverman WA, Sinclair JC The effect of the thermal environment on cold resistance and growth of small infants after the first week of life Pediatrics 41 1033–1046 (1968)

Hales DJ et al Defining the limits of the maternal sensitive period Develop Med Child Neurol 19 454–461 (1977)

Hey EN The relationship between environmental temperature and oxygen consumption in the newborn baby J Physiol 200 589–603 (1969)

Hey EN Keeping babies warm Nurs Mirror Midwives J 139 62–64 (1974)

Hey EN Thermal neutrality Br Med Bull 31 (1) 69–74 (1975)

Hey EN Katz G The optimum thermal environment for naked babies Arch Dis Child 45 328–334 (1970)

Hey EN Katz G The range of thermal insulation in the tissues of the newborn baby J Physiol 207 667–681 (1970)

Hey EN Katz G O Connell B The total thermal insulation of the newborn baby J Physiol 207 683–698 (1970)

100

Hey EN Maunce NP The effect of humidity on production and loss of heat in the newborn baby Arch Dis Child 43 166–171 (1968)

Hey EN O Connell B Oxygen consumption and heat balance in the cot nursed baby Arch Dis Child 45 335–343 (1970)

Hill JR Rahimtulla KA. Heat balance and the metabolic rate of newborn babies in relation to environmental temperature the effect of age and of weight on basal metabolic rate J Physiol 180 239–265 (1965)

Jolly H Molyneux P Newell DJ A controlled study of the effect of temperature on premature babies J Pediatr 60·889–894 (1962)

Jones RW Increased insensible water loss in newborn infants nursed under radiant heaters Br Med J 2 1347–1350 (1976)

Klaus MH et al Human maternal behavior at first contact with her young Pediatrics 46 187–192 (1970)

Klaus MH et al Maternal attachment: the importance of the first postpartum days N Engl J Med 286 460–463 (1972)

Klaus MH Kennell JH Maternal-Infant Bonding St Louis C V Mosby 1976

Lozoff B et al The mother newborn relationship limits of adaptability J Pediatr 91 (1) 1–12 (1977)

Lutz L, Perlstein P Temperature control in newborn babies Nurs Clin North Am 6 15–23 (1971)

Miller DL Oliver TK. Body temperature in the immediate neonatal period. the effect of reducing thermal loss Am J Obstet Gynecol 94 (7) 964–969 (1966)

Mobl KJ Blackburn MG Temperature regulation in the neonate a review of the pathophysiology of thermal dynamics and methods for environmental control Clin Pediatr 12 634–639 (1973)

Nalepka CD Understanding thermoregulation in newborns J Obstet Gynecol Neonatal Nurs 5 17–19 (1976)

Oliver TK Jr Temperature regulation and heat production in the newborn Pediatr Clin North Am 12 765–779 (1965)

Oliver TK Jr Karlberg P Gaseous metabolism in newly born human infants the effects of environmental temperature and 15 percent oxygen in the inspired air Am J Dis Child 105 427–435 (1963)

Perlstein PH Apnea in premature infants and incubator air temperature changes N Engl J Med 282 461–466 (1970)

Phillips CRN Neonatal heat loss in heated cribs vs mothers arms J Obstet Gynecol Neonatal Nurs 3 (6) 11–15 (1974)

Schachinger H Ballowitz L, Frank HD The necessity for thermal prophylaxis in the neonate J Perinatal Med 2 61–68 (1974)

Schubring C et al Oxygen consumption heart rate respiratory rate and rectal temperature in healthy newborns during the first two hours after birth J Perinatal Med 4 72–77 (1976)

Silverman WA, Fertig JW Berger AP The influence of the thermal environment upon the survival of newly born premature infants Pediatrics 22 876–885 (1958)

Silverman WA Parke P Keep him warm. Am J Nurs 65 81–84 (1965)

Silverman WA Sinclair JC, Agate FJ Jr The oxygen cost of minor changes in heat balance of small newborn infants Acta Pediatr Scand 55 294–300 (1966)

Silverman WA et al Warm nape of the newborn Pediatrics 33 984–987 (1964)

Smales ORC Simple method for measuring oxygen consumption in babies Arch Dis Child 53 53–57 (1978)

Smales ORC Kime R Thermoregulation in babies immediately after birth Arch Dis Child 53 58–61 (1978)

Stern L The newborn infant and his thermal environment Curr Problems Pediatr 1 3–29 (1970)

Stern L, Lees LH LeDuc J Environmental temperature oxygen consumption and catecholamine excretion in newborn infants Pediatrics 36 367–373 (1965)

Sulyok E, Jequier E Prod hom LS The relationship between body size thermal balance, and thermal insulation of term infants under various ambient conditions Biol Neonate 28 42–56 (1976)

Thomas WW Newborn thermoregulation and early bonding Unpublished manuscript Yale University School of Nursing New Haven Conn 1978

Van Art L Thermal regulation in newborn infants held skin-to-skin by their mothers shortly after birth Unpublished manuscript, University of Illinois School of Nursing Chicago Ill 1977

Williams JK Lancaster J Thermoregulation of the newborn Am J Maternal Child Nurs 1 355–360 (1976)

Wood C Beard RW Temperature of the human fetus J Obstet Gynecol Br Commonwealth 71 768–769 (1964)

Yashiro K et al Preliminary studies on the thermal environment of low birth weight infants J Pediatr 82 (6) 991–994 (1973)

Ziegel E Van Blarcom CC Obstetric Nursing New York Macmillan 1972

EATING AND DRINKING IN LABOR
A Literature Review

Leslie M Ludka, CNM, MSN, and Catherine C Roberts, CNM, MSN

ABSTRACT

This literature review questions the routine practice of denying food and fluids to women in labor Fasting in labor, an established practice throughout the United States since the 1940s is now under careful scrutiny Many clinical practices, especially those that offer midwifery services are currently instituting policies to allow and encourage eating and drinking in normal labor To date there have been no reported rises in maternal mortality with this policy change neither have there been any reports of detrimental outcomes for mother or infant.

The policy of nothing by mouth (NPO) in labor has become a well-established routine in many hospitals throughout the United States The NPO policy is a curious phenomenon because it is based largely on anecdotal misinformation and has not been supported by research data Many researchers are now questioning the practice of routine fasting in labor (1–5) This literature review will discuss the historical basis of withholding food and drink during labor, maternal mortality statistics, risk factors for anesthesia-related complications, the myth of the empty stomach, antacids, fasting and energy utilization intravenous substitution for food and fluids, stress related to food and fluid deprivation and current research and clinical implications

HISTORICAL OVERVIEW

Until the 1940s, parturient women in the United States were encouraged to eat and drink as a means of maintaining their stamina for the work of labor and delivery Dr Joseph DeLee (6) warned that food must be encouraged throughout labor to avoid general weakness, delayed labor, and serious postpartum hemorrhage By the mid-1940s, however, the practice of feeding laboring women was viewed as clinically unsound, and it was virtually abandoned. The change can be traced to obstetric anesthesiologists' fear of maternal mortality due to aspiration of stomach contents

In the 1940s, Mendelson (7), an obstetrician from Cornell, hypothesized that postanesthetic pneumonia was caused not solely by infected material but rather by stomach contents aspirated into the lungs He believed that gastric emptying time was delayed in labor Mendelson noted that it was not uncommon for a patient to vomit food ingested 24–48 hours previously (7) He reviewed charts of 44,016 pregnancies from 1932–1945 and found that aspiration of stomach contents into the lungs occurred in 0 15% (N = 66) In 1945, Mendelson conducted a series of experiments that examined the effects of aspiration of stomach materials into lungs of rabbits The stomach contents consisted of solid material, neutral fluids, and gastric fluids In his animal studies, there were no deaths due to aspiration of neutral liquids, death only occurred with aspirate that contained hydrochloric acid Aspiration of undigested solids caused obstruction Suffocation occurred only with complete obstruction Based on these findings, Mendelson suggested that women be prohibited from eating and drinking during labor He believed that this policy would reduce the stomach volume, thereby decreasing the risk of morbidity and mortality from acid aspiration while under general anesthesia

During this same time period, general anesthesia was being administered with greater frequency for labor and delivery Gases were given with a face mask often opaque in color, which obscured the anesthetist's view of the woman s airway Intubation and cricoid pressure were not routinely in-

Address correspondence to Leslie M Ludka CNM v 9 Marion Avenue Woburn MA 018

Copyright © 1993 by the American College of Nurse Midwives

0091 2182/93/$6 00

corporated into anesthesia practice In addition, skilled anesthetists were quite rare Often, the administration of gases was left in the hands of the most junior member of the anesthetic team These factors led to anesthesia-related cases of aspiration pneumonia in the partunent.

Expanding on Mendelson's research, further studies on aspiration pneumonia found two key factors that predicted an increased risk of maternal mortality and morbidity the combination of an aspirate with a volume of 25 mL or more and—the more lethal factor—a pH less than 2 5 (8–12) The clinical manifestations of pulmonary aspiration, which is now commonly referred to as "Mendelson's syndrome," includes intense bronchospasm, pulmonic congestion, and exudate production (13)

In 1956, Parker (14) undertook a study to determine why there had been no maternal deaths while using general anesthesia at home In Birmingham, England, 100,000 births took place in the home between 1943 and 1952 During that period, 3,048 forceps deliveries were completed with no deaths from aspiration pneumonia. These operative deliveries were done under general anesthesia with an open face mask. The women at home were commonly harnessed down in the lithotomy position and given anesthesia with no reported fatalities At the same time, in the Birmingham Maternity Hospital, 2,200 operative deliveries were performed with four maternal deaths due to aspiration Speculation was that the anesthesia machine in the hospital was less safe than the open mask Recommendations included that local anesthesia be used for simple forceps delivery, and if general anesthesia had to be used, it should be provided by an experienced anesthetist using a cuffed endotracheal tube

Leslie M Ludka received her B S N from Boston University School of Nursing and her M S N and C.N M from Yale University School of Nursing She is currently in clinical practice at Brigham and Women s Hospital Boston with a faculty appointment to Harvard University Medical School

Catherine C Roberts received her B S N from the University of Rhode Island and her M S N and C N M from Yale University School of Nursing She is currently in clinical practice at North Central Bronx Hospital New York City

MATERNAL MORTALITY

Fasting in labor is believed by many members of the medical community to reduce the risk of maternal morbidity and mortality by reducing stomach contents, thereby eliminating products for pulmonary aspiration (7, 11, 13, 15) However, detailed analysis of overall maternal mortality statistics in the United States reveals inadequate and inconsistent methods of collecting, categorizing, and reporting information Unlike England, where the specific cause of the maternal death is reported, here in the United States aspiration pneumonia is grouped under the broad category of "complications of the administration of anesthetic or other sedation in labor/delivery" It is one of four subgroups related to the obstetric anesthetic problem (16, 17)

In 1950, the incidence of maternal deaths was 83 per 100,000 live births In 1960, it was 37 1 per 100,000 live births The latest statistics for overall maternal mortality in 1988 is 8 4 per 100,000 live births, which is a statistically significant increase from 6 6 per 100,000 live births in 1987 In 1989, 320 women died, for a maternal mortality rate of 7 9 per 100,000 live births (16) Maternal mortality is a rare occurrence Maternal deaths related to anesthesia do occur but it is impossible to pinpoint the exact nature of the complication

A more detailed study, done in Michigan from 1972–1984, showed that failure to secure a patent airway was the primary cause of anesthesia related maternal deaths There were no deaths related to regional anesthesia (18) Out of 15 deaths (0 82 per 100,000 live births), one was listed as having been from aspiration of stomach contents

A study done in New York City from 1981–1983 revealed the maternal mortality ratio to be [illegible] deaths per 100,000 live births (19) Anesthesia-related deaths ranked as the third cause, with 13 cases (11%) Four were associated with legally induced abortions and one with ectopic pregnancy There was no specific breakdown for the cause of the remaining eight anesthesia-related cases

A recent study by Ro[illegible] and colleagues (20) looked at freestanding birth centers, with regard to different variables They reviewed cases from 11,814 women who ate and drank at will There was no reported mortality or morbidity from aspiration pneumonia even though there were women who required emergency cesarean sections Twenty-two perc[illegible] these had eaten solid foods, yet they had no aspiration complications

RISK FACTORS FOR ANESTHESIA-RELATED COMPLICATIONS

Failed Intubation

The occurrence of aspiration is directly related to difficult intubation during general anesthesia regardless of the patient's oral intake Expected rates of intubation failure are reported as one failure out of every 300 cases requiring general anesthetics Difficult intubation was a key factor in approximately one-half [illegible] anesthesia-related deaths reported by the Confidential Enquiry 1976–1978 (21) Endler and coworkers (18) speculate that a high rate of failed intubation results from the increasing number of cesarean sections, many of which are done with general anesthesia

In order to avoid failed intubation, experts agree that correct anesthetic care for general anesthesia should be undertaken This includes preoperative assessment, rapid and safe induction, awake extubation, and postoperative monitoring The interval from [illegible] induction of general anesthesia to complete control of the airway by cuffed endotracheal intubation presents the greatest risk for aspiration and death (22) Cricoid pressure, when properly applied by a trained assistant, has proven to be a safe, reliable method of preventing aspiration during induction of general anesth[illegible] (22–24) Repeated attempts at intubation should be abandoned, because they are rarely successful (21–24)

Inadequate Anticipation of Abdominal Deliveries

Proper assessment and preparation of the ob[illegible]c patient by anesthesia personnel is imperative for the prevention of anesthesia problems This assessment might begin antenatally with the primary provider notifying the anesthetist that a particular patient is at high risk for abdominal delivery (23–25) It has been suggested that anesthesiologists should routinely go on [illegible]s to assess potential difficulties in the event of abdominal delivery with general anesthesia. A clinical history, focusing on signs and symptoms of gastroesophageal reflux and laryngeal edema associated with preeclampsia, is crucial in the care of the obstetric patient (23, 25)

Substandard Management

There is considerable agreement among experts in anesthesiology that substandard management of anesthetic care is a primary cause of pulmonary aspiration (7, 11, 14, 22–33) Intubation cannot be completed, the obstetrician and anesthetist should have a "failed intuba[illegible] drill" in place Baker et al (18) suggest allowing the patient to regain consciousness and then proceeding with an awake intubation or administration of a regional block If there is an emergency, then general anesthesia with a mask and cricoid pressure should be employed A cricothyroidotomy is used as a last resort (18, 21)

Emergency Cesarean Sections and Regional Anesthesia

The need for general anesthesia in an emergency situation has been estimated to range from 3 5% to 13% (25, 34) In their prospective observation study of 360 consecutive patients delivered by emergency cesarean section, Morgan et al (25, 34) found that 87% of the cesarean sections could have been anticipated and that general anesthesia was only needed in 13% of the subjects Conklin (35) states that unless there is an absolute contraindication, a regional block for cesarean section is appropriate in most emergency situations He reasons that, in this way, the parturient can protect her own airway from pulmonary aspiration (35) Marx et al (36) have clearly shown that newborn outcomes after an emergency cesarean section were better when regional anesthesia was used. Haste is a well-known factor in critical anesthetic incidents, and it is the parturient's well-being that should be the first concern, because fetal distress is sometimes misdiagnosed (18, 21, 25, 33, 37)

Many authors concede that regional anesthesia has little effect on gastric emptying (14, 30, 32, 38–40) Crawford (39), an English physician who has researched the topic of potential aspiration in labor, stated that "a mother undergoing a comfortable labor, with the aid of an epidural analgesia, does welcome refreshment, and all other things being equal, we offer her a lemon sorbet, or a cup of tea and a slice of toast. " Roberts and Shirley (32) state that regional anesthesia dramatically reduces the risk of aspiration pneumonia

THE MYTH OF THE EMPTY STOMACH

Gastric Emptying Physiology

Gastric emptying is governed mainly by two factors 1) the volume of gastric contents, and 2) the influence of chemical and physical properties of chyme in the duodenum and jejunum (41) The rate of emptying depends on the volume of the meal, osmotic pressure, and chemical properties Gastric emptying is greatest and fastest at the beginning of digestion, when the volume of the stomach contents is the largest. Fat is the most powerful chemical agent in the digested diet that slows gastric motility (41, 42) Gastric motility is adversely affected by massive sympathetic discharges such as pain, nausea, and emotional disturbances (43) Heavy exercise does not impede emptying of liquids, they are emptied almost immediately Solids, on the other hand, must be less than 1 mm in diameter to pass through the pyloric canal. Large lumps can remain in the stomach as long as nine hours, continuing to stimulate gastric secretion (41)

Effect of Gestation and Labor on Gastric Emptying

Gastric emptying time in the laboring woman varies according to individual reports According to *Anesthesia for Obstetrics* (15), aspiration risk factors related to delayed gastric emptying include gestational age greater than 34 weeks, labor, heartburn (which is indicative of gastroesophageal reflux), stress, narcotics, and sedatives Other studies show a decreased gastric emptying time in labor, but the delay was related to the administration of narcotics and sedatives (10, 40, 44, 45)

According to obstetric anesthesiologists, it is the gastric contents that

put the parturient at risk for aspiration pneumonia in the event of general anesthesia (15) As stated, the routine policy of NPO in labor was initiated in the hope of decreasing or eliminating stomach contents, thereby leaving little or nothing to aspirate Yet, studies have repeatedly shown that there is no such thing as an empty stomach, regardless of the time of the last meal (10, 44, 46–49) Laboring women who have taken nothing orally have been found to secrete varying amounts of gastric juices containing hydrochloric acid with dangerously low pH values (32, 47) Fasting does not eliminate stomach contents, it only increases the concentration of hydrochloric acid (50) Therefore, depriving the mother of food and fluids during labor may actually increase the risk of maternal mortality and morbidity from acid aspiration

Hirsheimer et al's (51) serial x-ray studies after a barium meal showed that there was no constant or characteristic alteration of gastric evacuation in primigravidas during labor Changes that did occur were attributed to functional and neuromuscular rather than mechanical causes However, Davison et al (52) concluded, based on gastric fluids that were aspirated from a nasal gastric tube inserted early in labor, that gastric emptying time was delayed in labor Each parturient had 750 mL inserted into the stomach, at 10-minute intervals, the stomach contents were aspirated and assessed They found that each patient had rapid emptying over the first 10 minutes and then the volume decreased by almost one-third They acknowledged that the depressant effect on gastric mobility might be due to anxiety and excitement.

Simpson and Stakes (43) looked at gastric emptying in relation to anxiety levels in patients undergoing elective gynecologic procedures They found that gastric emptying was slower in patients who had a low predisposition to anxiety Patients with a tendency toward high anxiety did not show a delay in gastric emptying

Taylor et al (48) investigated the pH and volume of gastric contents in emergency obstetric patients and the effects of antacids on the pH They found that the volume of gastric contents varied markedly They concluded that every parturient should be assumed to have a full stomach of highly acid fluid contents

Hester and Heath (53) noted that 32% of patients who had been NPO for prolonged periods had greater than 40 mL of gastric contents Over half of them had a gastric aspirate of less than pH 2 5

A study by Roberts and Shirley (11) showed that the interval since the last meal to delivery did not guarantee a low volume of gastric juice in the stomach They concluded that all patients should be assumed to have a full stomach, regardless of the interval since their last oral intake

ANTACIDS

As cited earlier, Mendelson's study (7) reported that anesthesia deaths were due to hydrochloric acid aspiration and not to neutral aspirates In an effort to make the stomach contents less acidic, antacids (30 mL) have routinely been administered Particulate antacids such as magnesium hydroxide and magnesium trisilicate were given at first, but they have now been shown to cause severe pulmonary damage when aspirated (22, 54, 55) Cohen's study (54) showed that there is no evidence that administration of any antacid lowers maternal mortality or morbidity

Today, sodium citrate, which contains no particulate matter, is often used for rapid neutralization of the stomach contents It has an immediate onset of antacid action but it also has a wide variation in efficacy and duration of action Sodium citrate neutralizes acid immediately but the critical factor that influences its duration of action is the gastric emptying rates (56) Therefore analgesics that prolong gastric emptying also prolong the antacid s efficiency Ormezzano et al (56) found that sodium citrate was not always efficient in increasing gastric pH to greater than 2 5, especially by the time of extubation They demonstrated that effervescent cimetidine–sodium citrate is effective in increasing gastric pH to more than 2 5 at intubation and extubation Cimitidine, which is an H_2 receptor blocker, increases gastric pH by inhibiting gastric acid production for four to eight hours However it must be noted that the volume (30 mL) of antacid used is above that critical volume predictive of increased risk of maternal mortality should aspiration occur

FASTING, NUTRITION AND ENERGY UTILIZATION

The hydration and energy needs of the woman in labor have been compared to the needs of the athlete in competition (4) Food and fluid deprivation during this critical time may impact directly on labor progress and outcome

Blood glucose and muscle glycogen, major sources of energy for the mother and the fetus, are compromised in the pregnant woman during fasting Animal studies have shown that there is an immediate and continuous decline in maternal and fetal blood glucose levels during fasting (57) A direct relationship has been found between maternal glucose levels and fetal well-being as indicated by fetal breathing movements and general fetal activity (58, 59) Fetuses of fasted mothers show less overall activity than fetuses of fed mothers Stimulating fetal activity during fetal nonstress tests is often accomplished by feeding the mothers (59)

When blood glucose is not available to the mother for energy the body draws on its fat supplies As a result, large quantities of free fatty acids are oxidized, ultimately increasing the quantities of ketone in the blood and tissues This accumulation of ketone (β hydroxybutyric acid, aminoacetic acid) in the body is known as ketosis

Excessive production of ketone may lead to their excretion in the urine, ferred to as ketonuria Ketosis may progress to ketoacidosis, which is an accumulation of ketone in the body, accompanied by a metabolic acidosis Ketoacidosis can be life threatening however, ketonuria and ketosis are not the same as ketoacidosis It is uncertain whether either ketosis or ketonuria is actually harmful to the pregnant or laboring women or her fetus Ketosis occurs in the normal adult human body in response to exertion and fasting, both of which may be experienced by the laboring woman pregnant women in general are more prone to ketosis due to increased fetal demands, increased fat utilization, and pregnancy-induced hormone changes (4, 60)

Studies have shown that pregnancy exaggerates and accelerates the body s response to fasting (61, 62) During delivery, blood levels of ketone free fatty acids, and glycerol rise to meet energy demands Ketone bodies and free fatty acids significantly increase in the blood after only 12 to 18 hours of fasting in the third trimester (63) According to Hazle (4), "In labor this tendency toward ketosis is accentuated by increased muscular activity and imposed limitation of oral intake It is interesting to note that the amount of ketone in the blood of mothers who consumed food during labor has been shown to be significantly below that of fasted mothers (64 65)

Ketonuria may be a misleading guide to the need for fluid and carbohydrate replacement Ketonuria has been shown to occur in normal labor as well as in the normal antepartum patient (59 60 63, 66) It is often determined by a ketostix, which has been shown to report a high false positive reading when the blood acetoacetate level is within normal range (67) Ketone bodies, when excreted in the urine take large quantities of sodium and potassium with them, which may decrease the blood pH does seem to be some relationship between marked ketonuria and prolonged labor, but which comes first is unclear (60)

Some researchers state that as ketone bodies increase in the mother, they cross the placental barrier and increase in the fetus (64, 65, 68) Others disagree, stating that free fatty acids and ketone bodies do not readily cross the placenta (69)

Glucose is the principal fuel of the fetus, but the medical literature supports the belief that ketone bodies may serve as alternative fuel during fetal life (70, 71) Animal studies have shown ketone bodies to be precursors to lipid synthesis, as well as fuel for the fetal brain, liver, and lung in vitro (71)

As mentioned earlier, ketone and lactic acid do lower the blood pH Lowered pH in the fetus during labor has been cause for alarm It has been related to cardiac arrhythmias and considered to be an indication of fetal anoxia. However, in a recent study, 72% of infants whose cord pH indicated they were severely acidotic were born in a vigorous state, with an Apgar score of greater than 7 at one minute (72)

Essential amino acids gradually decline when the pregnant woman is deprived of food After only 12 hours of food deprivation, 10 out of 19 maternal amino acid levels were significantly below nonpregnant levels (62) Amino acids readily cross the placental barrier, and levels in the amniotic fluid are affected during maternal fasting A decrease in the essential amino acid alanine is shown to be of primary pathologic significance in ketotic hypoglycemia of infancy (62) This is important to both the fetus and the newborn because glucagon, a hormone that stimulates the conversion of glycogen to glucose in the liver, cannot permeate the placenta in the presence of hypoglycemia, however, administration of alanine to women in labor increases the glucagon levels of cord blood in the human fetus, thereby decreasing the risk of neonatal ketotic hypoglycemia (62)

INTRAVENOUS THERAPY

Routine administration of an intravenous infusion to prevent and treat dehydration, ketosis, and/or electrolyte imbalance can no longer be considered a completely safe substitute for food and fluids in labor (4, 73, 74)

Intravenous glucose infusion to the parturient has been shown to induce hyperglycemia in the fetus, followed by hypoglycemia in the newborn Hyperglycemia is potentially harmful to the rapidly developing brain of the fetus and the newborn Deleterious effects may include acidosis, increased carbon dioxide levels, increased lactic acid levels, and neonatal jaundice (75–78)

Hypoglycemia may result in immediate respiratory distress, apnea, cyanosis, and seizures (78) Singhi (79) reported that term infants of mothers who received intravenous glucose therapy during the course of spontaneous or oxytocin-induced labor showed "significant lowering of muscle tone and delayed habituation to various stimuli at one and two hours of age " Study infants had a three times higher incidence of hypoglycemia (79) Avoiding excess intravenous glucose infusion will reduce maternal and fetal hyperglycemia (76)

In another study, Singhi et al (80) reported that infusing 5% glucose to the laboring woman resulted in a significant increase in the incidence of hyponatremia and subsequent transient tachypnea in the newborn infant. There is a relationship between cord serum sodium levels in newborn infants and maternal intravenous therapy during labor (81) The sodium levels of infants whose mother had 5% dextrose was significantly below that of mothers who had oral hydration Also, infants of mothers who had dextrose infusion had significantly more weight loss in the first 48 hours than those infants of mothers who had oral hydration (82) Sodium levels in the mothers and infants were very similar When hyponatremia is

induced in the mother, it will affect the baby by a net transfer of fluid to the infant.

Fluid overload and hyponatremia can be serious complications for mother and infant (74, 81) Morton et al (74) state, "It seems illogical to suppress the concentration of ketoacids at the expense of increasing other organic acids which place a greater strain on the buffering capacity of the blood "

Maternal hyponatremia may cause cerebral edema, coma, convulsions, headache, vomiting, lethargy, confusion, mood changes, and postpartal psychosis (60, 81) Hyponatremia in infants may cause convulsions, apnea, cyanotic spells, neonatal jaundice, respiratory distress, feeding difficulties, and possible excess water loss after birth (60, 80, 81)

Intravenous therapy, oxytoxics, tocolytic drugs, and endotracheal intubation have all been seen to adversely affect pulmonary fluid balance, which is already altered by pregnancy (73, 82) A normal healthy woman at term already has an abundance of body water, with at least 2 L stored in the extravascular spaces Dumoulin et al (60) state that intravenous therapy is not routinely needed, especially in the first 12 hours of labor A study by Cotton et al (83) showed that the ordered rate of intravenous fluids was often exceeded by twice the amount. If intravenous therapy is clinically warranted because of the woman's high-risk status, then meticulous intake and output monitoring should be maintained

STRESS

Reduction of stress in labor may be associated with less pain, less anxiety, shorter labors, and fewer perinatal problems (84–86) Stress during labor increases the production of maternal catecholamines Increased catecholamines may affect labor by shunting blood away from the uterus and the placenta and by lengthening labor These effects may lead to prolonged fetal hypoxia, as evidenced by abnormal fetal heart tracings and abnormal scalp pH samples (84 87)

Laboring women are often subjected to procedures that contribute to their stress level Stressors imposed during labor may cause complications and may contribute to the need for aggressive interventions (88) Fasting is a known stressor Simpkin (88), in assessing stressful childbirth events, reported that 27% of women rated restriction of food in labor to be moderately to most stressful Fifty-seven percent of women found restriction of fluids in labor to be moderately to most stressful (88)

The stress response of the fetus is to increase the production of catecholamines in order to increase norepinephrine This response does not manifest itself with an increase in blood flow or an increase in heart rate as seen in the adult. Instead, stress in the fetus initiates a vagus nerve response that causes a drop in fetal heart rate in order to conserve oxygen (84, 85, 89) Some fetal catecholamine production, however, is normal Fetal catecholamines have been shown to contribute to prostaglandin synthesis, preparing for onset of labor (86)

CURRENT STUDIES

Available literature on the oral intake of the laboring woman focuses primarily on why the woman should be kept NPO Many authors consider fasting as a means of reducing maternal mortality Most studies focus on interventions used to replenish hydration and energy needs of the laboring woman

However, a recent study at Jubilee Maternity Hospital in Belfast, Northern Ireland, conducted by midwife Angela Flanagan, in association with Dr Kieran Fitzpatrick, an anesthetist, looked at outcomes of infants and length of labor among women who ate and drank during labor (90) Forty-four laboring women were encouraged to take light foods such as eggs, toast, sandwiches, ice cream yogurt jellies, and fresh fruit As a control group, 22 women were permitted to take according to the usual policy of toast and tea in very early labor with sips of water thereafter Ms. Flanagan reported the following results. Women who ate required less pain relief and less Pitocin, and the length of labor was shortened on the average by about 90 minutes In addition, Apgar scores of babies in the fed group were higher than in the control group As a direct result of this study intake restrictions have been overturned in Jubilee Maternity Hospital and Ms. Flanagan is currently undertaking a replication study with 1,000 expectant subjects (personal communication, Angela Flanagan, February 21 1993)

We studied the eating and drinking patterns of laboring women (unpublished master's thesis Yale University, 1991) The sample consisted of 76 women who were observed until they delivered or until they received medication or intravenous therapy Women were neither encouraged nor discouraged from oral intake but were simply observed in settings that permitted self-selection of intake All of the women drank at some point in their labor and 85 5% ate More women ate larger portions earlier in their labors, tapering off in active phase to negligible amounts by second stage Drinking also decreased as cervical dilation increased, with sips dominating in late active and second stage It was also noted that the incidence of nausea and vomiting occurred from 6 to 8 cm rather than 9 to 10 cm as commonly thought Women continued to eat and drink after an episode of nausea although they only drank after vomiting Women tended to eat at common mealtimes

DISCUSSION

Literature from anesthesia and obstetrics have repeatedly shown that there is no compelling scientific rationale for the maintenance of routine institutional NPO policies These pol

ıcies are based on tradition rather than on current scientific research Elkington (3) points out that "these policies may persist on the basis of anecdotal experience, institutional inertia to policy changes begun in the 1940s, compromise with anesthesia departmental, y to ensure adequate coverage, exaggerated notions of risk, or fears of litigation "

Researchers agree that every parturient should be regarded as having a full stomach with highly acidic fluid regardless of how long she has been NPO With this in mind, why limit their intake? We found that laboring wom , elf-regulated intake Once active labor began, women usually preferred liquids

Several studies looked at the effects of stress on labor, finding that labor might be prolonged and could invite intervention Intravenous fluids are not a reasonable substitute for oral fluids for the healthy parturient. Finally i orthwhile to consider the psychological importance of food and fluids to the laboring woman Food and drink not only provide hydration, nutrition, and increased comfort, but they also give the woman a feeling of control in labor Choices have been integral in the movement of modern obstetrics Institutional policies regarding c and drinking in labor should be reexamined in the light of current research data.

CLINICAL IMPLICATIONS

This literature review lends support to giving women the choice to eat and drink in normal labor There is no such thing ~ mpty stomach, regardless of time from the last intake, and to assume so could be deadly In most cases, Mendelson's syndrome can be prevented by appro priate anesthesia technique General anesthesia should be avoided and re gional anesthesia substituted as much as possible Women should be encouraged to eat a drink as they see fit If a woman is laboring in the early morning hours however, she may need extra encouragement to prevent dehydration and provide the calories needed to meet the strenuous demands of labor and delivery Nau sea and vomiting are part of labor for a certain percentage of women Women can continue with their intake after being nauseated without incurring further episodes

FUTURE RESEARCH

What is the best diet for the laboring woman? Would food and fluids during a serial induction help with labor progression? Should a woman who is comfortable with an epidural analgesia be permitted to eat and drink? Does ingestion of food and fluids speed labor? To answer these questions, randomized clinical studies should be undertaken whereby women admitted to labor and delivery are assigned to one of two groups an eating/drinking group and an NPO group Anesthesia, obstetrics, midwifery, and nursing departments should be included in the design of the study from the start.

American women and fetuses are being subjected to policies based on a belief system plagued with inaccuracies, outdated research, and misinformation The current policy of routine fasting in normal labor must be reevaluated It is based on anecdotal misinformation, institutional inertia, compromise, and fear Eating and drinking in normal labor should be reintroduced to the medical community and the consumer based on current sound scientific research

REFERENCES

1 Broach J, Newton N Food and beverages in labor Part 1 cross-cultural and historical practices Birth 1988 15 81–5

2 Dalton C Gudgeon CW Fasting or feeding during labor Med J Aust 1987 147 625–6

3 Elkington K At the water's edge where obstetrics and anesthesia meet Obstet Gynecol 1991 77 304

4 Hazle N Hydration in labor is routine intravenous hydration necessary? J Nurse Midwifery 1986 31 171–6

5 McKay S Mahan C Modifying the stomach contents of laboring women why and how success and risks Birth 1988,15 213–20

6 DeLee JB Obstetrics for nurses 5th ed Philadelphia Saunders 1918

7 Mendelson CL The aspiration of stomach contents into the lungs during obstetric anesthesia Am J Obstet Anesth 1946 52 191–205

8 James C, Gibbs C, Banner T Post partum perioperative risk of aspiration pneumonia. Anesthesiology 1984,61 756–9

9 James C Modell J, Gibbs C, Kuck E, Ruiz B Pulmonary aspiration effects of volume and pH in the rat Anesth Analg 1984,63 665–8

10 Holdsworth J Furness R Roulston R. A comparison of apomorphine and stomach tubes for emptying the stomach before general anesthesia in obstetrics Br J Anaesth 1974 46 526–9

11 Roberts R, Shirley M. Reducing the risk of acid aspiration during cesarean section Anesth Analg 1974,53 859–68

12 Teabeaut J Aspiration of gastric contents—an experimental study Am J Pathophysiology 1952 28 51–67

13 Williams J Williams obstetrics Norwalk (CT) Appleton 1989

14 Parker RB Maternal death from aspiration asphyxia Br Med J 1956 July 16–9

15 Shnider SM Gerson G Levison L Anesthesia for obstetrics 2nd ed Baltimore Williams & Wilkins 1989

16 National Center for Health Statistics Advanced report of final mortality statistics, 1989 monthly vital statistics report (vol 40, no 8, suppl 2) Hyattsville (MD) Public Health Service 1992

17 Kaunitz AM, Hughes H Grimes G Causes of maternal mortality in the U S Am J Obstet Gynecol 1985 16 605–12

18 Endler GC Manona FG Sokol RJ Stevenson LB Anesthesia-related maternal mortality in Michigan Am J Obstet Gynecol 1988 159 188–93

19 Dorfman SF Maternal mortality in New York City 1981–1983 Obstet Gynecol 1981–1982 76(3 Pt 1) 317–23

20 Rooks JP Weatherby NL Ernst EK Stapleton DR Rosenfield A Out

comes of care in birth centers the national birth center study N Engl J Med 1989,321 1804–11

21 Lyons G Failed intubation An aesthesia 1985,40·759–62

22 Gibbs C Gastric aspiration prevention and treatment. Clin Anaesth 1986,4(1) 47–52

23 Davies JM Weeks S Crone LA. Difficult intubation in the parturient. Can J Anaesth 1989,36 668–74

24 Sellick B Cricoid pressure to control regurgitation of stomach contents during induction of general anaesthesia Lancet 1961 2 404–6

25 Morgan BM Magni V Goroszeniuk T Anaesthesia for emergency caesarean section Br J Anaesth 1983,55 885–9

26 Eichorn JH Cooper JB Cullen D Standards for patient monitoring during general anesthesia at Harvard Medical School JAMA 1986 256 1017–20

27 Gibbs C, Rolbin S Norman P Cause and prevention of maternal aspiration Anesthesiology 1984 61 111–2

28 Hunter A, Moir D Confidential enquiry into maternal deaths Br J Anaesth 1983 55 367–9

29 Morgan J Pathophysiology of gastric aspiration Int Anesthesiol Clin 1977 15 1–11

30 Morgan J Anaesthetic contribution to maternal mortality Br J Anaesth 1987 59 842–55

31 Phillips O The role of anesthesia in obstetric mortality Int Anesthesiol Clin 1968 6 847–73

32 Roberts R. Shirley M The obstetrician's role in reducing the risk of aspiration pneumonia Am J Obstet Gynecol 1975 124 611–7

33 Tunstall M Anesthesia for obstetric patients Clin Obstet Gynecol 1980·7 665–95

34 Morgan BM Aulakh JM Barker JP Anaesthetic morbidity following caesarean section under epidural or general anaesthesia Lancet 1984 1 328–30

35 Conklin KA Can anesthetic related maternal mortality be reduced [letter] Am J Obstet Gynecol 1990 163 (1 Pt 1) 253–4

36 Marx GP Luy WM Cohen S Fetal neonatal status following caesarean section for fetal distress Br J Anaesth 1984 56 1009–21

37 Sykes GS, Molloy PM Johnson P, Stirrat GM, Turnbull AC Fetal distress and the condition of the newborn infant Br Med J 1983,287 943–5

38 Nimmo W Further studies of gastric emptying during labor Anaesthesia 1977,32 100

39 Crawford JS Commentary setting the record straight. Birth 1988 15 230–3

40 Wilson J Gastric emptying in labour some recent findings and their clinical significance J Int Med Res 1978 6 (Suppl) 54–62

41 Davenport H Physiology of the digestive tract. Chicago Yearbook Medical Publishers 1982

42 Johnson L. Gastrointestinal physiology Boston Mosby Year Book, 1991

43 Simpson K, Stakes A. Effect of anxiety on gastric emptying in preoperative patients Br J Anaesth 1987 59.540–4

44 Mark L, Marx G Henry E Joffe S The "full stomach'—a continuing problem in anesthetic management. N Y State J Med 1964 May·1114–5

45 Nimmo W, Wilson J Prescott L. Narcotic analgesics and delayed gastric emptying during labor Lancet 1975 1 891–3

46 Coleman D, Day B Anaesthesia for operative procedures Lancet 1956 1 708–9

47 Holdsworth J Furness R. Roulston R. A comparison of apomorphine and stomach tubes for emptying the stomach before general anesthesia in obstetrics Br J Anaesth 1974 46 526–9

48 Taylor G Pryse-Davies J The prophylactic use of antacids in the prevention of the acid pulmonary aspiration syndrome (Mendelson's syndrome) Lancet 1966 1 288–91

49 Roberts R Shirley M Aspiration during vaginal delivery Anesthesiology 1974 40 317

50 Shay H Sun D Stress and gastric secretion in man 1 a study of the mechanism involved in insulin hypoglycemia Am J Med Sci 1954 228 630–42

51 Hirsheimer A January DA Daversa JJ An x ray study of gastric function during labor Am J Obstet Gynecol 1938 36 671–3

52 Davison JJ Davison M Hay D Gastric emptying time in late pregnancy and labor J Obstet Gynecol Br Commonw 1970,77 37–41

53 Hester JB Heaui ML Pulmonary acid aspiration syndrome should prophylaxis be routine? Br J Anaesth 1977,49 595–9

54 Cohen S Aspiration syndromes in pregnancy Anesthesiology 1979·51 37–7

55 Heaney G, Jones H Aspiration syndromes in pregnancy Br J Anaesth 1979,51 266–7

56 Ormezzano X, Francois TP Viaud J-Y et al. Aspiration pneumonitis prophylaxis in obstetric anaesthesia comparison of effervescent cimitidine sodium citrate mixture and sodium citrate Br J Anaesth 1990 64 503–6

57 Simmons M, Meschia G Makowski E, Battaglia F Fetal metabolic response to maternal starvation Pediatr Res 1974 8 830–6

58 Natale R, Patrick J Richardson B Effects of human maternal venous plasma glucose concentrations on fetal breathing movements Am J Obstet Gynecol 1978 132 36–41

59 Miller FM Skiba H Klapholz H The effect of maternal blood sugar levels on fetal activity Obstet Gynecol 1978,52 662–5

60 Dumoulin J Foulkes J Ketonuria during labor [commentary] Br J Obstet Gynaecol 1984 91 97–8

61 Felig P Lynch V Starvation in human pregnancy hypoglycemia hyperinsulinemia, and hyperketonemia Science 1970 170 990–2

62 Felig P Kim Y, Lynch V Hendler R. Amino acid metabolism during starvation and pregnancy J Clin Invest 1972 51 1195–202

63 Metzger B Ravinkar V Vileisis R Freinkel N Accelerated starvation and the skipped breakfast in late normal pregnancy Lancet 1982 1 588–92

64 Sabata V Novak M Melichar V Ovlivneni bladin lipidu a glykemie prijmem potravy za porodu Czech Gynecol 1963 28 152

65 Sabata V Wolf H Lausmann S The role of free fatty acids glycerol ketone bodies and glucose in the energy metabolism of the mother and fetus during delivery Biol Neonatol 1968 13 7–17

66 Bencini F Symonds E Ketone

109

bodies in fetal and maternal blood during parturition Aust N Z Obstet Gynecol 1972 12 176

67 Coetzee E Jackson M Ketonuria in pregnancy special reference to calorie restricted food intake in obese diabetics Diabetes 1980 29 177–81

68 Kim Y, Felig P Maternal and fetal fuel substrate levels during caloric deprivation in human pregnancy Metabolism 1972,21 507–12

69 Fisher D Perinatal insulin glucagon and carbohydrate metabolism Perinatology Endocrinology Symposium Lengley Berks, Mead Johnson, 1973

70 Rudolf M. Maternal ketosis and its effect on the fetus Clin Endocrinol Metab 1980 413–28

71 Leturque A, Hauguel J, Revelli J Fetal glucose utilization in response to maternal starvation and acute hyperketonemia Am J Physiol 1989,6 699–703

72 Josten B, Johnson T, Nelson J Umbilical cord pH and Apgar scores as an index of neonatal health Am J Obstet Gynecol 1987,157 843–88

73 Lind T Fluid balance during labor a review J R Soc Med 1983 76 870–5

74 Morton K, Jackson M, Gillmer M. A comparison of the effects of four solutions for the treatment of ketonuria in labor Br J Obstet Gynaecol 1984,92 473–9

75 Kenepp NB Fetal and neonatal hazards of maternal hydration with 5% dextrose before caesarean section Lancet 1982 1 1150–2

76 Mendiola J Grylack L Scanlon J The effects of intrapartum maternal glucose infusion on the normal fetus and newborn Anesth Analg 1982,61 32–5

77 Robillard J Sessions C Kennedy R Smith F Metabolic effects of constant hypertonic glucose infusion in well-oxygenated fetuses Am J Obstet Gynecol 1978 199–203

78 Grylack L. To maintain perinatal glucose/insulin homeostasis Contemp Obstet Gynecol 1983 113–21

79 Singhi S Effect of maternal intrapartum glucose therapy on neonatal blood glucose levels and neurobehavioral status of hypoglycemic term newborn infants J Perinat Med 1988,16 217–24

80 Singhi S, Chookang E Hall J Kalghati S Iatrogenic neonatal and maternal hyponatremia following oxytocin and aqueous glucose infusion during labor Br J Gynecol 1985 92 356–63

81 Tarnow Mordi W, Shaw J, Lui D Gardner D Flynn F Iatrogenic hyponatremia of the newborn due to fluid overload a prospective study Br Med J 1981 283 639–42

82 Dahlenburg G Burnell R, Braybrook R. The relationship between cord blood serum sodium levels in newborn infants and maternal intravenous therapy during labor Br J Obstet Gynaecol 1980 87 130–1

83 Cotton DB Gonik B Spillman T Dorman K Intrapartum to postpartum changes in colloid osmotic pressure Am J Obstet Gynecol 1984 149 174–6

84 Lederman R Lederman D Work B McCann D Anxiety and epinephrine in multiparous women in labor relationship to duration of labor and fetal heart rate patterns Am J Obstet Gynecol 1985 153 870

85 Lederman E Lederman R Work B McCann D Maternal psychological and physiological correlates of fetal newborn health status Am J Obstet Gynecol 1981,139 956

86 Lederman R, Lederman E Work B McCann D The relationship of maternal anxiety plasma catecholamines and plasma cortisol to progress in labor Am J Obstet Gynecol 1978 78 495

87 Fox H The effects of catecholamines and drug treatment on the fetus and newborn Br Fam J 1979 6 157–65

88 Simpkin P Stress pain and catecholamines in labor part 2 stress associated with childbirth events a pilot survey of new mothers Birth 1986 13 234–40

89 Phillippe M. Fetal catecholamines Am J Obstet 1983 146 840

90 London Times Giving birth on an egg 1992 Dec 17

HOME STUDY PROGRAM UPDATES

JNM's 1992 Home Study Program which features "The Newborn' (March/April 1992 Supplement), will be valid for 0 9 CEUs through April 30, 1994 The fee is $100 Please note the following change Payment and study materials should be sent directly to Mary Ann Shah JNM Editor, 67 Tarry Hill Road, Tarrytown NY 10591

JNM's 1993 Home Study Program which features 'Advanced Nurse-Midwifery Practice (March/April 1993 Supplement) will be valid for 1 0 CEUs through April 30 1995 The fee is $75 for submissions postmarked by August 31 1993 and $100 thereafter Please note the following corrections

Page 7 S Post-test question # 18 should be left blank on the Answer Sheet.

Page 33-S Column 1 paragraph 2 sentence # 8—"The Pipelle is gently introduced through the cervical os and up into the uterine fundus much like the technique used to sound the uterus prior to intrauterine device insertion —should have been typeset two sentences earlier it is hoped that no reader was confused by this misprint.

JNM s 1994 Home Study Program which will feature 'Obstetric Complications is well underway It will be published as a Spring Supplement and will offer 1 0 CEUs to participants

Preliminary preparations are beginning for the 1995 Home Study Program It is anticipated that its focus will be 'Comprehensive Health Assessment. ' Please watch the Journal for further information and for 'A Call for Abstracts

EFFECT OF EPIDURAL ANALGESIA FOR LABOR ON THE CESAREAN DELIVERY RATE

ally C Morton, PhD
Mark S Williams, MD, JD, MBA,
Emmett B Keeler, PhD, Joseph C Gambone, DO,
and Katherine L Kahn, MD

Objective **To use meta analysis to evaluate the effect of epidural analgesia on the cesarean delivery rate**

Data sources **The MEDLINE data base was searched for articles published in English between January 1981 and April 1992 We also interviewed experts and conducted a bibliographic follow-up and manual review of recent journals published from April to July 1992**

Methods of study selection **We excluded articles with irrelevant titles, and those case studies book chapters, or articles that did not provide primary and relevant data Two hundred thirty articles were read, including articles that reported on women of standard obstetric risk and on cesarean delivery rates for an epidural group and for a concurrent no-epidural group These criteria yielded six studies for a primary analysis and two others for a secondary analysis**

Data extraction and [illegible]

[illegible] cesarean as a result of epidural analgesia was estimated The cesarean rate for women undergoing epidural analgesia was ten percentage points greater than for no-epidural women ($P < 05$) More than a nine percentage point increase was shown for cesarean deliveries for dystocia ($P < 05$ [illegible] pooling either all studies or only randomized [illegible]

Conclusions **The results of this meta analysis strongly support an increase in cesarean delivery associated with epidural analgesia Further research should evaluate the balance between analgesia associated with the use of epidurals, and postpartum morbidity and costs associated with cesarean deliveries** ***(Obstet Gynecol 1994,83 1045–52)***

From RAND Santa Monica the Departments of Anesthesiology Obstetrics and Gynecology and Internal Medicine University of California Los Angeles School of Medicine Los Angeles and Health Devices Research Institute Redwood City California

This research is part of the Management and Outcomes of Childbirth ORT which is supported by a contract to RAND (AHCPR 282-90-039) from the Agency for Health Care Policy and Research

Despite a large increase in the use of epidural analgesia for labor and delivery[1] to 16 0% in the United States in 1981[2] and 19 7% in the United Kingdom in 1991,[3] little information exists describing the possible effect of this procedure on the cesarean delivery rate [4] We examined the medical literature regarding how the use of epidural analgesia for labor in primiparous women affects the cesarean delivery rate and conducted a meta-analysis

Materials and Methods

We began with a MEDLINE data base search using the key words epidural or extradural, cesarean or caesarean, and primigravid or nulliparous We restricted our search to English language articles published from January 1981 to April 1992 Several authors[5,6] have estimated the sensitivity of a MEDLINE search to be about 50% Thus we supplemented our search by interviewing experts, by investigating bibliographic references from relevant articles and the book *Effective Care in Pregnancy and Childbirth* [7] and by manually reviewing issues of relevant anesthesia, obstetric, and perinatal journals published from April to July 1992 Our search generated approximately 1000 articles

The titles of all articles were reviewed and clearly irrelevant titles were excluded The abstract of each remaining article and if necessary the text was reviewed to establish whether it addressed cesarean delivery rates for women having epidural analgesia for labor Case studies editorials book chapters and articles that did not provide primary data were excluded Two hundred thirty articles were read completely

To increase the chance that differences in cesarean delivery rates between women with and without epidural could be attributed to the epidural rather than to

0029 7844/94/$7 00

Table 1 Study Characteristics

[illegible]	[illegible]	[illegible]	[illegible]	Experimental [illegible] during [illegible]	Control [illegible]
[illegible]	1983	[illegible]	Denmark	Bupivacaine 0.375% [illegible]	Intramuscular 75 mg [illegible]
Thorp[4]	1989	1987	Texas	Bupivacaine 0.25% bolus injection followed by 0.125% continuous infusion	Narcotic agents offered
Mancuso[14]	1990	1983–87	England	Bupivacaine 0.375% intermittent	Intramuscular 75 mg [illegible]
[illegible]	1991	1988	Texas	Bupivacaine 0.25% bolus injection followed by 0.12[illegible] continuous infusion	Narcotic agents offered
Thorp[15]	1989	1990–1989	Missouri	Bupivacaine 0.25% bolus injection followed by 0.125% continuous infusion	Narcotic agents offered

differences in other factors we restricted our attention to a group of women who appeared similar with respect to obstetric risk. We included in our analysis only studies that examined primarily primiparous women of standard obstetric risk, with singleton pregnancies that presented by vertex with spontaneous labor at term. Studies were included if they provided cesarean delivery rates for an experimental group of women given epidural analgesia and for a concurrent control group in which no epidural was used.

Two studies[8,9] were analyzed separately because in both their experimental and control groups all women received analgesia through epidural catheters in the first stage of labor. In the second stage of labor, epidural analgesia was given to the experimental group while the control group received saline. In the remaining studies, which are our primary focus, the control group did not receive an epidural in either the first or second stage of labor.

In addition, studies were excluded if they demonstrated an obvious bias between the epidural and no-epidural groups. For example, we excluded a study in which epidural analgesia was "given at random per the availability of anesthesia personnel to monitor the patient."[10] Given limited personnel, epidural might be used most frequently by those patients experiencing the greatest difficulty in labor and with the greatest chance of having a cesarean. Further, patients having more prolonged and difficult labors would be present for a longer time period during which anesthesia personnel might become available to provide an epidural.

We tabulated the characteristics of the six articles[4,11–15] that met our primary study inclusion criteria (Table 1). We will refer to these studies by the name of their first author. All studies were published in 1989 or later and appear to include data collected in the 1980s–1990s. Four studies were conducted in the United States, one in England, and one in Denmark. Five took place in single university hospitals and one in a large British public hospital.

Five studies specified the epidural anesthetic agent as bupivacaine, though doses varied and one study did not specify the agent. Three studies used continuous infusion, two used intermittent infusion, and one did not specify. Table 1 also shows the anesthetic either given or available to the no-epidural group.

The timing of the epidural, especially in relation to oxytocin use, varied from study to study, as did the amount of information provided on these variables. Generally, we could not "tell which came first, that is, oxytocin augmentation requiring epidural analgesia or epidural analgesia followed by oxytocin augmentation."[13] For the one study in which data were available, we stratified our analysis by use of oxytocin.

The study designs were categorized according to standard epidemiologic terminology (Table 2).[16] The Philipsen[12] study was prospective, with patients randomized to the epidural and no-epidural groups. The 1993 Thorp[4] study was a randomized study in which the no-epidural group received meperidine and phenergan intravenously if requested.

The two studies by Chestnut[8,9] were randomized trials but are not included in Tables 1 and 2 because their control groups received an epidural through the first stage of labor, as compared to the other studies in which the control groups were actually no-epidural groups. The first study[8] used bupivacaine as an anesthetic agent, whereas the second[9] used lidocaine.

The remaining four studies[11,13–15] were retrospective forward design studies, as they were all retrospective

112

[illegible]	[illegible]	[illegible]	[illegible]
Neuhoff[11]	[illegible]	[illegible] forward design	[illegible] available [illegible] patients
Philipsen[12]	1989	Prospective	Randomized
Thorp[13]	1989	Retrospective forward design	Patients were offered either narcotic agents or epidural analgesia if they requested assistance with pain relief
Manyonda	[illegible]	Retrospective forward design matched cohort	[illegible] data
Thorp[15]	1991	Retrospective forward design	Patients were offered either narcotic agents or epidural analgesia if they requested assistance with pain relief
Thorp[4]	1993	Prospective	Randomized

reviews of medical records (Table 2) Three of these [illegible] the Neuhoff[11] and both retrospective Thorp[13 15] studies reviewed all women who delivered during a specific period The Manyonda[14] study was a matched cohort study in which a woman receiving an epidural was matched to a woman who did not receive an epidural

Investigators in retrospective studies do not have control over patient assignment to the epidural or no-epidural groups However some authors offered information on the availability and procurement of epidurals In both Thorp[13 15] studies, "Patients were offered either narcotic agents or epidural analgesia if they requested assistance with pain relief" In the Neuhoff[11] study, epidural was "available to all patients," whereas the Manyonda[14] study provided no data

Several studies presented the reasons for cesarean deliveries, specifically dystocia or fetal distress Other articles presented results for particular subgroups of women specifically defined by oxytocin use and socioeconomic class These data allowed us to compare the epidural and no-epidural groups from different perspectives and to control, to varying extents for other factors besides epidural use that might affect cesarean delivery

For each study, we estimated the cesarean delivery rates for both the epidural and no epidural groups and the cesarean delivery risk difference also known [illegible] the epidural group compared to [illegible] group, we may conclude that in 100 women [illegible] the use of epidural analgesia is associated with ten more cesarean deliveries on average In contrast to other measures of association such as [illegible] odds ratios [illegible] have measurement units (eg relative [illegible] risk difference is in percentage points and has the advantage that clinicians can estimate the number [illegible] whose method of delivery is associated with the use of epidural analgesia [17] For those studies that contained results for subgroups of women we estimated the cesarean delivery risk difference separately for each subgroup

After examining the results from each study separately, we employed meta-analysis to combine individual study data into a 'pooled result Meta-analysis overcomes sample size limitations by considering all studies simultaneously This technique is applicable only when the studies resemble each other that is when they are not too variable

Within each study, variation in cesarean delivery rates results from sampling variability and differences among the women even before they have analgesia In addition between-study variation results from differences across included studies such as unmeasured differences in both the populations of women studied and the styles of practice in the different geographic locations where the studies occurred We examined the homogeneity of the study results using a χ^2 test to evaluate whether the between-study variability outweighed the within-study variability [18] This would be an indication that the studies are not similar enough to be pooled When we did pool studies, we used an equal-effects model,[19] in which studies are weighted by the inverse of their variances, so that less variable studies are weighted more heavily than more variable ones We also calculated a 95% confidence interval (CI) for the pooled result and identified statistically significant results at the 05 two-sided level

As a second way to address between-study variation we fit a random effects model [20] The random effects approach provides a more conservative estimate of the association of epidural with cesarean delivery risk than does the equal-effects strategy, and is a safeguard against spurious conclusions given the homogeneity test s lack of statistical power The equal effects and random-effects methods reached the same conclusion except in one case

[illegible] Results for Cesarean [illegible] for [illegible] Studies With a No [illegible] Group

First author	Epidural		No epidural		Cesarean delivery risk difference (% points)
	All women	Women with cesarean	All women	Women with cesarean	
[illegible]	25[illegible]	[illegible]	35[illegible]	22 (6 2%)	[illegible]
[illegible][13]	57	9 (15 8%)	54	3 (5 6%)	+10 2%
Thorp[13]*	447	46 (10 3%)	264	10 (3 8%)	+6 5%[§]
Thorp[15]*	294	46 (15 7%)	206	5 (2 4%)	+ 3 2%[§]
Thorp[4]	48	8 (16 7%)	45	1 (2 2%)	+14 5%
Pooled estimate for all studies		13 [illegible]%		4 4%	+9 1%[§]
Pooled CI		11 2 15 2		3 1 5 8	6 7 11 5
Pooled estimate for randomized studies only[†]		16 2%		4 0%	+12 3%[§]
Pooled CI		9 1 23 2		1 6 7 9	4 3 20 3

CI = confidence interval

* The two studies by Chestnut[8,9] are excluded because both the epidural and no-epidural groups received an epidural for the first stage of labor

† The risk difference is the cesarean delivery rate for the epidural group minus the cesarean delivery rate for the no-epidural group

‡ The terms dystocia and failure to progress are used interchangeably The diagnosis of failure to progress in labor was made by either the attending physician or the obstetric resident with consultation from the clinical faculty No specific criteria were required other than the judgment of the attending physician [11]

§ The 95% confidence interval for the risk difference does not contain 0% (no difference) This can be roughly interpreted as meaning that the difference in the cesarean delivery rates for women with and without epidural analgesia is statistically different from 0% ($P < .05$)

‖ The main indication for cesarean delivery was cephalopelvic disproportion [12]

¶ The term dystocia means arrest of the active phase in the first stage of labor arrest of descent in the second stage of labor [13,15] ie fetus in persistent occipitoposterior position minor deflexion or asynclitism and cephalopelvic disproportion [13]

Risk difference still significantly different from 0% even after controlling for confounding factors with multivariate analysis

** The term dystocia means an arrest of cervical dilatation in the active phase of labor or when there was arrest of descent in the second stage of labor Cesarean delivery for dystocia was performed only after documentation of adequate labor by internal uterine pressure catheter and oxytocin augmentation if necessary [4]

†† This estimate pools only the studies of Philipsen[12] and Thorp [4]

The three Thorp[4,13,15] studies presented data for women having cesarean deliveries for fetal distress The number of cesarean deliveries across both groups in these studies combined was only 30, and the pooled cesarean delivery risk difference of 0 7% due to epidural was not significant (not shown) This difference was based on combined sample sizes of 789 in the epidural group and 515 in the no-epidural group However, to detect a 50% increase in cesarean delivery for fetal distress from the observed 2% in the no [illegible] deliveries and [illegible] deliveries Epidurals may increase the cesarean delivery rate for fetal distress but research based on many more women would be required to detect such a difference if it exists

The results for the two and [illegible] studies are similar to those for all studies combined regardless of design (Tables 3 and 4) We can further examine possible selection bias effects resulting from nonrandomization by noting that both nonrandomized Thorp[13,15] studies attempted to correct for noncomparability between the epidural and no-epidural groups The 1989 study[13] excluded from the analysis six epidural-group women who had epidurals after experiencing abnormal rates of dilatation and subsequently had cesarean deliveries for dystocia The 1991 study[15] presented results for a subgroup of women who had an early (between admission in early labor and 5 cm of dilatation) dilatation rate of less than 1 cm per hour, and who had an epidural administered early (at less than or equal to 5 cm of dilatation) Both of these restrictions attempted to balance the epidural and no-epidural groups by eliminating women who may have received an epidural for abnormal labor, which also resulted in a cesarean delivery These restrictions (not shown) did not change the significance or direction of the overall pooled results presented in Tables 3 and 4

Studies Comparing Epidural Use to No Epidural Use Specifically in the Second Stage of Labor

The no-epidural patients in the two Chestnut studies[8,9] received the same analgesia as the epidural group through the first stage of labor and then received saline solution through the catheter in the second stage, beginning at 8 cm of dilatation These second-stage studies showed no significant effect of epidural on cesarean delivery (not shown) However, they estimated the effect of epidural continuing from the first through the second stage of labor on cesarean delivery rates in contrast to the other six studies, which examined the effect of epidural administered early in labor These two studies also included only 13 cesarean deliveries, so lack of a significant difference is not surprising given the small sample

Both studies excluded women who had cesarean deliveries during the first stage of labor, before the randomization of women into the epidural or no epidural group If these women are included in the calculation of the overall cesarean delivery rate across

[illegible] the Neuhoff[11] Study

[illegible]	[illegible]	[illegible] cesarean	All women	Women [illegible] cesarean	[illegible]
Oxytocin	176	38 (21 2%)	99	20 (20 2%)	[illegible]
Oxytocin private	122	35 (28 7%)	77	19 (24 7%)	+4 0%
Oxytocin clinic	54	3 (5 6%)	22	1 (4 6%)	+1 0%
[illegible]	[illegible]	9 ([illegible])	255	[illegible]	[illegible]
[illegible]	[illegible]	8 (15 7%)	165	[illegible]	[illegible]
[illegible]	2[illegible]	1 (3 9%)	90	[illegible]	[illegible]

* The risk difference is the cesarean delivery rate for the epidural group minus the cesarean delivery rate for the no [illegible] P val[illegible] less than 20[illegible] e[illegible]

both the experimental and control groups, ie, the rate for women who at least received an epidural during the first stage of labor, the rate for the first study[8] was 12% and for the second study[9] 18% All cesarean deliveries in the latter study were for dystocia The significance of these cesarean delivery rates cannot be assessed without knowledge of the rate in the underlying populations

Three studies offered further insight into the effect of epidural use on the cesarean delivery rate by providing estimates of the cesarean delivery risk difference for specific subgroups of women Thorp s 1991 study[15] categorized women into those who had an early (between admission in early labor and 5 cm of dilatation) slow dilatation rate of less than 1 cm per hour or a normal rate The study also categorized epidurals into those administered early, at less than or equal to 5 cm dilatation, versus those given late This yielded four subgroups of women for calculation of a cesarean delivery risk difference due to epidural The comparison between women who had a slow dilatation rate and an early epidural versus those who had a slow dilatation rate and no epidural gave a cesarean delivery risk difference of 17 4% ($P <$ 05) Each of the other three comparisons showed a higher cesarean delivery rate for the epidural group, but the differences were not significant The risk difference for all women receiving an epidural early was 15 6% ($P <$ 05)

Thorp s latest study[4] categorized each woman in the epidural group by her dilatation when she received her epidural and each subject in the no-epidural group by her dilatation when she received her first narcotic dose The authors compared the epidural and no-epidural cesarean delivery rates for the early-placement and late-placement women respectively The results showed a significant risk of cesarean delivery associated with epidural if the epidural was placed before 5 cm dilatation ($P <$ 05) similar to the earlier results [15] However, the risk of cesarean delivery was not significantly increased if the epidural was placed at 5 cm dilatation or greater

The third study that yielded subgroup results was Neuhoff [11] Of the 607 total patients, 192 (32%) were clinic patients and the remaining 415 (68%) received private services at the same hospital The same proportion (42%) in either group received epidurals resulting in a balance of private and clinic patients in both the overall epidural and no-epidural groups In contrast, Manyonda[14] also presented the distribution of women of low, medium, and high ' social class categories, as determined by the husband s occupation Although 47% of all women were in the low social class, only 37% of the women who received epidurals were in the low social class, and 62% of the women who received no epidural were in the low social class

In the Neuhoff[11] study, a higher proportion of private patients (48%) than clinic patients (39%) received oxytocin Table 5 presents the various subgroup results for women who did and did not receive oxytocin categorized by private versus clinic status Use of oxytocin and use of epidurals were strongly associated ($P <$ 05) Of women who received oxytocin, 64% received an epidural of those who did not receive oxytocin, 23% were given an epidural Of women who had an epidural, 70% were given oxytocin and of women who did not have an epidural 28% were given oxytocin

All patients who received oxytocin demonstrated a 1 4% increase in the cesarean delivery rate in the epidural group (not significant) However when we stratified by patient socioeconomic status we saw a 4 0% increase in cesarean deliveries for private patients and a 1 0% increase for clinic patients though the relative risk was 1 2 in both situations (not significant) The underlying cesarean delivery rates for private patients versus clinic patients were different overall

115

17 1 and 5 2% [illegible] receiv [illegible] [illegible] 3%

Discussion

Tables 3 and 4 demonstrate that epidural analgesia was consistently associated with an increase in cesarean delivery rate [illegible] that cesarean [illegible] with epidural [illegible] dystocia Analyses of all studies [illegible] supported these conclusions as did two conservative analyses one that pooled only randomized studies and one that attempted to correct for lack of randomization

The major meta-analysis work in the perinatal field, *Effective Care in Pregnancy and Childbirth*,[7] concentrated on randomized controlled trials Our meta analysis included both randomized and nonrandomized studies, if the nonrandomized studies provided enough data to allow meaningful analysis This permitted us to include more studies and thus more patients from more settings for analysis Unfortunately, studies did not always provide complete patient covariate data and some did not provide study details such as the type of analgesia administered As is clear from the strong association between other patient characteristics and cesarean deliveries in the subgroup results, additional covariate data would have allowed a more thorough examination Regardless, our conclusion is consistent across the studies we examined

The consistent association between epidural analgesia and cesarean delivery does not explain their relationship This meta-analysis cannot ascertain this mechanism nor can it determine the influence of varying types of labor management on the effect of epidural analgesia, even given the results of randomized studies The randomized study by Philipsen[12] had equal use of oxytocin in its epidural and no-epidural groups In contrast, the epidural and no-epidural groups in the randomized Thorp[4] study were managed differently, with more than a twofold increase in oxytocin augmentation in the epidural group (58 versus 27%, $P < 05$) Higher oxytocin use did not protect against increased cesarean delivery risk in this study

To isolate the physiologic effect of an epidural we would need to conduct a randomized trial in which both the women and health care providers were blinded to the epidural The latter group would have to be blinded so that their knowledge of who received an epidural would not change their behavior Such a double-blind study is probably not feasible given the obvious effect of the epidural

As the cesarean delivery rate of 24 7%[21] in the United States continues to rise [illegible] the [illegible] to this [illegible] by patients [illegible] and [illegible] health care [illegible] pooled in this meta-analysis may be reduced by delaying the placement of the epidural,[4,15] by adjusting the epidural anesthetic, or by combining the analgesia with oxytocin use Alternatively, the increased risk may [illegible] the [illegible] of an epidural in relieving pain These hypotheses merit further examination, including consideration of not only immediate maternal and fetal outcomes but also longer-term outcomes such as changes in functioning physiologic and psychosocial effects, and financial impact This meta-analysis is an initial component in this research and provides physicians and patients with information to consider when balancing the risks and benefits of each individual patient's situation

References

1 Spielman FJ Corke BC Advantages and disadvantages of regional anesthesia for cesarean section A review J Reprod Med 1985,30 832–40

2 Gibbs CP Krischer J Peckham BM Sharp H Kirschbaum TH Obstetric anesthesia A national survey Anesthesiology 1986 65 298–306

3 Davies MW Harrison JC Ryan TDR Current practice of epidural analgesia during normal labour Anaesthesia 1993 48 63–5

4 Thorp JA Hu DH Albin RM et al The effect of intrapartum epidural analgesia on nulliparous labor A randomized controlled prospective trial Am J Obstet Gynecol 1993 169 851–8

5 Dickersin K Hewitt P Mutch L Chalmers I Chalmers TC Perusing the literature Comparison of MEDLINE searching with a perinatal trials database Controlled Clin Trials 1985-6 306–17

6 Kirpalani H Schmidt B McKibbon KA Haynes RB Sinclair JC Searching MEDLINE for randomized clinical trials involving care of the newborn Pediatrics 1989,83 543–6

7 Chalmers I Enkin MJNC eds Effective care in pregnancy and childbirth Oxford Oxford University Press 1989

8 Chestnut DH Bates JN Choi WW Continuous infusion epidural analgesia with lidocaine Efficacy and influence during the second stage of labor Obstet Gynecol 1987 69.323–7

9 Chestnut DH Vandewalker GE Owen CL Bates JN Choi WW The influence of continuous epidural bupivacaine analgesia on the second stage of labor and method of delivery in nulliparous women Anesthesiology 1987 66 774–80

10 Diro M Beydoun SN Segmental epidural analgesia in labor A matched control study J Natl Med Assoc 1985 78 569–73

11 Neuhoff D Burke MS Porreco RP Cesarean birth for failed progress in labor Obstet Gynecol 1989 73 915–20

12 Philipsen T Jensen N Epidural block or parenteral pethidine as analgesic in labour A randomized study concerning progress in labour and instrumental deliveries Eur J Obstet Gynecol Reprod Biol 1989 30 27–33

13 Thorp JA Parisi VM Boylan PC Johnston DA The effect of continuous epidural analgesia on cesarean section for dystocia in nulliparous women Am J Obstet Gynecol 1989 161 670–5

14 Manyonda IT Shaw DE Dnfe JO The effect of delayed pushing

116

[illegible] nbar epidural [illegible] Gy[illegible] [illegible] Am J [illegible] dystocia [illegible]-10

[illegible] de nologic research Belmont California Wadsworth 1982 [illegible]-95 160–4

17 Mausner JS Kramer S Epidemiology—an introductory text Philadelphia WB Saunders 1985 166–76

18 Hedges LV Olkin I Statistical methods for meta analysis San [illegible]

19 [illegible] Mosteller [illegible] methods for combining experimental results Technol Assess Health Care 1990 6 5–30

20 DeSimone R [illegible] Meta analysis in clinical trials Controlled Clin Trials 1986 7 177–88

21 Taffel SM Placel [illegible]

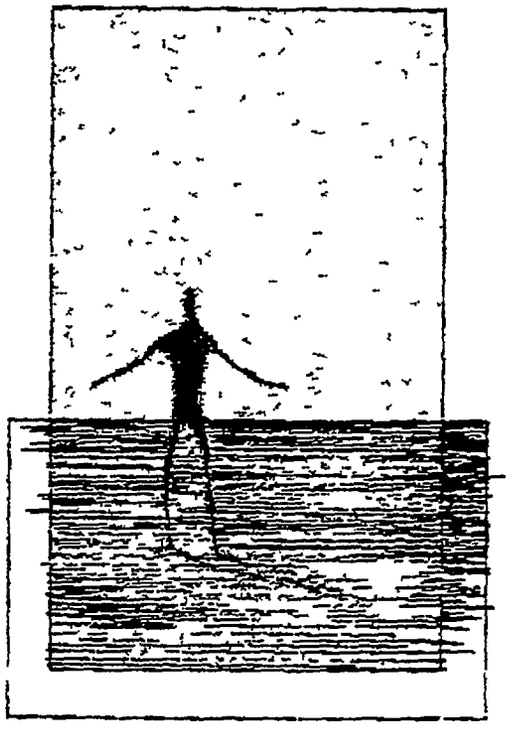
Reprints are not available

Received October [illegible] 1993
Received in revised form January [illegible] 1994
Accepted January 20 1994

Copyright © 1994 by The American College of Obstetricians and Gynecologists

THIRD EDITION

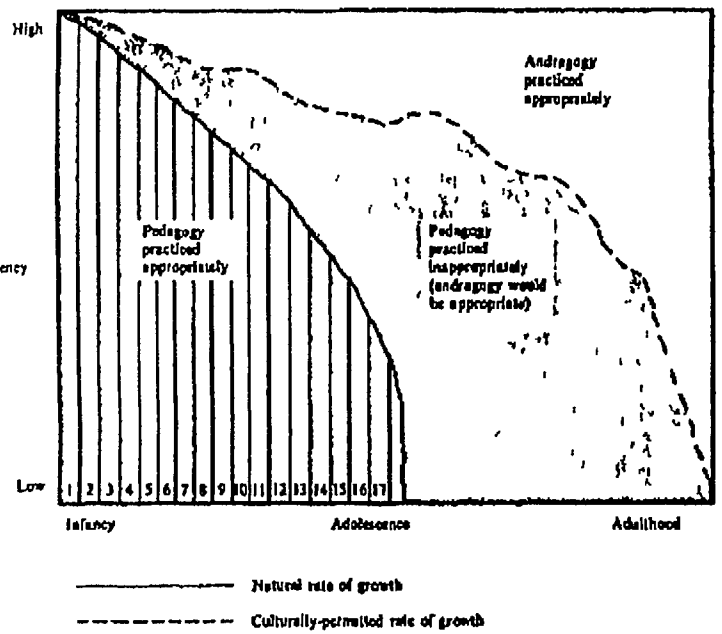
The Adult Learner
A Neglected Species



Malcolm Knowles

118

919 966 6816 P 06/10



ire 3-2 The natural maturation toward self-direction as com-
ıd with the culturally-permitted rate of growth of self-direction

MAR-04-1996 10 39 INTRAH

- *The role of experience* The learner's experience is of little worth as a resource for learning, the experience that counts is that of the teacher, the textbook writer, and the audio-visual aids producer Therefore, transmittal techniques—lectures, assigned readings, etc , are the backbone of pedagogical methodology
- *Readiness to learn* Learners become ready to learn what the teacher tells them they must learn if they want to pass and get promoted
- *Orientation to learning* Learners have a subject-centered orientation to learning, they see learning as acquiring subject-matter content Therefore, learning experiences are organized according to the logic of the subject-matter content
- *Motivation* Learners are motivated to learn by external motivators—grades, the teachers' approval or disapproval, parental pre s

919 966 6816 P 06

And Then Came Andragogy

Before describing the andragogical assumptions about learners and learning, it is helpful to look at what we mean by "adult " As I see it, there are four definitions of "adult " First, the *biological* definition we become adult biologically when we reach the age at which we can reproduce—which at our latitude is in early adolescence Second, the *legal* definition we become adult legally when we reach the age at which the law says we can vote, get a driver's license, marry without consent, and the like Third, the *social* definition we become adult socially when we start performing adult roles, such as the role of full-time worker, spouse, parent, voting citizen, and the like Finally, the *psychological* definition we become adult psychologically when we arrive at a self-concept of being responsible for our own lives, of being self-directing From the viewpoint of learning, it is the psychological definition that is most crucial But it seems to me that the process of gaining a self-concept of self-directedness starts early in life (I was almost completely self-directing in learning to use my leisure time by age five) and grows cumulatively as we become biologically mature, start performing adult-like roles (I was a magazine salesman and paper-route entrepreneur in high school), and take increasing responsibility for making our own decisions So we become adult by degree as we move through childhood and adolescence, and the rate of increase by degree is probably accelerated if we live in homes, study in schools, and participate in youth organizations that foster our taking increasing responsibilities But most of us probably do not have full-fledged self-concepts of self-directedness until we leave school or college, get a full-time job, marry, and start a family

The Andragogical Model

The andragogical model is based on several assumptions that are different from those of the pedagogical model

1 *The need to know* Adults need to know why they need to learn something before undertaking to learn it Tough (1979) found that when adults undertake to learn something on their own

03-04-1996 11 19AM

MAR-04-1996 10 40 INTRAH 919 966 6816 P 07/10

they will invest considerable energy in probing into the benefits they will gain from learning it and the negative consequences of not learning it Consequently, one of the new aphorisms in adult education is that the first task of the facilitator of learning is to help the learners become aware of the "need to know" At the very least, facilitators can make an intellectual case for the value of the learning in improving the effectiveness of the learners' performance or the quality of their lives When I think of all the courses I have taken in school and college, I can think of very few in which I understood the need to know what the teacher was teaching me, I was taking the courses to get credits toward a diploma or degree. And I am sure that I would have learned more from those courses if the teachers had shown me how I would be able to use the learnings in real life But even more potent tools for raising the level of awareness of the need to know are real or simulated experiences in which the learners discover for themselves the gaps between where they are now and where they want to be Personnel appraisal systems, job rotation, exposure to role models, and diagnostic performance assessments are examples of such tools. Paolo Freire, the great Brazilian adult educator, has developed an elaborate process for what he calls the "consciousness-raising" of peasants in developing countries in his *The Pedagogy of the Oppressed* (1970)

2 *The learners' self-concept* Adults have a self-concept of being responsible for their own decisions, for their own lives Once they have arrived at that self-concept they develop a deep psychological need to be seen by others and treated by others as being capable of self-direction. They resent and resist situations in which they feel others are imposing their wills on them But this presents a serious problem to us in adult education the minute they walk into an activity labeled "education" or "training" or any of their synonyms, they harken back to their conditioning in their previous school experience, put on their dunce hats of dependency, fold their arms, sit back, and say "Teach me." I have experienced over and over again adults who are obviously self-directing in every other aspect of their lives putting pressure on me to tell them what to do The problem occurs when we assume that this is really where they are

coming from and start treating them like children, for then we create a conflict within them between their intellectual model—learner equals dependent—and the deeper, perhaps subconscious psychological need to be self-directing And the way most people deal with psychological conflict is to try to flee from the situation causing it—which probably accounts in part for the high dropout rate in much voluntary adult education. As we have become aware of this problem, adult educators have been working at creating learning experiences in which adults are helped to make the transition from dependent to self-directing learners My little book, *Self-Directed Learning: A Guide for Learners and Teachers* (1975) is a collection of such experiences

3. *The role of the learners' experience* Adults come into an educational activity with both a greater volume and a different quality of experience from youths By virtue of simply having lived longer, they have accumulated more experience than they had as youths But they also have had a different kind of experience. When I was 15, I had not had the experience of being a full-time worker, a spouse, a parent, a voting citizen, when I was 30, I had had all those experiences This difference in quantity and quality of experience has several consequences for adult education

For one, it assures that in any group of adults there will be a wider range of individual differences than is the case with a group of youths Any group of adults will be more heterogeneous—in terms of background, learning style, motivation, needs, interests, and goals—than is true of a group of youths Hence, the great emphasis in adult education on individualization of teaching and learning strategies

For another, it means that for many kinds of learning the richest resources for learning reside in the adult learners themselves Hence, the greater emphasis in adult education on experiential techniques—techniques that tap into the experience of the learners, such as group discussion, simulation exercises, problem-solving activities, case method, and laboratory methods—over transmittal techniques Hence, also, the greater emphasis on peer-helping activities

BEST AVAILABLE COPY

03-04-1996 11 20AM 919 966 6816 P 07

MAR-04-1996 10 41 INTRAH 919 966 6816 P 08/10

But the fact of greater experience also has some potentially negative effects As we accumulate experience, we tend to develop mental habits, biases, and presuppositions that tend to cause us to close our minds to new ideas, fresh perceptions, and alternative ways of thinking Accordingly, adult educators are trying to discover ways of helping adults to examine their habits and biases and open their minds to new approaches Sensitivity training, value clarification, meditation, and dogmatism scales are among the techniques that are used to tackle this problem

There is another, more subtle reason for emphasizing the utilization of the experience of the learners, it has to do with the learners' self-identity Young children derive their self-identity largely from external definers—who their parents, brothers, sisters, and extended families are, where they live, and what churches and schools they go to As they mature, they increasingly define themselves in terms of the experiences they have had To children, experience is something that happens to them, to adults, their experience is *who they are* For example, when I was 10, if I had been asked who I am, I probably would have replied, "My name is Malcolm Knowles, my father is Dr A D Knowles, a veterinarian, I live at 415 Fourth Street, Missoula, Montana, I attend Roosevelt Grammar School on Sixth Street, and I am a member of the Sunday School at the Presbyterian Church on Fifth Street If someone had asked me at age 30 who I was I would have replied, "My name is Malcolm Knowles, I was a delegate to the World Boy Scout Jamboree in Berkinhead, England in 1929, I studied international law at Harvard College, graduating in 1934, I was director of training for the National Youth Administration of Massachusetts from 1935 to 1940, and so on I derived my self-identity from my experiences The implication of this fact for adult education is that in any situation in which adults' experience is ignored or devalued, they perceive this as not rejecting just their experience, but rejecting them as persons

4 *Readiness to learn* Adults become ready to learn those things they need to know and be able to do in order to cope effectively with their real-life situations An especially rich source of "readiness to learn" is the developmental tasks associated with

BEST AVAILABLE COPY

03-04-1996 11 21AM 919 966 6816 P 08

moving from one developmental stage to the next The critical implication of this assumption is the importance of timing learning experiences to coincide with those developmental tasks For example, a sophomore girl in high school is not ready to learn about infant nutrition or marital relations, but let her get engaged after graduation and she will be very ready Bench workers are not ready for a course in supervisory training until they have mastered doing the work they will be supervising and decided that they are ready for more responsibility

It is not necessary to sit by passively and wait for readiness to develop naturally, however. There are ways to induce readiness through exposure to models of superior performance, career counseling, simulation exercises, and other techniques

5. *Orientation to learning* In contrast to children's and youths' subject-centered orientation to learning (at least in school), adults are life-centered (or task-centered or problem-centered) in their orientation to learning Adults are motivated to devote energy to learn something to the extent that they perceive that it will help them perform tasks or deal with problems that they confront in their life situations Furthermore, they learn new knowledge, understandings, skills, values, and attitudes most effectively when they are presented in the context of application to real-life situations

This point is so critical that I would like to reinforce it with three illustrations

For many years, we sought to reduce illiteracy in this country by teaching courses in reading, writing, and arithmetic, and our record was terribly disappointing The dropout rate was high, motivation to study was low, and achievement scores were poor When researchers started trying to discover what was wrong in the early 1970's, they quickly discovered that the words presented in the standard vocabulary lists in the reading and writing courses were not the words these people used in their life situations and that the mathematical problems presented in their arithmetic courses were not the problems they had to be able to solve when they went to the store, the bank, or the shop As a result, new curriculums organized around life situations and the acquisition of coping skills (e g , coping

with the world of work, of local government and community services, of health, of the family, of consuming) were constructed Many of the problems encountered in the traditional courses disappeared or were greatly reduced

A second example is from university extension For many years it was the practice of universities to offer late afternoon or evening courses for adults that were exactly the same courses taught to teenagers in the day Then in the 1950s I began noticing the evening programs changing. A course titled "Composition I" in the day program became "Writing Better Business Letters" in the evening program, "Composition II" became "Writing for Pleasure and Profit"; and "Composition III" became "Improving Your Professional Communications" And it wasn't just the titles that changed, the way they were taught also changed While students in "Composition I" still memorized rules of grammar, students in "Writing Better Business Letters" started right off writing business letters and then extracted principles of grammatical writing from an analysis of what they had written

A third example comes from my own personal experience with trying to learn to use a computer for writing letters, articles, and books, keeping my accounts, maintaining mailing lists, and the like In December 1981 I bought myself one of the more popular personal computers, set it up in my study, and started reading the instruction manual with enthusiastic anticipation The instruction manual started right off making me memorize commands After memorizing about three pages' worth, I had to go off on a short trip, and when I returned I dashed up to my study to practice the commands I had memorized Lo and behold, after retrieving three or four commands, I couldn't remember the others It occurred to me that I was being asked to learn something for its own sake without knowing how I would use it to perform the tasks I wanted the computer to perform for me So I decided to ignore the manual and teach myself how to make the computer write letters for me It was a struggle, and the manual wasn't very helpful, but after several months I was using the computer for most of my correspondence, and in June I wrote my first article on it. It became clear to me that the computer company could have saved me a

BEST AVAILABLE COPY

MAR-04-1996 10 41 INTRAH 919 966 6816 P 09/10

lot of time if its software producers and manual writers understood that adults are task-centered in their learning and had taught me the commands in the context of using them to write letters or perform other tasks I wanted to perform Some months later I wrote an article for *Training and Development Journal* in which I included a "Memo to the Computer Industry" (see Appendix D) as an example of the application of the andragogical model to computer instruction

This assumption is strongly supported by the studies of adults' time perspective described by McClusky in Appendix C and by Tough's studies of adult learning projects described earlier in this chapter In fact, I now prefer Tough's concept of learning projects as a basis of organizing adult educational programs to my earlier concept of problem areas

6 *Motivation* While adults are responsive to some external motivators (better jobs, promotions, higher salaries, and the like), the most potent motivators are internal pressures (the desire for increased job satisfaction, self-esteem, quality of life, and the like) Tough (1979) found in his research that all normal adults are motivated to keep growing and developing, but that this motivation is frequently blocked by such barriers as negative self-concept as a student, inaccessibility of opportunities or resources, time constraints, and programs that violate principles of adult learning

Putting the Pedagogical and Andragogical Models in Perspective

In the treatment of these two models so far it may appear that I am saying that they are antithetical, that pedagogy is bad and andragogy is good, and that pedagogy is for children and andragogy is for adults This is pretty much the way I presented the models in the first edition of *The Modern Practice of Adult Education Pedagogy Versus Andragogy* in 1970 But during the next decade, a number of teachers in elementary and secondary schools and in colleges reported to me that they were experimenting with applying the andragogical model and that children and youths seemed to learn better in many circumstances when some features of the andragogical model were applied So, in the

03-04-1996 11 22AM 919 966 6816 P 09

APPENDIX A

Admission Criteria for the Normal Birth Center September 1992

- Gestational age > 36 to < 42 completed weeks
- Gestational age ≥ 43 weeks with reactive nonstress test and amniotic fluid index ≥ 10 cm
- Estimated fetal weight 2,500 to 4,000 gm
- Low-risk class A-1 diabetes
  1. Regular attendance at clinic with normal fasting blood sugar (FBS < 105) documented in prenatal records within last month
  2. Without history of overt diabetes, antepartum stillbirth, or traumatic delivery due to macrosomia
- One prior cesarean section (C/S) with
  1. Documented low transverse uterine scar and patient desire for trial of labor in NBC
  2. Undocumented uterine scar with history of uncomplicated vaginal birth after cesarean

Exclusions: Clients with the Following Are Ineligible for Admission

- Anemia (hematocrit < 28%)
- Parity > 8
- Previous C/S with the following:
  1 Undocumented uterine scar, no prior vaginal birth after cesarean
  2 Low vertical or classical uterine scar
  3 More than one C/S
- Previous difficult delivery
- Weight > 225 lb
- Hypertension 140/90
- Proteinuria > 2+
- Positive syphilis serology, untreated
- Client in custody
- Spontaneous rupture of membranes
  1. Not in labor
  2. Signs or symptoms of amnionitis
- At-risk class A-1 diabetics including history of
  1 Previous overt diabetes
  2. Prior antepartum stillbirth
  3 Traumatic delivery due to macrosomia
- Abnormal vaginal bleeding
- Multiple gestation
- Temperature > 99 6°F
- Unidentifiable presenting part
- Station > −3 for multiparas, >−2 for primiparas
- Thick meconium
- Acute or chronic medical condition
- Nonvertex presentation

APPENDIX B

Intrapartum and Postpartum Transfer Criteria: 1992

Fetal

- Abnormal fetal heart rate pattern indicative of fetal distress that is unresponsive to alleviating interventions

Maternal

- Evidence of amnionitis
- Development of pregnancy-induced hypertension/preeclampsia
- Request or need for regional anesthesia
- Hematocrit < 28% on admission
- Hemorrhage prior to delivery
- Excessive blood loss at delivery or fourth stage—and symptomatic
- Prolonged second stage (more than 2 or 3 hours)
- Failure to progress during active labor
- Clients who, after evaluation, do not comply with admission criteria
- Client request for medical management

Exclusion Criteria for 12-Hour Discharge

- Abnormal physical examination
- Medical, surgical, or psychiatric problem
- Estimated blood loss > 750 mL
- Hematocrit < 30%
- Marked episiotomy discomfort; severe bruising or edema
- Temperature > 100 4°F during hospitalization or > 99 4°F at 12 hours
- Unable to ambulate easily and/or care for self and infant
- Inability to void
- Third- or fourth-degree laceration

BEST AVAILABLE COPY

183

Maternal Hydration Increases Amniotic Fluid Index in Women With Normal Amniotic Fluid

SARAH J KILPATRICK, MD, PhD, AND KATHLEEN L SAFFORD, RN

Objective **To test the hypothesis that maternal oral hydration would increase the amniotic fluid (AF) index in pregnancies with normal AF**

Methods **Forty women with a normal AF index (7 0–24 0 cm) were randomized to either the control or hydration group Women in the hydration group drank 2 L of water and returned for the post-treatment AF index in 4–6 hours, whereas women in the control group drank only 100 mL of water during the same time period The investigator performing the AF index was blinded to the subject's group The pre- and post-treatment AF indexes and maternal urine specific gravities were compared between the groups**

Results **The mean AF index in the hydration group increased significantly by 3 0 ± 2 4 cm ($P \leq$ 0001) whereas it declined significantly by 1 5 ± 2 7 cm in the control group ($P \leq$ 02) The maternal urine specific gravities also changed significantly in the expected direction, with those in the hydration group decreasing and those in the control group increasing ($P \leq$ 0001) There was a regression coefficient of −0 6 ($P \leq$ 0001) between the change in urine specific gravity and the change in AF index The mean time between the pre- and post-treatment AF indexes was not different between the groups**

Conclusions **Maternal oral hydration increased the AF index by approximately 16%, whereas fluid restriction decreased the AF index by 8% in women with normal AF These findings support previous data that maternal hydration increased the AF index by 31% in women with decreased AF and suggest that maternal fluid volume or osmolality may have a role in maintaining the AF volume** ***(Obstet Gynecol 1993,81 49–52)***

Amniotic fluid (AF) volume is controlled by a balance between its production and absorption The most accepted factors involved in this balance are fetal urination and swallowing [1] However, recent data have suggested that fetal swallowing and urination can account for only 50% of the variation in AF volume [2,3] Both an intramembranous route (between AF and the fetus) and a transmembranous route (between AF and the mother) have been proposed as additional channels of AF control [2,4] However, how these routes interact and what factors affect them are not clear Although adequate volume is reassuring and oligohydramnios or polyhydramnios is considered worrisome, what actually maintains AF volume in a normal range is unknown

An additional factor that affects AF volume is maternal hydration Recently, we reported that oral maternal hydration increased the AF index by approximately 30% in women with a decreased AF index (initial AF index less than 6 0 cm) [5] We wished to investigate further the relationship of maternal hydration to AF index and test the hypothesis that maternal oral hydration would increase the AF index in women with normal AF indexes

Materials and Methods

This blinded, randomized trial was approved by the Committee on Human Research at the University of California, San Francisco, and each subject read and signed the approved consent form All subjects were volunteers without known pregnancy complications We selected inclusion criteria of greater than 28 weeks gestation, singleton pregnancy and no ruptured membranes The initial AF index was between 7 0–24 0 cm which we consider normal [6,7] An investigator not performing the AF index randomized each subject to either the control or the hydration group using opaque envelope selection The envelopes, each containing the group notation, had been randomly mixed and then numbered consecutively A sample-size calculation with α = 0 05 and β = 0 20 and an effect size of a 20% increase in AF index, estimated that approximately 20 subjects were needed per group

Hydration subjects were given an 800-mL plastic container marked in mL and were instructed to drink 2 L of water in approximately 2 hours and return for the

From the Department of Obstetrics Gynecology and Reproductive Sciences University of California San Francisco San Francisco California

0029 7844/93/$6 00

124

Table 1 Results of Maternal Hydration

	Control (N = 20)	Hydration (N = 20)
Pre-treatment		
AF index (cm)	17 7 ± 5 0	18 4 ± 4 7
USG	1 013 ± 0 007	1 015 ± 0 008
Post treatment		
AF index (cm)	16 2 ± 4 48	21 4 ± 4 5*
USG	1 019 ± 0 009†	1 006 ± 0 006†
Delta AF index‡ (cm)	−1 5 ± 2 7	3 0 ± 2 4
Intake (mL)§	1576 ± 607	1596 ± 465

AF = amniotic fluid USG = urine specific gravity
* $P \leq$ 02 paired t test pre-treatment *vs* post treatment
† $P \leq$ 0001 paired t test pre-treatment *vs* post-treatment
‡ Post treatment AF index − pre-treatment AF index
§ Previous 24-h liquid intake

repeat AF index 2–5 hours after finishing the water The women in the control group received the same container but were instructed to drink only 100 mL and to return 2–5 hours later for the repeat AF index Subjects were asked not to reveal to which group they had been randomized Urine specific gravities were recorded immediately after both the pre- and post-treatment AF indexes were measured The times of the pre-treatment and post-treatment AF indexes were recorded for all women, and the women in the hydration group recorded the time they began drinking and the time they finished drinking the water All subjects were asked to estimate the volume of liquid they consumed the previous day for an estimate of background hydration

All AF indexes were performed by the same investigator (KLS) using the method of Phelan et al [8] Two AF indexes were measured at each visit and the mean used for analysis The differences between the post- and pre-treatment AF indexes and urine specific gravities were referred to as the delta AF index and delta urine specific gravity, respectively The data were analyzed with paired and nonpaired Student t tests and simple regression analyses as appropriate

Results

Oral hydration was associated with a significant increase in AF index As seen in Table 1, the AF index increased by a mean of 3 0 ± 2 4 cm after hydration with 2 L of water (paired t-test, $P \leq$ 0001) This represents approximately a 16% increase in AF index Conversely, the AF index declined significantly in the control patients, whose oral intake was limited to 100 mL over the same period (paired t-test, $P \leq$ 02) The AF index decreased by a mean of 1 5 ± 2 7 cm

Figure 1 displays the delta AF indexes The pre-treatment AF indexes were not significantly different between the control and hydration groups, whereas the post-treatment AF indexes were The pre-treatment urine specific gravities were not different between the groups However, the hydration group showed a significant decrease and the control group a significant increase in urine specific gravity (paired t test, $P \leq$ 0001) The delta urine specific gravity had a significant negative correlation with the delta AF index (R = −0 62, $P \leq$ 0001)

There was no difference in the total time between the pre- and post-treatment AF index determinations, with 360 ± 45 and 333 ± 43 minutes for the hydration and control groups, respectively The mean time to drink the 2 L was 127 ± 37 minutes, and the mean time between finishing the water and the post-treatment AF index was 209 ± 35 minutes with a range of 150–270 There was no difference between the groups in the mean fluid intake the previous day, with a mean of approximately 1 6 L each The mean gestational ages were not significantly different between the control and hydration groups (35 1 ± 3 4 versus 34 6 ± 4 0 weeks, respectively) One patient in the hydration

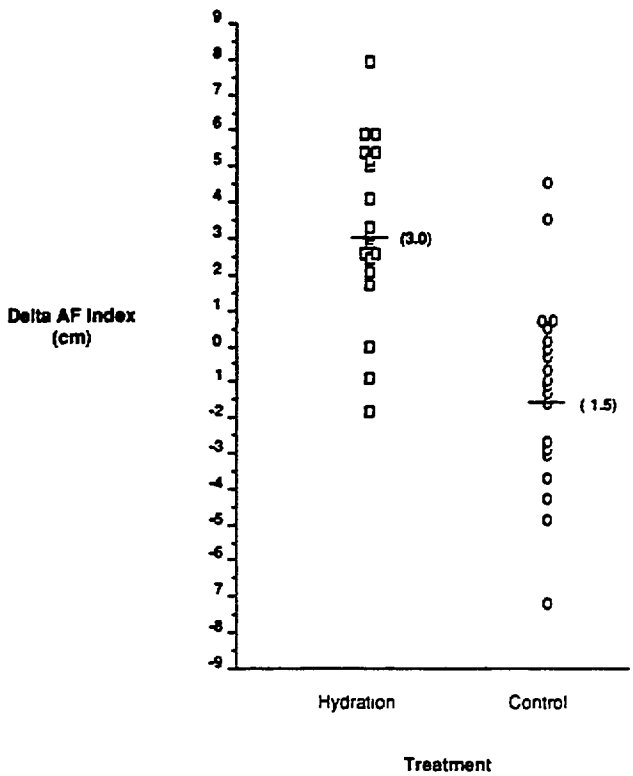


Figure 1 Delta amniotic fluid (AF) index (post treatment AF index − pre treatment AF index) for each subject in each group Numbers in parentheses are the mean AF indexes

125

group reported diarrhea after drinking the 2 L of water However, she consumed the 2 L in only 35 minutes, which was by far the shortest time All other hydration subjects drank their water over at least 90 minutes (range 90–240)

Discussion

Maternal hydration was associated with an increase in AF index and a decrease in maternal urine specific gravity in women with normal AF indexes These data corroborate existing evidence in humans that maternal hydration affects AF In women with decreased AF, ie, an AF index of 6 0 cm or less, maternal hydration increased the AF index [5] As might be expected, the magnitude of increase in the AF index was less than that seen in women with a decreased AF index, at 16 and 31%, respectively Our findings suggest that maternal hydration status plays a role in AF volume regulation in women with either normal or decreased AF An unexpected finding, which further supports the concept that maternal hydration status influences AF, was that the control group actually had a significant decrease in AF index as well as an increase in urine specific gravity It appears that limiting oral fluid intake to 100 mL over approximately 6 hours is consistent with fluid deprivation A similar effect was noted in a case report describing a woman with extreme dehydration and oligohydramnios After hydration with 6500 mL of crystalloid, the AF appeared normal [9]

That this effect is not due to chance is supported by the randomized, blinded design of the study and several additional factors The groups were similar before randomization, and the mean AF indexes were similar The urine specific gravities and the amount of fluid consumed the previous day were the same in both groups, suggesting that all subjects had a similar background hydration status before treatment Although this measure of fluid consumption relied on each woman's memory, it seemed to be reliable because the mean daily intake of 1 6 L is similar to the previously reported median fluid intake of 1 9 L for pregnant women [10] The mean time between ingesting the water and measuring the effect on the AF index was 3 5 hours This delay seems to have a reasonable biologic basis, as 2 hours were necessary before direct fetal volume infusion in sheep was associated with a significant increase in AF index [2] One would expect that more time would be necessary before maternal hydration would alter the AF index The time between randomization and measurement of the post-treatment AF index was also the same in each group Finally, it is unlikely that the effects on AF index were due to intra-observer error in measurement We reported previously that the intra-observer error was 3% in our testing center, which is less than the effect size of 8–16% reported here [5] Thus, these data suggest that restricting or augmenting oral maternal fluid intake alters the AF index

The mechanism of this effect is unknown In sheep and in humans, there is evidence that maternal osmolality influences fetal osmolality and urine output acutely, but there are few data evaluating AF volume Maternal dehydration in sheep, by either fluid restriction or mannitol administration, was associated with a decrease in fetal urine flow rate and free water clearance [11–13] Amniotic fluid volume was not measured This effect may be mediated by parallel changes in maternal and fetal osmolality After dehydration, both maternal and fetal osmolality increased and fetal ADH increased, suggesting that the decrease in free water clearance was caused by the increased fetal ADH [11 13] In humans, when maternal osmolality was changed, fetal osmolality changed in the same direction [14] In sheep, direct fetal intravascular infusion increased fetal urine output, and subsequently, AF volume increased [2] Therefore, one might speculate that AF volume would increase with maternal hydration if it caused an increase in fetal volume or decrease in fetal osmolality However, the direct association between maternal hydration changes and AF volume has not been frequently examined Maternal dehydration in the ewe was associated with a 35% reduction in AF volume [15] In humans, a case report noted the association between extreme maternal dehydration and oligohydramnios, and further noted that maternal rehydration was associated with an increase in AF [9] Goodlin et al[16] reported that volume repletion in four of 12 women with decreased intravascular volume resulted in an increase in AF by ultrasound assessment, and further noted a correlation between maternal plasma volume and AF volume Therefore the present data along with our previous results in women with decreased AF, represent the best evidence that altering maternal fluid intake affects AF Further, this suggests that maternal volume or osmolality is a factor in AF regulation Although these changes in AF index in pregnancies with normal AF volume are unlikely to be clinically significant the fact that manipulation of maternal fluid intake can alter AF provides some insight into AF dynamics Further studies are needed to understand the role of maternal hydration state and AF volume in both the normal pregnancy and in those complicated by abnormal fluid volumes Whether there is an effective and safe role for manipulation of maternal fluid intake in the management of abnormal AF volumes remains to be established

126

References

1 Brace RA Amniotic fluid volume and its relationship to fetal fluid balance Review of experimental data Semin Perinatol 1986 10 103–12

2 Brace RA Moore TR Transplacental amniotic urinary and fetal fluid dynamics during very large-volume fetal intravenous infusions Am J Obstet Gynecol 1991 164 907–16

3 Tomoda S Brace RA Longo LD Amniotic fluid volume regulation Basal volumes and responses to fluid infusion or withdrawal in sheep Am J Physiol 1987 252 R380–7

4 Gilbert WM Brace RA The missing link in amniotic fluid volume regulation Intramembranous absorption Obstet Gynecol 1989 74 748–54

5 Kilpatrick SJ Safford KL Pomeroy T Hoedt L Scheerer L Laros RK Maternal hydration increases amniotic fluid index Obstet Gynecol 1991 78 1098–102

6 Jeng CJ Jou TJ Wang KG Yang YC Lee YN Lan CC Amniotic fluid index measurement with the four-quadrant technique during pregnancy J Reprod Med 1990,35 674–7

7 Rutherford SE Phelan JP Smith CV Jacobs N The four-quadrant assessment of amniotic fluid volume An adjunct to antepartum fetal heart rate testing Obstet Gynecol 1987 70 353–6

8 Phelan JP Ahn MO Smith CV Rutherford SE Anderson E Amniotic fluid index measurements during pregnancy J Reprod Med 1987,32 601–4

9 Scherer DM Cullen JBH Thompson HO Woods JR Transient oligohydramnios in a severely hypovolemic gravid woman at 35 weeks gestation with fluid reaccumulating immediately after intravenous maternal hydration Am J Obstet Gynecol 1990 162 770–1

10 Ershow AG Brown LM Cantor KP Intake of tapwater and total water by pregnant and lactating women Am J Public Health 1991 81 328–34

11 Bell RJ Congiu M Hardy KJ Wintour EM Gestation-dependent aspects of the response of the ovine fetus to the osmotic stress induced by maternal water deprivation Q J Exp Physiol 1984 69 187–95

12 Lumbers ER Stevens AD Changes in fetal renal function in response to infusions of a hyperosmotic solution of mannitol to the ewe J Physiol 1983 343 439–46

13 Stevens AD Lumbers ER The effect of maternal fluid intake on the volume and composition of fetal urine J Dev Physiol 1985 7 161–6

14 Battaglia F Prystowsky H Smisson C Hellegers A Brun P The effect of the administration of fluids intravenously to mothers upon the concentrations of water and electrolytes in plasma of human fetuses Pediatrics 1960,25 2–10

15 Schreyer P Sherman DJ Ervin MG Day L Ross MG Maternal dehydration Impact on ovine amniotic fluid volume and composition J Dev Physiol 1990 13.283–7

16 Goodlin RC Anderson JC Gallagher TF Relationship between amniotic fluid volume and maternal plasma volume expansion Am J Obstet Gynecol 1983 146 505–11

Address reprint requests to
Sarah J Kilpatrick MD, PhD
Department of Obstetrics Gynecology and Reproductive Sciences
University of California San Francisco
505 Parnassus Avenue
Box 0132
San Francisco CA 94143–0132

Received July 6 1992
Received in revised form August 27 1992
Accepted August 28 1992

Copyright © 1993 by The American College of Obstetricians and Gynecologists

University multihospital twin study Am J Obstet Gynecol 1980 138 781 9
13 Rush RW Kierse MJNC, Howat P et al Contribution of preterm delivery to perinatal mortality BMJ 1976 2 965 8
14 Golan A Langer R Newman M et al Obstetric outcome in women with congenital uterine malformations J Reprod Med 1992 37 233 6
15 MRC/RCOG Working Party on Cervical Cerclage Interim report of the Medical Research Council (Royal College of Obstetricians and Gynaecologists) multicentre randomized trial of cervical cerclage Br J Obstet Gynaecol 1988 95 437-45
16 Murphy DP The uterine contraction pattern of false labor and its relation to premature labor Am J Obstet Gynecol 1943 46 408 11
17 Martin JN Jr McColgin SW Martin RW Roach H Morrison JC Uterine activity among a diverse group of patients at high risk for preterm delivery Obstet Gynecol 1990 76 47S 51S
18 Alvarez H Caldeyro Barcia R Contractility of the human uterus recorded by new methods Surg Gynecol Obstet 1950 91 1-13
19 Schwenzer I Schumann R Halberstadl E The importance of 24 hour cardiotocographic monitoring during tocolytic therapy In Jung H Lambert G eds Betamimetic drugs in obstetrics and perinatology New York Thieme Stratton 1982 60 4
20 Bell R The prediction of preterm birth by recording spontaneous antenatal uterine activity Br J Obstet Gynaecol 1983 90 884 7
21 Newman N RB Richmon GS Winston YE Hamer C, Katz M Antepartum uterine activity characteristics differentiating true from threatened preterm labor Obstet Gynecol 1990 76 39S 41S
22 Main DM Katz M Chin G Campion S Gabbe SG Intermittent weekly contraction monitoring to prevent preterm labor in low risk women a blinded study Obstet Gynecol 1988 72 757 61
23 Berg G Andersson RGG Ryden G β Adrenergic receptors in human myometrium during pregnancy change in the number of receptors after β mimetic treatment Am J Obstet Gynecol 1985 151 392 6

Longitudinal measurement of amniotic fluid index in postterm pregnancies and its association with fetal outcome

Michael Y Divon, MD, Ariel D Marks, MS, and Cassandra E. Henderson, MD

Bronx New York

OBJECTIVE Our purpose was to study the association between dynamic changes in serial amniotic fluid index measurements and adverse fetal outcome in postterm pregnancies

STUDY DESIGN Serial amniotic fluid index values were obtained semiweekly in 139 reliably dated uncomplicated singleton pregnancies at >41 weeks gestation Adverse fetal outcome was defined by the presence of moderate or thick meconium fetal heart rate decelerations cesarean delivery for fetal distress neonatal intensive care unit admission and perinatal mortality

RESULTS Prominent changes in the amniotic fluid index (i e >50% increase or decrease) had no association with adverse fetal outcome irrespective of rate of change provided the final value remained >5 0 cm A significant association with fetal heart rate decelerations and the presence of meconium was detected only in patients whose final amniotic fluid index was ≤5 0 cm (p = 0 007 and p = 0 003 respectively)

CONCLUSION Irrespective of the rate of change in amniotic fluid index postterm pregnancies are significantly associated with potential complications such as fetal heart rate decelerations and meconium staining when the final amniotic fluid index is ≤5 0 cm (Am J Obstet Gynecol 1995 172 142 6)

Key words Amniotic fluid index postterm pregnancy fetal outcome

From the Department of Obstetrics and Gynecology, Albert Einstein College of Medicine of Yeshiva University
Received for publication February 17 1993 revised April 20 1994 accepted June 1 1994
Reprint requests Michael Y Divon MD Weiler Hospital of Albert Einstein College of Medicine Rm 703 1825 Eastchester Road Bronx NY 10461
Copyright © 1995 by Mosby–Year Book Inc
0002 9378/95 $3 00 + 0 6/1/58076

Several investigators have demonstrated that prolongation of pregnancy beyond term is accompanied by a rise in perinatal morbidity and mortality [1] Abnormalities such as meconium staining congenital anomalies growth retardation dysmaturity and fetal asphyxia have been associated with reduced amniotic fluid volume (oligohydramnios) commonly observed in post

term pregnancies[2, 3] Oligohydramnios has particular relevance to postterm pregnancies because the volume of amniotic fluid diminishes as gestation advances beyond term Outcomes for this complication of pregnancy have been reported by several authors[1, 3] Therefore ultrasonographic evaluation for the presence of oligohydramnios is extensively used for fetal testing in these pregnancies

Amniotic fluid volumes have been shown to significantly decrease as gestational age advances beyond term[6] To date however the relationship between dynamic changes in serially measured amniotic fluid index values and fetal outcome is unknown The purpose of this study was to evaluate dynamic changes in serially obtained amniotic fluid index values and to determine any association with adverse fetal outcome in the postterm population

Material and methods

All postterm patients seen at the Maternal Fetal Assessment Center of Weiler Hospital at the Albert Einstein College of Medicine between Jan 1 1988 and July 30 1991 were evaluated for participation in this study (n = 638) Patients were selected for further analysis on the basis of the following criteria (1) singleton pregnancy (2) reliable dating of gestational age (selection was restricted to individuals with a regular menstrual cycle and certain last menstrual period consistent with ultrasonographic estimates of gestational age last menstrual period was thus used to calculate gestational age for all patients) (3) gestational age ≥41 weeks at initial evaluation and (4) a minimum of two ultrasonographic evaluations of the amniotic fluid index were required for analysis of longitudinal trends Patients whose last menstrual period was not consistent with ultrasonographic estimates or whose gestational age was established by ultrasonographic parameters alone or who had only one measurement of amniotic fluid index were excluded from further analysis Thus 139 patients met the entry criteria and formed the study population

Amniotic fluid index measurements were obtained with an Aloka 650 ultrasonographic device with a 3 5 MHz linear transducer (Corometrics Medical Systems Wallingford Conn) With the patient typically lying in the supine position the transducer head was placed along the longitudinal axis perpendicular with the floor as described by Phelan et al and the pocket of amniotic fluid with the deepest vertical dimension was identified and measured in centimeters This procedure was repeated in each of the uterine quadrants and the values were added to determine the amniotic fluid index In pockets that contained both amniotic fluid and the umbilical cord measurements were based on the space occupied by fluid only

Those patients with amniotic fluid index measurements consistently >5 0 cm who also demonstrated either a reactive nonstress test or a biophysical profile score ≥8/10 were maintained on a semiweekly fetal evaluation protocol During the semiweekly fetal evaluations any patient whose amniotic fluid index dropped to <5 0 cm or who had abnormal fetal testing results was referred for delivery because of the higher morbidity associated with these conditions

A Wilcoxon signed rank test established whether the first and last amniotic fluid index measurements were significantly different Amniotic fluid index values were categorized into two groups with further subdivisions group 1 patients whose values increased between the first and last measurements group 2 patients whose values decreased between the first and last measurements group 2a patients whose values decreased but remained >5 0 cm and group 2b patients whose values decreased and fell below 5 0 cm

At delivery the following data variables were collected presence of moderate or thick meconium abnormal intrapartum fetal heart rate (FHR) decelerations (variable or late decelerations or bradycardia) cesarean delivery for fetal distress neonatal intensive care unit admission and neonatal mortality FHR patterns were evaluated from the initiation of the active phase of labor Persistent patterns were then identified and the most severe patterns were used to classify the FHR tracing Any decrease in FHR that did not meet the criteria for early or late decelerations or bradycardia was considered a variable deceleration Cesarean delivery was categorized into fetal distress which related to immediate fetal well being Scalp pHs were used to define the need for emergency cesarean section and not just FHR abnormalities except in situations in which it was technically impossible to obtain a scalp pH yet FHR abnormalities were of significant clinical concern to warrant an immediate delivery Other indications that did not encompass issues that related directly to fetal well-being included repeat cesarean section arrest of dilation breech presentation preeclampsia macrosomia chorioamnionitis failed induction arrest of descent and cord prolapse

Adverse fetal outcome was compared with the amniotic fluid changes in each group by Student s two sample t test χ test or Fisher s exact test when appropriate Statistical significance was defined as $p < 0\ 05$ Significant changes in amniotic fluid index were defined as an increase or a decrease of ≥50% This cutoff level was chosen because it represents a change that is substantially greater than the interobserver and intraobserver variability reported by Moore and Cayle[4]

Results

The total number of deliveries seen at the College Hospital during the study period was 11 175 Six hundred thirty eight patients had gestational ages ≥41

Table I Change in amniotic fluid index in postterm pregnancies versus adverse fetal outcome

	Adverse fetal outcome			
	Meconium staining	*FHR decelerations (variable or late decelerations or bradycardia)*	*Cesarean section (fetal distress)*	*Neonatal intensive care unit admission*
Group 1 (any increase in amniotic fluid index) (n = 43)	12	14	2	3
Group 2 (any decrease in amniotic fluid index) (n = 96)	26	18	4	4
Group 2a (decrease in amniotic fluid index by ≥50%) (n = 12)	6	5	0	2
Group 2b (final amniotic fluid index <5 0 cm) (n = 14)	10*	9†	2	2

*p = 0 007
†p = 0 003

weeks (5 7%) With criteria for postdatism as defined by The American College of Obstetricians and Gynecologists (i e ≥42 weeks of gestational age) the incidence of postdatism in the total population was 3% Of the 638 patients initially evaluated by ultrasonography 45 (7 1%) had either an amniotic fluid index ≤5 0 cm or otherwise abnormal fetal testing and were therefore referred for delivery The remaining 593 patients either went into spontaneous labor underwent labor induction because of a favorable cervix or had a subsequent amniotic fluid index evaluation Four patients who had serial amniotic fluid level measurements were lost to follow-up No outcome results where available for these individuals The study group consisted of 139 patients who fulfilled the entry criteria by having two or more amniotic fluid index measurements with reliable gestational dates and who were delivered in our hospital allowing outcome variables to be obtained Oligohydramnios (i e amniotic fluid index ≤5 0 cm) was demonstrated in 14 of the 139 patients (10%) who fulfilled the entry criteria The mean gestational ages for the first and last ultrasonographic examinations were 41 6 ± 0 5 weeks (±SD) and 42 4 ± 0 6 weeks respectively The mean time interval between individual first and last measurements was 5 5 days (±3 4 days) The range of gestational ages was 41 2 to 43 9 weeks

Forty postterm patients demonstrated an increase in amniotic fluid index between serial ultrasonographic examinations Three patients showed no change in amniotic fluid index and 96 patients had a drop in amniotic fluid index Fourteen of the patients who had a decrease in amniotic fluid index had final values <5 0 cm The mean amniotic fluid index of all 139 patients for the first and last ultrasonographic examinations was 12 6 cm (±5 2 cm) and 10 6 cm (±4 6 cm) This decrease was statistically significant (p < 0 0007) In the patients who either had an increase or no change in amniotic fluid index (n = 43) the mean initial value was 10 4 ± 4 0 cm with an average increase of 27% ± 29% In those patients whose amniotic fluid index values decreased but remained >5 0 cm (n = 82) the mean initial value was 13 9 ± 3 9 cm with an average 25% ± 17% drop In patients whose values decreased to <5 0 cm (n = 14) the mean initial amniotic fluid index was 8 6 ± 3 2 cm with an average drop of 53% ± 26% Seventy-five percent of the patients who had a >50% drop in amniotic fluid index during the course of the study had final values <5 0 cm

The association between changes in amniotic fluid index and fetal outcome variables is shown in Table I The presence of FHR abnormalities and meconium staining was significantly higher when the amniotic fluid index fell below 5 0 cm Reasons for neonatal intensive care unit admission in those patients who showed an overall increase in amniotic fluid index included meconium aspiration (1) rule out sepsis (1) and transient tachypnea of the newborn (1) In those patients who demonstrated a drop in amniotic fluid index reasons for neonatal intensive care unit admissions included low Apgar score (1) meconium aspiration (2) and rule out sepsis (1)

The presence of FHR abnormalities or meconium cannot be attributed to macrosomia (Table II) or gestational age The mean gestational age for infants with adverse outcome was 42 3 ± 0 5 weeks and for infants with no evidence of adverse outcome 42 4 ± 0 6 weeks (not significant) The mean birth weight of infants whose final amniotic fluid index was >5 0 cm was 3700 ± 386 gm and for those whose final amniotic fluid index was ≤5 0 cm 3409 ± 445 gm This difference was not statistically significant Overall the incidence of cesarean deliveries in the study population was 28% six patients were delivered by cesarean section because of fetal distress and 33 for other indications No mortality or structurally abnormal fetuses or newborns were observed in the study population

Table II Association between birth weight FHR abnormalities and meconium staining

Birth weight (gm)	*FHR decelerations*	*No FHR decelerations*	*Meconium staining*	*No meconium staining*
≤4000	53	64	38	79
>4000	10	12	9	13
TOTAL	63	76	47	92

χ^2 test for FHR decelerations = 0.048 p = 0.826 (not significant) χ^2 test for meconium staining = 0.272 p = 0.602 (not significant)

Comment

The introduction of ultrasonographic antepartum examination has greatly simplified the diagnosis of oligohydramnios. There remains considerable conjecture over the specific definition of oligohydramnios. Some researchers define oligohydramnios as an amniotic fluid index ≤5.0 cm.[1] Others have defined it as an amniotic fluid index <5th percentile for gestational age.[10] In addition, an arbitrarily defined maximum vertical pocket depth as visualized by ultrasonography has been suggested by Chamberlain et al.[2] who used a 2 cm rule to define oligohydramnios. Various authors[4,11] have suggested subjective scales to assess the amount of amniotic fluid. Subjective methods however have not gained wide acceptance because of their lack of reproducibility and increased interobserver variability.

This study confirms previous reports that oligohydramnios (defined as an amniotic fluid index ≤5.0 cm) is associated with potential perinatal complications or compromise.[1,12] However it is unique in that dynamic changes in serially obtained amniotic fluid index values as opposed to absolute values were compared with outcome variables. Prominent increases or decreases in amniotic fluid index of postterm patients had no association with adverse fetal outcome irrespective of the rate of change of the amniotic fluid index provided the final value remained >5.0 cm. When the amniotic fluid index fell below 5.0 cm there was a significant association with increased incidence of FHR abnormalities and the presence of meconium.

This association between reduced amniotic fluid index and variable decelerations is well documented.[13,14] As suggested by Gabbe et al.[14] and Lee and Hon[16] variable FHR decelerations detected in patients with oligohydramnios are probably related to increased umbilical cord compression. This idea is further supported by reports of intrapartum saline solution amnioinfusion in mothers with oligohydramnios. This procedure was shown to reduce the incidence of variable FHR decelerations, meconium staining below the vocal cords and operative delivery for fetal distress.[17,18]

In the postterm pregnancy the combination of a larger infant and a decreased amount of amniotic fluid makes it possible that during fetal movement or uterine contraction the umbilical cord is vulnerable to compression or impingement. Both Phelan et al.[7,9,10] and Eden et al.[19] found that the frequency of nonstress tests demonstrating FHR decelerations and bradycardias increased as the ultrasonographic estimates of the amniotic fluid declined. The presence of meconium is also a common finding in reduced amniotic fluid volume.[20] Sarno et al.[21] showed that when the amniotic fluid index was ≤5 cm the incidence of meconium staining and variable decelerations increased.

Numerous hypotheses have been offered to explain the pathophysiologic mechanisms of oligohydramnios. Oligohydramnios when defined as an amniotic fluid index ≤5.0 cm has an incidence of 8.5% to 15.5%.[1,13] In the absence of ruptured membranes or fetal renal tract abnormalities diminishing levels of amniotic fluid volume may be related to poor placental function.[22] The major determinants of amniotic fluid volume in the mature fetus are fetal urine output and fetal swallowing. Nicolaides et al.[5] hypothesized that fetal hypoxemia may result in diminished urine production which in turn may cause oligohydramnios. Similarly Campbell et al.[4] argue that inadequate placental function might cause hypoxemia and hence oligohydramnios. This is an attractive model especially in the postterm population which has an increased incidence of placental senescence and hence reduced placental function. A vicious cycle could develop with oligohydramnios causing cord compression resulting in further hypoxemia, oligohydramnios and FHR abnormalities. The increased incidence of FHR abnormalities seen with decreased amniotic fluid index values in our patients supports this hypothesis. Under these circumstances fetal hypoxemia may induce relaxation of the rectal sphincters and hence meconium staining, another finding seen when the amniotic fluid index dropped to <5.0 cm. Considering the absence of statistically significant fetal compromise when values remained >5.0 cm irrespective of the rate of drop, this cascade of events seems to require an absolute drop whereby cord compression cannot be avoided.

Trimmer et al. reported that oligohydramnios is associated with diminished fetal urine production in postdates pregnancies. Other causes of oligohydram

nios in the postdates population include spontaneous rupture of the membranes genitourinary anomalies, intrauterine growth retardation and abnormal karyotypes It is important to rule out these other causes of oligohydramnios before attributing reduced amniotic fluid levels to fetal hypoxemia

The use of an amniotic fluid index ≤5 0 cm to define oligohydramnios was first suggested by Phelan et al [7 9 10] as an arbitrary measure based on retrospective studies Nevertheless it has since gained popular appeal Our results support this criterion as a useful predictor of potential fetal compromise However unlike other studies we prospectively examined serial changes in amniotic fluid index in the postterm population and demonstrated that large changes (both increases and decreases) are not significant unless the index value drops below 5 0 cm Ten percent of the patients in our study had a normal amniotic fluid index which dropped below 5 0 cm on subsequent testing thus serial amniotic fluid index values to detect oligohydramnios should continue to have a definite role in the management of postterm pregnancies

Adverse fetal outcome is not uniformally detected in postterm pregnancies with oligohydramnios Therefore distinguishing patients who have low levels of amniotic fluid but are otherwise normal from those whose oligohydramnios is a manifestation of a pathologic mechanism remains a challenge

REFERENCES

1 Naeye RL Causes of perinatal mortality excess in prolonged gestations Am J Epidemiol 1978 108 429 33
2 Chamberlain PF Manning FA, Morrison I Harman CR Lange IR Ultrasound evaluation of amniotic fluid volume I The relationship of marginal and decreased amniotic fluid volumes to perinatal outcome Am J Obstet Gynecol 1984 150 245 9
3 Crowley P O Herlihy C, Boylan P The value of ultrasound measurement of amniotic fluid volume in the management of prolonged pregnancies Br J Obstet Gynaecol 1984 91 444 8
4 Mercer LJ Brown LG Petres RE Messer RH A survey of pregnancies complicated by decreased amniotic fluid Am J Obstet Gynecol 1984 149 355 61
5 Bastide A Manning FA. Harman CR Lange IR Morrison I Ultrasound evaluation of amniotic fluid outcome of pregnancies with severe oligohydramnios Am J Obstet Gynecol 1986 154 895 900
6 Marks AD Divon MY Longitudinal study of the amniotic fluid index in postdates pregnancy Obstet Gynecol 1992 79 229 33
7 Phelan JP Smith CV Broussard P Small M Amniotic fluid volume assessment with the four quadrant technique at 36 42 weeks gestation J Reprod Med 1987 32 540 2
8 Moore TR Cayle JE The amniotic fluid index in normal human pregnancy Am J Obstet Gynecol 1989 161 882 3
9 Phelan JP Platt LD Yeh S Broussard P Paul RH The role of ultrasound assessment of amniotic fluid volume in the management of the postdate pregnancy Am J Obstet Gynecol 1985 151 304 8
10 Phelan JP Ahn MO Smith CV Rutherford SE, Anderson E Amniotic fluid index measurements during pregnancy J Reprod Med 1987 32 601-4
11 Crowley P Non quantitative estimation of amniotic fluid volume in suspected prolonged pregnancy J Perinat Med 1980 8 249 51
12 Rutherford SE, Phelan JP Smith CV Jacobs N The four quadrant assessment of amniotic fluid volume an adjunct to antepartum fetal heart rate testing Obstet Gynecol 1987 70 353 6
13 Sarno AP Ahn MO Harbinder SB et al Intrapartum Doppler velocimetry amniotic fluid volume and fetal heart rate as predictors of subsequent fetal distress I An initial report Am J Obstet Gynecol 1989 161 1508 14
14 Gabbe SG Ettinger BB Freeman RK Martin CB Umbilical cord compression associated with amniotomy Laboratory observations Am J Obstet Gynecol 1976 126 358 5
15 Miyazaki FS Taylor NA Saline amnioinfusion for relief of variable or prolonged decelerations A preliminary report Am J Obstet Gynecol 1983 146 670 8
16 Lee ST Hon EH Fetal hemodynamic response to umbilical cord compression Obstet Gynecol 1963 22 558 62
17 Strong TH Hetzler G Sarno AP Paul RH Prophylactic intrapartum amnioinfusion a randomized clinical trial Am J Obstet Gynecol 1990 162 1370 5
18 Wenstrom KD Parson MT The prevention of meconium aspiration in labor using amnioinfusion Obstet Gynecol 1989 73 647 51
19 Eden RD Gergely RZ Schifrin BS Wade ME Comparison of antepartum testing schemes for the management of the postdate pregnancy Am J Obstet Gynecol 1982 144 683 91
20 Phelan JP Platt LD Yeh SY Trujillo M Paul RH Continuing role of the nonstress test in the management of postdates pregnancy Obstet Gynecol 1984 64 624 8
21 Sarno AP Jr Ahn MO Phelan JP Intrapartum amniotic fluid volume at term association of ruptured membranes oligohydramnios and increased fetal risk J Reprod Med 1990 35 719 23
22 Gresham EL Rankin JHG Makowski EL Meschia G Battaglia FC An evaluation of fetal renal function in a chronic sheep preparation J Clin Invest 1984 150 245 9
23 Nicolaides KH Peters MT Vyas S Rabinowitz R Rosen DJD Campbell S Relation of rate of urine production to oxygen tension in small for gestational age fetuses Am J Obstet Gynecol 1990 162 387 91
24 Campbell S Wladimiroff JW Dewhurst CJ The antenatal measurement of fetal urine production Br J Obstet Gynaecol 1973 80 680 6
25 Trimmer KJ Leveno JL Peters MT Kelly MA Observations on the cause of oligohydramnios in prolonged pregnancy Am J Obstet Gynecol 1990 163 1900 3

132.

A Comparison of the Auscultated Acceleration Test and the Nonstress Test as Predictors of Perinatal Outcomes

LISA L PAINE • MARY I BENEDICT • DONNA M STROBINO • CAROLYN L GEGOR • ELAINE L LARSON

In this prospective study the predictive ability of the nonstress test (NST) the most widely used antepartum screening test to assess fetal well-being was compared with that of the auscultated acceleration test (AAT) in predicting perinatal outcomes The AAT is a more easily administered test than the NST and, unlike the NST does not use electronic fetal monitors Study subjects were 205 women with singleton pregnancies greater than 34 weeks gestation whose delivery occurred within 7 days of receiving antepartum testing by NST at Johns Hopkins Hospital The AAT yielded better prediction of poor perinatal outcomes than the NST The NST, however was a significantly better predictor of favorable outcomes than the AAT The AAT has the potential to affect perinatal care if false positive results can be decreased through further research

The nonstress test (NST) is currently the most widely used electronic fetal monitoring (EFM) technique for screening high-risk fetuses It has been popularized due to its noninvasive nature and the ease of test performance and interpretation However the NST requires the use of expensive fetal monitors technological support and specially trained personnel making it unavailable to many pregnant women In addition use of the NST as a universal screening test has been discouraged because of its low sensitivity in predicting perinatal morbidity outcomes

Interest in a low-technology screening test that is less expensive and simpler to administer than the NST prompted the development of the auscultated acceleration test (AAT) by Paine and her colleagues (Paine, Payton & Johnson 1986a Paine, Johnson, Turner, & Payton 1986b Paine Johnson & Alexander,1988) This 6-minute test is conducted without the use of EFM and can be easily administered by nurses using a fetoscope Thus it has appeal as a universal screening test for all low-risk pregnant women as well as for high-risk women in remote sites

The AAT appears to be easily reproducible by properly trained nurses (Paine et al , 1986a) Moreover the AAT is quite reasonable in predicting abnormal NST results (sensitivity of 75) and excellent in predicting normal NST results (specificities ranging from 93 to 98) (Paine et al 1986b 1988) On the other hand, vibroacoustic stimulation does not appear to increase the usefulness of the AAT in predicting NST results over manual stimulation of the fetus (Paine et al 1988) While these studies suggest promise of the AAT as a universal screening test none have evaluated AAT prediction of perinatal outcome

The purpose of this research was to compare the validity of the AAT and the NST as screening tests in predicting selected perinatal outcomes in a sample of women with high-risk pregnancies It was also designed to address some of the limitations of previous studies of the AAT particularly with regard to sample size test interpretation variability and appropriate statistical analysis

Method

Study Setting and Subjects The study site was the Fetal Assessment Center a nurse-managed center for antepartum fetal surveillance Two hundred thirty of the 297 women who received antepartum testing during the study period met the eligibility criteria Of the 230 eligible women 12 refused to participate in the study The most common reason for refusal was concern about the length of time the testing would take An additional 13 women were eliminated from analysis due to scheduling conflict (5 women) technical problems in conducting the AAT (women) and interceding events that could not be detected by antepartum testing (4 women) The final sample for analysis contained 205 women These women did not differ from all eligible women on any demographic or clinical variables

The women in the sample were relatively young M = 24 7 years SD = 5 9 and had a completed education of M = 12 3 SD = 2 9 years The majority were black (63 9%) and unmarried (56 9%) Over half were clinic service users or financed by medical assistance and half were nulliparas The most common labor complication were dysfunctional labor fetal distress syndrome and nuchal umbilical cord More than half of the women de

livered vaginally spontaneously one-fifth by forceps or vacuum and the remainder by cesarean The infants weighed an average of 3,349 8 gm (*SD* = 582 4 gm) and 88 7% had a one-minute Apgar score of over 6

Procedure Four data collectors performed the AATs and gathered demographic and clinical data They were blinded to the results of the NST Three were certified nurse–midwives and one was an experienced fetal assessment nurse The data collectors were trained to perform the AAT prior to the start of data collection, 6–10 supervised auscultations were conducted by each auscultator until the auscultator had correctly demonstrated the protocol technique One of the data collectors, the most experienced in fetal assessment techniques, also interpreted the NST results

The procedures for administering the NST and the AAT conformed to the published literature and to the routine procedures used in the center For both tests, participants were asked to assume a semi-sitting (semi-Fowler s) position with a slight left tilt to avoid supine hypotension (Abitbol Monheit Poje & Baker 1986, Witter & Besinger 1989) For the NST external electronic fetal monitoring (EFM) was started by the center nurse who was not one of the four data collectors EFM was generally stopped at 20 minutes unless reactivity was not achieved in the latter case the test was repeated for another 20-minute segment The mean time subjects spent undergoing EFM for the NST was 44 3 minutes

The NST was interpreted for clinical purposes by the attending physician and by objective criteria by the most experienced data collector The standard minimum criteria were used for NST reactivity of at least two fetal heart rate (FHR) accelerations of at least 15 beats per minute lasting 15 seconds within a 20-minute period (Keegan & Paul 1980 Paine et al 1988) The NST was nonreactive if these criteria were not met Discrepancies in the interpretation of the NST occurred between the attending physician and the data collector in 5 2% of the tests These NSTs were reevaluated by another center attending physician and her interpretation was used to determine test results for analysis purposes

The auscultators performed the AAT using the basic technique reported by Paine and colleagues (1986a) with one modification The AATs were not discontinued after an acceleration was auscultated as was done previously they were continued for a full 6 minutes, whether or not accelerations occurred EFM was performed simultaneously with the AAT on 96 4% of the participants to determine accuracy of auscultation of baseline FHRs by the auscultators The correlation between auscultated and monitored FHR baselines was 80 for all auscultators, with a range from 69 to 87

The auscultator first listened to the FHR using an Allen-type fetoscope for 2 minutes to establish the baseline FHR and to record any accelerations The auscultated FHRs were recorded on an AAT data collection graph (Paine et al 1986a) If no acceleration of at least two beats per 5-second period occurred during this initial period the fetus was externally manipulated using a gentle 5-second shaking procedure to elicit fetal movement The shaking procedure was repeated once more if no fetal movement occurred in the 2-minute period after the first manipulation The auscultation continued for an additional 2 minutes for a total of 6 minutes of auscultation The majority of women needed external manipulation twice to elicit fetal movement No external manipulation was required for 23 8% of women while it was used once for 18 9%

Standard criteria were used to read the AATs and determine AAT reactivity (Paine et al , 1986a 1986b) An auscultated acceleration was defined as a FHR increase of at least two beats per 5 seconds above the baseline The AAT was considered reactive if one auscultated acceleration occurred during the 6 minutes of auscultation and nonreactive if no acceleration occurred

The AATs were uniformly read by a data collector who read the NSTs Fourteen (5 6%) of the tests were reread to evaluate reliability of the initial readings Thirteen readings were identical, one discrepant result was found (92 9% accuracy)

Description of the Tests and the Testing Circumstances Only the NST/AAT test closest to delivery was used in the analysis presented here, although a total of 591 NST/AAT test pairs were performed on the study women The most frequent indications for the last test prior to delivery were postterm pregnancy (47 3%) and suspected intrauterine growth retardation (22 0%) Other indications such as pregnancy-induced hypertension previous pregnancy loss gestational diabetes and decreased fetal movement occurred with less frequency The NST was the only EFM test performed on 89 (35 9%) women The remaining 159 (64 1%) underwent additional antepartum tests during their last fetal assessment visit Labor was induced in 9 (3 7%) women due to nonreassuring fetal testing

The prevalence of nonreactive AATs was 24 2% of nonreactive NSTs 8 1% The mean time to NST reactivity was 44 3 minutes Over 60% of the test pairs met criteria for reactive AATs within 2 minutes, over 80% within 3 minutes and over 90% within 5 minutes

Table 1 Delineation of Common Measures of Screening Test Validity Applied to Prediction of Outcome by Antepartum Nonstress Test and Auscultated Acceleration Test

Sensitivity	Proportion of nonreactive tests among all who had an unfavorable outcome
Specificity	Proportion of reactive tests among all who had a favorable outcome
Predictive value positive	Proportion or unfavorable outcomes among all who had nonreactive tests
False positive rate	Proportion of favorable outcomes among all who had nonreactive tests
Predictive value negative	Proportion of favorable outcomes among all who had reactive tests
False negative rate	Proportion of unfavorable outcomes among all who had reactive tests
Prevalence	Proportion of unfavorable outcomes among all who were tested

Table 2 Differences in Sensitivity and Specificity Between the Nonstress Tests and Auscultated Acceleration Tests in Prediction of Poor Perinatal Outcomes (N = 205)

			Sensitivity			Specificity		
Outcome	n	Prevalence	NST	AAT	p	NST	AAT	p
Small for gestational age	12	6 0%	16	42	ns	93	75	< 0001
Late decelerations	15	7 3%	07	29	ns	92	75	< 0001
Fetal distress	28	13 8%	11	29	ns	92	74	< 0001
Operative delivery for FDS	26	12 7%	08	27	ns	92	74	< 0001
Thick meconium	21	10 4%	00	20	< 05	90	73	< 0001
Neonatal resuscitation	4	2 0%	50	1 00	05	93	76	< 01
NICU admission	7	3 4%	14	43	ns	92	75	< 0001

Demographic and Clinical Data Data were abstracted from medical records of the study women on two occasions Demographic and clinical data were abstracted from the records by the auscultators at the time of testing Intrapartum and newborn outcomes during labor and delivery were abstracted from the mother and newborn s charts shortly after birth Reliability of the abstracted data was evaluated by reabstraction of 10 selected variables for 10% (n = 25) of the records The overall accuracy rate for these variables was 93 8%

Several measures of perinatal outcomes considered conceptually and clinically important and which occurred with enough frequency in the population to result in meaningful analysis (prevalence >2%) were studied to test the predictive validity of the AAT and the NST They were late FHR decelerations in labor fetal distress in labor operative delivery for fetal distress thick meconium stained amniotic fluid neonatal resuscitation immediate neonatal intensive care unit (NICU) admission and small for gestational age These variables were abstracted from labor and delivery records

Data Analysis Measures of screening test validity were calculated to evaluate the predictive ability of the AAT and NST (Larson 1986) including sensitivity specificity, positive and negative predictive value false positive and false negative rates and overall observed agreement (see Table 1 for definitions) Z-scores were used to detect significant differences in estimates of each validity measure between the AAT and the NST The conventional level of significance of 05 was used throughout the analysis

Results

Table 2 shows estimates of the prevalence sensitivity, and specificity for the prediction of perinatal outcomes by the NST and AAT Z-score p-values are also shown for comparison of each of these estimates between the NST and AAT

Sensitivity was very low for all outcomes for the NST it exceeded 20 for only one measure neonatal resuscitation The AAT sensitivity was somewhat higher for each outcome at least 20 for all outcomes when compared to the NST However only for thick meconium stained amniotic fluid and neonatal resuscitation were the differences between tests significant

Specificity was much higher than sensitivity for all outcomes for the two tests It also was more consistent across outcomes than sensitivity It exceeded 90 for all outcomes for the NST while it ranged from 70 to 75 for the AAT All differences in specificity between the AAT and the NST were statistically significant

To further evaluate the validity of the two tests the most serious perinatal outcomes were combined for the two major types of pre- and postdelivery components of perinatal morbidity fetal distress (FD) and neonatal morbidity (NM) Fetal distress is clinically defined as a potentially precarious fetal condition which if allowed to persist, *may* result in permanent damage or perinatal death (Boehm 1990 Huddleston 1990) FD was defined for study purposes as delivery due to the clinical diagnosis of FD in labor or diagnosis of distress in labor which was unresponsive to treatment Fourteen percent of the 205 women experienced FD in labor

Neonatal morbidity was defined as the presence of one or more of the following neonatal resuscitation using endotracheal intubation or positive pressure oxygen administration immediate admission to the NICU or hospital stay greater than 6 days These variables were combined due to their low prevalence Morbidity related to prematurity suspected sepsis or a long hospital stay due to maternal factors was not included in this measure since it is unlikely to have been detected by antepartum testing A total of 8 (3 9%) of the 205 newborns had NM as defined here 4 (2 0%) required resuscitation and 6 (2 9%) had prolonged hospital stay or were admitted to the NICU Five infants were included in both the FD and the NM groups

Table 3 shows the screening test validity measures and Z-scores for the NST and AAT prediction of fetal distress and neonatal morbidity The sensitivity of the AAT (28) in predicting FD was significantly higher than the sensitivity of the NST (10) while the specificity of the AAT was significantly lower Positive and negative predictive values and false positive and false negative rates for FD were not significantly different between the two tests Overall agreement of the test results with the presence or absence of FD for the AAT (68) was significantly lower than for the NST (81)

The sensitivity of the AAT in predicting NM (75) was higher than the sensitivity of the NST (38) although these differences were not statistically significant Specificity (76) and overall agreement (65) of the AAT for NM were significantly lower than the specificity (92) and overall agreement (91) of the NST but no other comparisons were statistically significantly different

Discussion

The results of this study suggest that the AAT may be a better predictor of poor perinatal outcomes than the NST

(although sensitivity was low for both the NST and the AAT) Differences in screening test validity measures between the two tests, however, were significant only for thick meconium stained fluid vigorous neonatal resuscitation and an index of fetal distress On the other hand the NST was a significantly better predictor of a favorable outcome than the AAT

The results for sensitivity and specificity must be interpreted in light of the fact that the two measures are interrelated When sensitivity is high, specificity is low, and vice versa Thus, we would expect the different patterns to exist for the NST and AAT, once we know that they differ on either measure

Table 3 Z Score Differences in Screening Test Validity Measures for Nonstress Test and Auscultated Acceleration Test Prediction of Fetal Distress and Neonatal Morbidity (N = 205)

Screening Test	Fetal Distress			Neonatal Morbidity		
Validity Measures	NST	AAT	p	NST	AAT	p
Sensitivity	10	28	< 01	38	75	ns
Specificity	92	74	< 001	92	76	< 0001
Positive predictive value	18	15	ns	18	11	ns
False positive rate	82	85	ns	82	89	ns
Negative predictive value	86	86	ns	97	99	ns
False negative rate	14	14	ns	03	01	ns
Overall agreement	80	68	< 01	91	76	< 0001

The difference in the results for the two tests may be due in part to differences in the prevalence of nonreactive tests between the AAT (24%) and the NST (8%) The decreased false positives from the NST are likely to arise from its longer testing time and its better detection of low amplitude FHR accelerations The longer testing time is not, however, a positive feature of the NST as it limits its use as a universal screening test

Although the low sensitivities reported here are of some concern, low sensitivity of antepartum tests in predicting poor perinatal outcomes has been widely reported (Mohide & Grant, 1989, Devoe, Castillo & Sherline 1985 Thacker & Berkelman, 1986) One reason for the low sensitivities observed here for both NSTs and AATs may be due to the use of perinatal morbidity to evaluate antepartum testing Some proponents of antepartum testing claim that the only outcome of importance in evaluating antepartum testing programs is antepartum fetal death Others argue that the prediction of morbidity outcomes is also important, particularly when comparing the value of one test with the other (Hutson & Petrie 1986) Indeed the absence of a poor outcome after an appropriate intervention for a nonreassuring test does not necessarily indicate a false positive test result It may, rather indicate a successfully timed intervention based on the ability of the test to indicate a *potential* problem (Mohide & Grant 1989 Mohide & Keirse, 1989)

Several limitations warrant comment here First the prevalence of nonreactive NSTs and poor perinatal outcomes was lower than anticipated A higher prevalence would have improved the ability to detect significant differences in sample proportions between the tests (Sackett Haynes, & Tugwell, 1985) For example only eight infants (3 8%) experienced neonatal morbidity and none died However nine fetuses were electively delivered due to nonreassuring results If left to natural events the complication rate may have been much higher Even though the sensitivity of the NST in predicting neonatal morbidity (375) was quite low relative to that of the AAT (75) the difference was not significant A sample size of about 625 subjects would have been required to detect significant differences in these sensitivity proportions at a significance level of 05 and a power of 80 (Fleiss 1981) given the low rate of neonatal morbidity

A second limitation is that the study sample may not be representative of other high-risk samples since the primary criterion for sample entry was referral to the center by a primary care provider Differential rates of referral to the unit by provider and by complication may result in different populations served at other institutions This disparity is important to the extent that test indication affects test results and their prediction The use of medical records as the source of diagnostic information was also a limitation The diagnosis of fetal distress was based on the clinical judgment of the physician or nurse-midwife who attended the woman in labor rather than predefined objective criteria subjectivity in these interpretations is not uncommon

Despite these limitations the AAT does show promise as a low-technology antepartum assessment technique The technology of EFM and the NST has made it possible to show that auscultation a method used for centuries is useful today The advantage of this simple method is that it can be used wherever there are qualified nurses and midwives It is especially promising as an alternative to the NST in areas and in countries where technology is scarce and perinatal mortality is high

The low specificity of the AAT, however is of concern in its potential widespread application For example Devoe and his colleagues (1985) suggested that in order for an antepartum test to be clinically useful it must have a minimum sensitivity of 50% and a specificity of 95% Neither the AAT nor the NST achieved these values

Some modifications of the AAT are necessary to improve its specificity and decrease its false positive rate before it can be applied as a screening test One modification might be adding maternal fetal movement counting to the testing scheme to measure another aspect of fetal behavior although this modification may be most useful for highly motivated women Alternatively a two-phase testing method could be used such as conducting two AATs 20 to 30 minutes apart and evaluating the combined results of both tests This modification warrants future in

vestigation Whatever modification is made it must be simple and easy to administer in order to use the auscultated acceleration test as a universal screening test **NR**

Accepted for publication September 12 1991
This research was supported in part by a National Center of Nursing Research Grant Number 1 R01 NR-01705-01 The authors acknowledge Young Kim PhD for her expert guidance in statistical analysis P Ashley Faber MSN RN for her assistance in data collection and Timothy R B Johnson MD for his generosity as director of the Johns Hopkins Hospital Fetal Assessment Center

Lisa L Paine DrPH CNM FAAN is associate professor and director Nurse Midwifery Education Program Boston University School of Public Health Boston MA

Mary I Benedict DrPH MSW is assistant professor Johns Hopkins University School of Hygiene and Public Health Baltimore MD

Donna M Strobino PhD is associate professor Johns Hopkins University School of Hygiene and Public Health Baltimore MD

Carolyn L Gregor CNM MS FDMS is instructor and director of Nurse Midwifery Services Johns Hopkins University School of Medicine Baltimore MD

Elaine L Larson PhD RN FAAN CIS is Nutting professor in clinical nursing and director Center of Nursing Research Johns Hopkins University School of Nursing Baltimore MD

References

Abitbol M M Monheit A G Poli J & Baker M A (1986) Nonstress test and maternal position *Obstetrics and Gynecology 68* 310–316

Boehm F H (1990) Fetal distress In R D Eden & F H Boehm (Eds) *Assessment and care of the fetus Physiological clinical and medicolegal principles* (pp 809–821) East Norwalk Connecticut Appleton & Lange

DeVoe L D Castillo R A & Shirley D M (1985) The nonstress test as a diagnostic test A critical reappraisal *American Journal of Obstetrics and Gynecology 152* 104–7

Fleiss J L (1981) *Statistical methods for rates and proportions* New York John Wiley & Sons

Hutson J M & Petrie R H (1986) Possible limitations of fetal monitoring *Clinical Obstetrics and Gynecology 29* 104–113

Huddleston J F (1990) Electronic Fetal Monitoring In R D Eden & F H Boehm (Eds) *Assessment and care of the fetus Physiological clinical and medicolegal principles* East Norwalk CT Appleton & Lange

Keegan K & Paul R (1980) Antepartum fetal heart rate testing IV The non stress test as a primary approach *American Journal of Obstetrics and Gynecology 136* 75–80

Larson E (1986) Evaluating validity of screening tests *Nursing Research 35* 186

Mohide P & Grant A (1989) Evaluating diagnosis and screening during pregnancy and childbirth In I Chalmers M Enkin & M J Keirse (Eds) *Effective care in pregnancy and childbirth* (pp 66–80) Oxford UK Oxford University Press

Mohide P & Keirse M J (1989) Biophysical assessment of fetal well being In I Chalmers M Enkin & M J Keirse (Eds) *Effective care in pregnancy and childbirth* (pp 477–492) Oxford UK Oxford University Press

Paine L L Payton R G & Johnson T R B (1986a) Auscultated fetal heart rate accelerations I Accuracy and documentation *Journal of Nurse Midwifery 31*(2) 68–72

Paine L L Johnson T R B Turner M H & Payton R G (1986b) Auscultated fetal heart rate accelerations II An alternative to the non stress test *Journal of Nurse-Midwifery 31*(2) 73–78

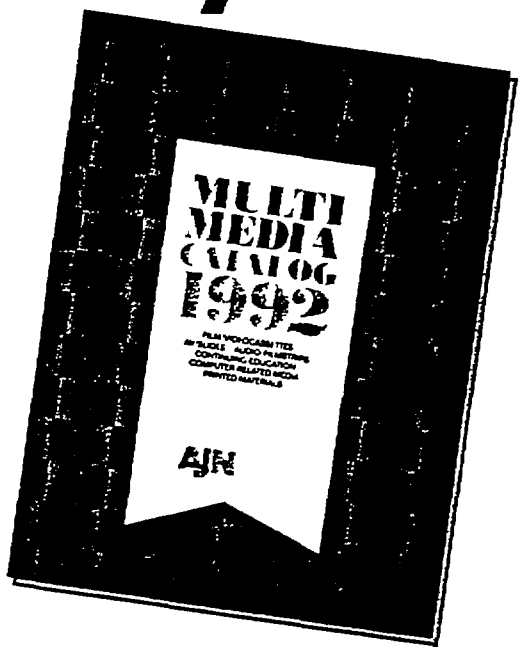
Paine L L Johnson T R B & Alexander G R (1988) Auscultated fetal heart rate accelerations III Use of vibroacoustic stimulation *American Journal of Obstetrics and Gynecology 159* 1163–1167

Sackett D L Haynes R B & Tugwell P (1985) *Clinical epidemiology A basic science for clinical medicine* Boston Little Brown & Company

Thacker S B & Berkelman R L (1986) Assessing the diagnostic accuracy and efficacy of selected antepartum fetal surveillance techniques *Obstetrics and Gynecologic Survey 41* 121–141

Witter F R Nesbitt R E (1989) The effect maternal position on uterine artery flow during antepartum fetal heart rate testing *American Journal of Obstetrics and Gynecology 160* 379–386

Make Teaching Easy...



THE AJN MULTIMEDIA CATALOG

is your guide to a wealth of educational materials in videotape, slide-tape, interactive video, CAI, film and print Every program gives you the latest and the best information in the most time-saving, cost-effective format available

Available Now FREE!

CALL TOLL FREE 1-800-223-2282
AND IN NY (212) 582-8820
ASK FOR CUSTOMER SERVICE

APPENDIX C

Table I Distribution of study population by primary indication* for referral

Indication	*No of patients*	*% of total*
Suspected intrauterine growth retardation	2625	20 8
Hypertension	2209	17 5
Postdates (42 weeks)	1464	11 6
Diabetes (total)	1161	9.2
Class A	909	7 1
Insulin-dependent	252	2 1
Previous low segment cesarean section	618	4 9
Antepartum hemorrhage	568	4 5
Decreased fetal movement	543	4 3
Previous stillbirth	542	4 3
Maternal disease	441	3 5
Twins	416	3 3
Suspected anomaly	341	2 7
Premature labor	303	2 4
Premature rupture of membranes	278	2 2
Large for dates	177	1 4
Fetal heart rate anomaly	175	1 4
Rh disease	139	1 1
Other	620	4 9
Total	12 620	100

*Many patients had multiple risk factors Classification is by the factors promoting initial referral

on this analysis, routine nonstress testing was discontinued when the ultrasound variables were normal and used only when one or more of the ultrasound-monitored variables was abnormal Additional tests of fetal well-being such as maternal serum estriol levels were not used at all and contraction stress testing was used rarely

Perinatal management decisions were based on the results of the fetal biophysical profile score always as considered within the overall clinical context of each case (Table III) A normal score (biophysical profile score ≥8) was considered as indicative of a nonasphyxiated fetus and in such cases the indication for delivery if any was based on other fetal, maternal or obstetric factors Thus for example, delivery was recommended in the presence of a normal score if the fetus was recognized as being growth retarded and pulmonary maturity was confirmed if the patient was beyond 42 completed weeks of gestation and the cervix was favorable for induction of labor, or if the maternal medical condition (for instance preeclampsia) was deteriorating Further when oligohydramnios was observed in the postdate patient delivery was recommended even if the other components of the biophysical profile score were normal An equivocal test result (biophysical profile score = 6) was considered as an indication for repeat testing within 24 hours and if results were equivocal or abnormal at repeat testing then delivery was recommended An abnormal test result (biophysical profile score ≥4) was always considered an indication for delivery and management was delayed only in the presence of extreme fetal immaturity (<28 completed weeks of gestation) In all instances in which delivery was recommended the route of delivery was based on a consideration of fetal obstetric and maternal factors a trial of vaginal delivery was recommended unless otherwise contraindicated

Perinatal mortality was defined as death of a perinate of a birth weight of at least 500 gm and included deaths occurring within 28 completed days after birth All perinatal deaths were assigned to one of three categories based upon probable cause of death The groups were (1) death due to asphyxia or unknown cause in an otherwise structurally normal perinate (2) death as a direct result of major anomaly(s) and (3) death as a consequence of Rh isoimmunization including traumatic death at the time of intrauterine transfusion The latter group is defined separately since this center is a major referral center for treatment of isoimmunized fetuses and as a result such cases contribute disproportionately to the overall mortality[7] The false negative rate in this study is defined as stillbirth of a structurally normal fetus within 1 week of a last normal fetal biophysical score (≥8)

Results

In total 12 620 consecutive high-risk patients with a live fetus at the time of initial referral were studied An additional 71 patients were noted to have a fetal death at the time of initial assessment and were not considered as part of the study group In the study group the mean gestational age at the time of initial assessment was 34 3 ± 1 8 weeks (range 26 to 44 weeks) The distribution of these study patients in accordance with the primary indication for referral is listed in Table I, most patients had more than one risk factor at initial referral It is noted that four major risk factors accounted for more than half the study population (59 1%) being suspected intrauterine growth retardation (20 8%) hypertensive disorders of pregnancy (17 5%) postdate pregnancy (11 6%) and diabetes (9 2%)

In total there were 26 257 fetal biophysical profile tests performed in the 12 620 patients (mean 2 1 per patient range one to 18 tests) Distribution of test by score is listed in Table IV Most tests (25 606 tests 97 52%) were scored as normal (biophysical profile score ≥8) A total of 452 tests (1 72%) demonstrated the absence of two variables (equivocal biophysical profile score = 6) and the remaining 199 tests (0 76%) had three or more variables absent (biophysical profile score ≤4) Most equivocal tests (82%) were normal on repeat testing within 24 hours Conversion of an abnormal

Table II Biophysical profile scoring Technique and interpretation*

Biophysical variable	*Normal (score = 2)*	*Abnormal (score = 0)*
1 Fetal breathing movements	≥1 episode of ≥30 sec in 30 min	Absent or no episode of ≥30 sec in 30 min
2 Gross body movements	≥3 discrete body/limb movements in 30 min (episodes of active continuous movement considered as single movement)	≤2 episodes of body/limb movements in 30 min
3 Fetal tone	≥1 episode of active extension with return to flexion of fetal limb(s) or trunk Opening and closing of hand considered normal tone	Either slow extension with return to partial flexion or movement of limb in full extension or absent fetal movement
4 Reactive fetal heart rate	≥2 episodes of acceleration of ≥15 bpm and of ≥15 sec associated with fetal movement in 20 min	<2 episodes of acceleration of fetal heart rate or acceleration of <15 bpm in 20 min
5 Qualitative amniotic fluid volume	≥1 pocket of fluid measuring ≥1 cm in two perpendicular planes	Either no pockets or a pocket <1 cm in two perpendicular planes

*See reference 5

Table III Biophysical profile scoring Management protocol

Score	*Interpretation*	*Recommended management*
10	Normal infant low risk for chronic asphyxia	Repeat testing at weekly intervals Repeat twice weekly in diabetic patients and patients ≥42 wk
8	Normal infant low risk for chronic asphyxia	Repeat testing at weekly intervals Repeat twice weekly in diabetic patients and patients ≥42 wk Indication for delivery = oligohydramnios
6	Suspected chronic asphyxia	Repeat testing within 24 hr Indication for delivery = oligohydramnios or remaining ≤6
4	Suspected chronic asphyxia	≥36 score and favorable cervix If <36 wk and lecithin/sphingomyelin ratio <2 0 repeat test in 24 hr Indication for delivery = repeat score ≤6 or oligohydramnios
0-2	Strong suspicion of chronic asphyxia	Extend testing time to 120 min Indication for delivery = persistent score ≤4 regardless of gestational age

score (biophysical profile score ≥4) to normal (biophysical profile score ≥8) occurred in only one instance (0 5%)

Ninety-three perinatal deaths occurred among the study population for a gross (uncorrected) perinatal death rate of 7 37 per 1000 live births Forty six of these deaths were stillbirths (49 5%) and 47 were neonatal deaths (50 5%) The gross stillbirth rate was 3 64 per 1000 and the gross neonatal death rate was 3 72 per 1000 Perinatal mortality as related to test score result is listed in Table IV, mortality ranged from as low as 0 652 per 1000 tests with a normal score (biophysical profile score = 8) to as high as 187 per 1000 tests with a completely abnormal score (biophysical profile score = 0) Total perinatal deaths classified by cause are listed in Table V In total 69 of 93 (74 2%) perinatal deaths were a direct result of either major lethal anomalies (66 7%) or severe Rh disease (7 5%) Perinatal morbidity is considered in a separate report to follow

Perinatal deaths directly attributable to a major anomaly were classified according to the major systems affected (Table VI) anomalies affecting at least two major systems were classified as multiple anomalies In total, 62 of 93 perinatal deaths (66 7%) were due to a major anomaly, of which 19 were major central nervous system anomalies (30 6%) 11 were major renal anomalies (17 6%), nine were major gastrointestinal anomalies (13 2%), eight were major cardiac anomalies (13%) seven were major skeletal anomalies (11 2%) seven were multiple anomalies (11 2%) and one anomaly was due to a major cytogenetic disorder (1 6%) Seven deaths were a direct result of Rh isoimmunization four of which were due to trauma at the time of intrauterine transfusion and three occurred within 48 hours of intrauterine transfusion and were considered the result of advanced fetal disease (hydrops fetalis)

The remaining 24 deaths representing 25 8% of the total deaths, occurred among structurally normal fetuses and therefore all may be considered as potentially preventable Thus the corrected perinatal mortality

140

Table IV Test score distribution and associated corrected perinatal mortality

Test score result	No of tests	% of total tests	Corrected perinatal mortality*	
			No of deaths	Rate per 1000 tests
8-10 (normal)	25 606	97 52	16	0 652
6 (equivocal)	452	1 72	0	0
4 (abnormal)	136	0 52	3	22 0
2 (abnormal)	47	0 18	2	42 6
0 (abnormal)	16	0 06	3	187
Total	26 257	100	24	—

*Excludes deaths due to either major congenital anomaly or severe Rh isoimmunization

Table V Perinatal deaths by cause and time of death (n = 93)

Category	Stillbirths		Neonatal deaths		Total all deaths	
	No of deaths	% of total	No of deaths	% of total	No of deaths	% of total
Major (lethal) anomaly	26	56 6	36	76 6	62	66 7
Rh disease/Rh trauma	5	10 8	2	4 3	7	7 5
Death in normal fetus	15	32 6	9	19 1	24	25 8
Total	46	100	47	100	93	100

Table VI Perinatal death due to major anomaly Classification by anomaly type (n = 62)

Anomaly type	Stillbirths	Neonatal deaths	Total
Major central nervous system (total)	9	10	19
Anencephaly/neural tube	7	8	
Holoprosencephaly	1	2	
Hydrocephalus	1		
Major renal (total)	6	5	11
Renal agenesis	5	1	
Obstructive uropathy	1	4	
Major gastrointestinal (total)	1	8	9
Diaphragmatic hernia	0	4	
Omphalocele/cardiac	1	1	
Other	0	3	
Major cardiac (total)	0	8	8
Ebstein s anomaly	0	1	
Ventricular septal defect	0	3	
Hypoplastic ventricles	0	2	
Other	0	2	
Major skeletal dystrophy	7	0	7
Thanatophoric dwarfism	2	0	
Achondroplastic	2	0	
Unclassified	3	0	
Major multiple anomalies (total)	3	4	7
Major chromosomal anomalies (total)	1	0	1
Total	27	35	62

rate in this study population was 1 90 per 1000 Fifteen of these 24 deaths (62 5%) occurred as stillbirths for a corrected stillbirth rate of 1 18 per 1000 The relationship of interval between testing and stillbirth and the last test result before stillbirth is listed in Table VII Ten stillbirths occurred within 1 week of the last test (range 2 to 7 days) of these eight occurred following a *normal* last test result Therefore the false negative rate was 0 634 per 1000 In three of these false negative cases the deaths occurred in fetuses of diabetic patients in two the cause of death was unexplained and one death was the result of abruptio placentae In three false negative cases death occurred among fetuses of patients being evaluated for intrauterine growth retardation the diagnosis was confirmed in two of these infants at delivery but in the remaining case no evi

14

Table VII Stillbirths in structurally normal fetuses without Rh isoimmunization as classified by test-to-death interval and last test result (n = 15)

Patient	*Interval (days)*	*Last test result*	*Clinical diagnosis*
Interval of ≤7 days last test normal (≥8) (n = 8)			
V H	3	8 (NST not done)	Suspected IUGR 34 wk
V L	5	10 (NST reactive)	Suspected IUGR, 32 wk
J R	5	8 (NST not done)	Postdate 42 wk
A T	5	8 (NST not done)	Class B diabetes/massive abruptio placentae 38 wk
V D	6	10 (NST reactive)	Hypertension 39 wk
J M	7	8 (NST reactive)	Suspected IUGR, 36 wk
C S	7	8 (NST not done)	Class B diabetes 35 wk
M R	7	8 (NST not done)	Class A diabetes 37 wk
Interval of >7 days last test normal (≥8) (n = 3)			
E C	15	8 (NST not done)	Suspected IUGR 34 wk
M M	21	8 (NST not done)	Suspected IUGR 29 wk abruptio placentae
S C	28	8 (NST not done)	Multiple sclerosis 29 wk
Interval of ≤7 days last test abnormal (≤4) (n = 2)			
L C	2	4 (absent FBM and FM (NST nonreactive)	Hypertensive at term intrapartum death—not monitored in labor
D S	5	4 (absent FBM and FT oligohydramnios)	Delivery delayed <27 wk
Interval of >7 days, last test abnormal (≤4) (n = 2)			
C S	11	0	IUGR delivery delayed because of immaturity (26 wk)
C. M	11	2 (fetal movement only)	IUGR delivery delayed because of immaturity (<29 wk)

NST Nonstress test IUGR intrauterine growth retardation FBM fetal breathing movements FM fetal movements FT fetal tone

dence of intrauterine growth retardation was determined at delivery The remaining two deaths were associated with maternal hypertension and postmaturity respectively Two stillbirths occurred within 1 week of an *abnormal* last test result. In one case a score of 4 was recorded in a hypertensive patient at 38 weeks and medical induction of labor was suggested but was delayed for 48 hours The patient went into spontaneous labor and intrapartum fetal heart rate monitoring was not used the fetus died during the intrapartum period In the other case a biophysical profile score of 4 was recorded in a growth-retarded fetus at 27 weeks gestation and delivery delayed because of fetal immaturity, fetal death occurred 5 days later Five stillbirths occurred at an interval >7 days after the last normal fetal biophysical profile score (range, 11 to 28 days)

Two stillbirths occurred >7 days after a last abnormal test result In both, severe intrauterine growth retardation was recognized, but delivery was delayed because of the extreme fetal immaturity (28 and 26 weeks respectively) It is of interest to note that in both of these cases fetal death did not occur until 11 days after the last abnormal score

Nine neonatal deaths occurred in structurally normal neonates (corrected neonatal death rate 0 72 per 1000 Table VIII) In five of these deaths the last fetal biophysical profile score before delivery was normal four of these deaths were due to respiratory distress syndrome in fetuses whose birth weight was <1500 gm (range 830 to 1460 gm) and one death was due to intrapartum chorioamnionitis and neonatal sepsis (birth weight, 4520 gm) The remaining four neonatal deaths occurred after a last fetal biophysical profile score that was abnormal In two of these deaths the last score before delivery was 0 One was recognized as having severe intrauterine growth retardation at the first visit at 37 weeks despite immediate delivery by emergency low segment cesarean section the fetus was grossly asphyxiated at birth and died The other death occurred in a 27-week infant whose mother was severely hypertensive One death occurred as a result of meconium aspiration in a term infant after a last test score of 4 and one death occurred in an infant with a last test score of 2 and was due to pulmonary immaturity (respiratory distress syndrome)

Comment

The natural relationship between a fetal biophysical profile score as used in this study and perinatal mortality has been reported previously in the absence of intervention, perinatal mortality rose progressively as the fetal biophysical profile score fell [5] In this current series of 12 620 referred high-risk pregnancies in which antepartum fetal assessment and obstetric management decisions were based on fetal biophysical profile scoring, we observed 93 perinatal deaths for a mor

142

Table VIII Neonatal deaths among structurally normal infants (n = 9)

Case No	*Patient*	*Last test score*	*Interval from test to delivery*	*Birth weight (gm)*	*Cause of death*
Last test score normal					
1	I M	10 (reactive NST)	1 day	3860	Chorioamnionitis sepsis
2	M B	8 (NST not done)	7 days	1100	Respiratory distress syndrome hyaline membrane disease
3	S J	10 (reactive NST)	7 days	1460	Respiratory distress syndrome hyaline membrane disease
4	S Y	8 (NST not done)	10 days	1100	Respiratory distress syndrome hyaline membrane disease
5	M J	8 (NST not done)	10 days	860	Respiratory distress syndrome hyaline membrane disease
Last test score abnormal					
6	C. S	0	<1 hr	1860	Severe asphyxia intrauterine growth retardation
7	E. K	0	2 days	770	Asphyxia respiratory distress syn drome hyaline membrane disease
8	C. L.	4 (absent FM FBM non reactive NST)	3 days	4520	Meconium aspiration
9	M L.	2 (absent FM tone nonreactive NST absent FBM)	6 days	760	Respiratory distress syndrome hyaline membrane disease

tality rate of 7 37 per 1000 This death rate is similar to that reported with the method in smaller study populations from this and other centers [1-4] As the causes and mechanisms of perinatal death are of diverse origin, it is likely that multiple factors may be operant in explaining the remarkably low mortality rate observed Since matched nontested control subjects were not available, the extent of change in observed from expected mortality may be estimated by indirect methods only During the study interval within the catchment area population there were 65,979 deliveries, the majority of which (80%) were classified as low risk by maternal risk screening methods [6,9] Within this entire population there were 943 perinatal deaths, for a perinatal mortality rate of 14 3 per 1000 [7] The perinatal mortality rate in the study population (7 37 per 1000), all of whom had high-risk pregnancies (Table I), was reduced to nearly one half (48 5%) that rate observed in this general population The gestational age at which antepartum testing is begun may influence mortality statistics since the death rate due to immaturity will decline as the gestational age at first test advances In this study population the mean gestational age at which testing was begun, 34 3 weeks, almost certainly is a major factor in the low neonatal death rate observed in the absence of major anomaly (0 72 per 1000) Analysis of the frequency and cause of stillbirth may be a better method of judging the efficacy of the fetal biophysical profile scoring since maturity factors are less significant In the study population 46 stillbirths were reported (stillbirth rate, 3 64 per 1000), of which 15 stillbirths (32 6%) occurred in structurally normal nonisoimmunized fetuses (corrected stillbirth rate 1 18 per 1000) In contrast within the entire population during the study interval there were 477 reported stillbirths (stillbirth rate, 7 22 per 1000) of which 419 (88%) occurred in structurally normal fetuses (corrected stillbirth rate 6 35 per 1000) [8] These comparisons although of a general nature suggest that within the study population a true decrease of undetermined magnitude has occurred in the perinatal death rate the stillbirth rate and the corrected stillbirth rate Further such comparisons suggest that in the study population the decreased stillbirth frequency is associated with a change in etiology such that the relative number of deaths due to anomaly may be increased substantially that is to 56 6% in the study population as compared to 12% in the population at large These data suggest that the low stillbirth rate observed in the study population is largely due to a decrease in deaths among structurally normal fetuses

Antepartum recognition of fetal asphyxia by the use of fetal biophysical profile scoring contains inherent inaccuracies In this study we recorded eight intrauterine deaths in structurally normal fetuses within 1 week of a last normal test result (corrected false negative rate 0 634 per 1000) This observed false negative rate with fetal biophysical profile scoring is similar to that reported for contraction stress testing (0 4 per 1000) and lower than that reported with the nonstress test (3 2 per 1000) [10] Neither of these latter methods of fetal assessment based on antepartum fetal heart rate monitoring reliably detect major anomalies whereas anomaly detection is an inherent part of

143

Table VIII Neonatal deaths among structurally normal infants (n = 9)

Case No	Patient	Last test score	Interval from test to delivery	Birth weight (gm)	Cause of death
Last test score normal					
1	I M	10 (reactive NST)	1 day	3860	Chorioamnionitis sepsis
2	M B	8 (NST not done)	7 days	1100	Respiratory distress syndrome hyaline membrane disease
3	S J	10 (reactive NST)	7 days	1460	Respiratory distress syndrome hyaline membrane disease
4	S Y	8 (NST not done)	10 days	1100	Respiratory distress syndrome hyaline membrane disease
5	M J	8 (NST not done)	10 days	860	Respiratory distress syndrome hyaline membrane disease
Last test score abnormal					
6	C. S	0	<1 hr	1860	Severe asphyxia, intrauterine growth retardation
7	E. K	0	2 days	770	Asphyxia respiratory distress syndrome hyaline membrane disease
8	C L.	4 (absent FM FBM, non reactive NST)	3 days	4520	Meconium aspiration
9	M L.	2 (absent FM, tone nonreactive NST absent FBM)	6 days	760	Respiratory distress syndrome hyaline membrane disease

tality rate of 7 37 per 1000 This death rate is similar to that reported with the method in smaller study populations from this and other centers [1-4] As the causes and mechanisms of perinatal death are of diverse origin, it is likely that multiple factors may be operant in explaining the remarkably low mortality rate observed Since matched nontested control subjects were not available, the extent of change in observed from expected mortality may be estimated by indirect methods only During the study interval within the catchment area population there were 65,979 deliveries, the majority of which (80%) were classified as low risk by maternal risk screening methods [6,9] Within this entire population there were 943 perinatal deaths for a perinatal mortality rate of 14 3 per 1000 [7] The perinatal mortality rate in the study population (7 37 per 1000), all of whom had high-risk pregnancies (Table I), was reduced to nearly one half (48 5%) that rate observed in this general population The gestational age at which antepartum testing is begun may influence mortality statistics since the death rate due to immaturity will decline as the gestational age at first test advances In this study population the mean gestational age at which testing was begun, 34 3 weeks, almost certainly is a major factor in the low neonatal death rate observed in the absence of major anomaly (0 72 per 1000) Analysis of the frequency and cause of stillbirth may be a better method of judging the efficacy of the fetal biophysical profile scoring since maturity factors are less significant In the study population 46 stillbirths were reported (stillbirth rate, 3 64 per 1000) of which 15 stillbirths (32 6%) occurred in structurally normal nonisoimmunized fetuses (corrected stillbirth rate 1 18 per 1000) In contrast within the entire population during the study interval there were 477 reported stillbirths (stillbirth rate, 7 22 per 1000) of which 419 (88%) occurred in structurally normal fetuses (corrected stillbirth rate 6 35 per 1000) [8] These comparisons although of a general nature, suggest that within the study population a true decrease of undetermined magnitude has occurred in the perinatal death rate the stillbirth rate, and the corrected stillbirth rate Further such comparisons suggest that in the study population the decreased stillbirth frequency is associated with a change in etiology such that the relative number of deaths due to anomaly may be increased substantially that is, to 56 6% in the study population as compared to 12% in the population at large These data suggest that the low stillbirth rate observed in the study population is largely due to a decrease in deaths among structurally normal fetuses

Antepartum recognition of fetal asphyxia by the use of fetal biophysical profile scoring contains inherent inaccuracies In this study we recorded eight intrauterine deaths in structurally normal fetuses within 1 week of a last normal test result (corrected false negative rate, 0 634 per 1000) This observed false negative rate with fetal biophysical profile scoring is similar to that reported for contraction stress testing (0 4 per 1000) and lower than that reported with the nonstress test (3 2 per 1000) [10] Neither of these latter methods of fetal assessment based on antepartum fetal heart rate monitoring reliably detect major anomalies whereas anomaly detection is an inherent part of

144

the principle with inclusion of more fetal variables will improve the accuracy even further

REFERENCES

1 Manning FA Baskett TF Morrison I Lange IR Fetal biophysical profile scoring a prospective study in 1,184 high risk patients Am J Obstet Gynecol 1981 140 289
2 Baskett TF, Gray JH Prewett SJ et al Antepartum fetal assessment using a fetal biophysical profile score Am J Obstet Gynecol 1983,148,630
3 Schifrin BS, Guntes V, Gergely RC et al The role of real time scanning in antenatal fetal surveillance Am J Obstet Gynecol 1981 140 525.
4 Platt LD Eglinton GS, Sipos L, et al Further experience with the fetal biophysical profile score Obstet Gynecol 1983 61 480
5 Manning FA Platt LD Sipos L. Antepartum fetal evaluation development of a fetal biophysical profile score Am J Obstet Gynecol 1980 136 787
6 Manning FA. Modified fetal biophysical profile scoring selective use of the NST (Abstract) In Proceedings of the Society of Obstetricians and Gynaecologists of Canada Montreal June 19-23 1984
7 Bowman J Manning FA Intrauterine fetal transfusion Winnipeg 1982 Obstet Gynecol 1983 61 203
8 Morrison I Perinatal and Maternal Welfare Committee report for 1982 Winnipeg College of Physicians and Surgeons of Manitoba 1983 1
9 Coopland AT Peddle LJ Baskett TF et al A simplified antepartum high risk pregnancy scoring form Statistical analysis of 5459 cases Can Med Assoc J 1977 116 999
10 Freeman RE Anderson G Dorcester W A prospective multi institutional study of antepartum fetal heart rate monitoring 1 Risk of perinatal mortality and morbidity according to antepartum fetal heart rate test results Am J Obstet Gynecol 1982 143 771
11 Manning FA, Morrison I Lange IR et al Antepartum evaluation of fetal health In Chiswick ML, ed Recent advances in perinatal medicine New York Churchill Livingstone 1983 41ff
12 Pratt D Diamond F Yen H et al Fetal stress and non stress tests an analysis and comparison of their ability to identify fetal outcome Obstet Gynecol 1979 54 419
13 Collea JV Holls WM The contraction stress test Clin Obstet Gynecol 1982 25 707
14 Schifrin BS Foye G Amato J et al Routine fetal heart rate monitoring in the antepartum period Obstet Gynecol 1979 54 21
15 Boddy K Dawes GS Fetal breathing Br Med Bull 1976,31 3
16 Natale R Clewlow F Dawes GS Measurement of fetal forelimb movement in the lamb in utero Am J Obstet Gynecol 1981 140-545
17 Rochard F Schifrin BS Goupil F et al Nonstressed fetal heart rate monitoring in antepartum period Am J Obstet Gynecol 1976 126 699
18 Manning FA Lange IR Morrison I et al Fetal biophysical profile score and the NST A comparative trial Obstet Gynecol 1984 (in press)
19 Patrick JE Campbell K Carmichael L, et al Patterns of human fetal breathing during the last 10 weeks of pregnancy Obstet Gynecol 1980 56 24
20 Chamberlain PF Manning FA Morrison I et al Ultrasound evaluation of amniotic fluid volume I The relationship of marginal and decreased amniotic fluid volumes to perinatal outcome Am J Obstet Gynecol 1984 150 245
21 Cohn HE Sacks EJ Heyman MA et al Cardiovascular responses to hypoxemia and acidemia in fetal lambs Am J Obstet Gynecol 1974 120 817
22 Seeds AE Current concepts of amniotic fluid dynamics Am J Obstet Gynecol 1980 138 575

145

ПРИЛОЖЕНИЕ А

Критерии принятия в Центр нормальных родов
Сентябрь 1992

* Срок беременности > 36 до < 42 полных недель

* Срок беременности > 43 недель с проведением реактивной нестрессовой пробы и уровнем амниотической жидкости >10 см

* Предположительный вес плода от 2500 до 4000 граммов

* Диабет класса А-1 небольшой степени риска
  1. Женщины, регулярно посещавшие клинику, с нормальным содержанием сахара в крови натощах (сахар в крови натощах < 105), что внесено в историю развития беременности за последний месяц
  2. Женщины, не имеющие в анамнезе открытых форм диабета, преждевременных родов, закончившихся мертворождением или травматических родов из-за макросомии /гигантизма/

* Женщины, перенесшие одно кесарево сечение (КС), если у них:
  1. По документам установлен низко расположенный диагональный маточный шрам, и пациентка письменно подтверждает свое желание рожать в Центре нормальных родов
  2. Нет документации о маточном шраме, но есть подтверждение о нормальных родах через родовые пути после перенесенного кесарева сечения.

Исключение: Не подлежат приему пациентки со следующими показаниями:

* Анемия (гемоглобин < 28%)
* Количество родов > 8
* Перенесенное кесарево при следующих обстоятельствах:
  1. Недокументированный шрам матки, отсутствие последующих родов через обычные родовые пути
  2. Низко расположенный вертикальный или классический шрам матки
  3. Более, чем одно кесарево сечение (КС)
* Трудные предыдущие роды
* Вес женщины > 225 фунтов
* Высокое кровяное давление 140/90
* Наличие белка в моче > 2+
* Положительная проба на сифилис, незалеченный сифилис
* Пациентки, находящиеся под надзором полиции
* Пациентки со спонтанным разрывом мембраны
  1. И отсутствием схваток
  2 С признаками или симптомами амнионита
* Диабет класса А-1 со степенью риска с анамнезом, включающим:
  1. Перенесенные открытые формы диабета
  2. Перенесенные преждевременные роды, закончившиеся мертворождением
  3. Травматические роды из-за макросомии /гигантизма/

BEST AVAILABLE COPY

* Влагалищное кровотечение больше нормы
* Многоплодная беременность
* Температура выше 99,6 градусов по Фаренгейту
* Неопределимая предлежащая часть
* Статус > -3 для многорожавших и >-2 для первородящих
* Твердый меконий /содержимое кишечника/
* Острое или хроническое заболевание
* Неголовное предлежание

ПРИЛОЖЕНИЕ Б

Критерии для перевода в другую больницу в течение родов или после родов

Для плода:
* Ненормальное сердцебиение плода, свидетельствующее о его тяжелом состоянии, не поддающемся принимаемым мерам для облегчения состояния

Для матери:
* Наличие амнионита
* Повышение кровяного давления, вызванное состоянием беременности/состояние, предшествующее эклампсии
* Просьба пациентки предоставить ей местное обезболивание или необходимость местного обезболивания
* Гемоглобин при поступлении < 28%
* Предшествующее родам кровотечение
* Чрезмерная потеря крови во время родов или на четвертой стадии - и похожие симптомы
* Затянувшаяся вторая стадия (более 2 или 3 часов)
* Отсутствие прогресса во время активных схваток
* Пациентки, не удовлетворяющие критериям приема в центр нормальных родов, что было обнаружено после оценки их состояния
* Просьба пациентки о том, чтобы роды принимали другие, более квалифицированные медицинские работники

Критерии для выписки пациентки в течение 12 часов

* Ненормальное физическое состояние
* Медицинские, хирургические или психиатрические показания
* Потеря крови, достигающие более 750 мл
* Гемоглобин < 30%
* Явные неприятные ощущения у входа во влагалище: серьезные кровоподтеки или отеки
* Температура выше 100,4 градусов по Фаренгейту во время госпитализации или выше 99,4 градусов по Фаренгейту спустя 12 часов
* Неспособность пациентки ходить и/или заботиться о себе и ребенке
* Неспособность ходить в туалет
* Разрывы третьей и четвертой степени

Журнал медицинских сестер и акушерок, Том 39,
№ 4, июль/август 1994 г.

BEST AVAILABLE COPY

CASE STUDY INSTITUTIONAL BARRIER

Scenario A small group of physicians and midwives attended a conference on FCMC and now desire to initiate some of the practices they learned about it their own institution

Barrier The head of the hospital is concerned that this is just a reaction to what they learned, a passing fad He/she is concerned that there are Ministry of Health regulations prohibitimg these changes He/she doesn't want to rock the boat

Problem What should the providers do to address the administrator's concerns? Specifically how can they address the regulations, assure acceptance and longevity among providers and reassure him/her about the benefits of these practices?

CASE STUDY PROVIDER BARRIERS

Scenario The physicians and midwives at an urban hospital would like to re-assess their practices and incorporate some of the newer FCMC practices that have proven successful elsewhere They feel that their best success in selling the idea to administration will be to have pediatrics present when they request these changes When they approach the chief pediatrician and the chief obstetrician, they find both are resistant to the idea The chief obstetrician is concerned that women are too high risk for these practices Further he thinks the risk of infection is great The chief pediatrician has concerns about the effects on the baby of rooming-in, unrestricted breastfeeding and family visitations She is concerned about infant infections and weight gain

Problem How will the physicians and midwives approach educating the the two chiefs and addressing their concerns? What resources might they access to educate the two chiefs about her concerns?

CASE STUDY CONSUMER BARRIERS

Scenario A group of physicians and midwives have initiated some FCMC practices in their prenatal clinic and maternity center They are offering many more classes for both the woman and her partner and family They are encountering much skepticism on the part of the women about their own ability to labor and birth without analgesia In addition, very few male partners are interested in the classes that are being offered which is minimizing attendance by the women as well

Problem Describe the specific steps that the providers will take to increase the confidence level and interest among their clientele

APPENDIX B

APPENDIX B

Fetal Kick Count

You are the person who knows best about your baby's movements We ask that you spend some time each day paying attention only to your baby and count the moves, kicks and rolls your baby makes We would like you to have a snack which includes something with sugar and then relax and count your baby's moves until you have felt ten (10) We ask that you mark the date and time you do this and make check marks for each movement until you have ten If your baby does not move ten times in one hour, then please have another snack and try for one more hour If after two hours, your baby has not moved ten times, please report to the Maternity Center as soon as possible and report this to your doctor or midwife

Date/Time	Movements

CASE STUDY EVALUATION PROCESS

SCENARIO The clinicians at a clinic in Odensk have requested a change in the way that prenatal care is delivered They wish to make it more family-centered, particularly involving husbands and partners more in the care and increasing the education component Their desire for change is based on their own readings and has not been addressed with the women and families they serve The clinic administrator has agreed to this if they can prove that the families they serve also desire it and will accept it They reach agreement of a two month trial period for this new initiative If the project is to continue past that time, the clinicians must be able to demonstrate acceptance and desire for continuation among the families they serve

PLAN The clinicians meet and define the steps that they think will lead to the greatest chance for success education, positive reinforcement and evaluation They decide that they need to do a pre- and post-project evaluation piece for comparison They then decide to combine a qualitative and quantitative aspect to the evaluation They design questionnaires eliciting information regarding families needs and desires for education and involvement The qualitative piece is done via focus groups which meet before and after the trail period to obtain input and discussion about various aspects of the project This input is used in the design and administration of the project

RESULTS At the end of the two month trail period, the clinicians were able to produce editorial comments for participants plus documented responses to the perceived pluses and minuses of the project with recommendation from both providers and families about continuation and content

APPENDIX B

CASE STUDY PRENATAL CARE

Scenario The providers at a prenatal clinic have been told by their administrators that they will be receiving education about FCMC and integrating the material into their management within three months She has asked them to develop and conduct a pre-project evaluation tool which will be used for strategic planning for the integration of changes The subjects are the consumers

Problem Describe the evaluation tool(s), including when, how and by whom they will be administered Discuss all the details of recruitment and compliance and how barriers will be addressed

CASE STUDY INTRAPARTUM CARE

Scenario The providers at a busy urban hospital have been asked to attend a training on FCMC and integrate the new practices within 6 months of the training The request has come from the consumers and is supported by administration The providers express many concerns, particularly about having the time to perform what they perceive as labor-intensive practices, such as bedside support The chief of service has been asked to conduct a pre-TOT evaluation project to ascertain providers barriers and attitudes The information from the evaluation will be used to direct the training and implementation

Problem Describe the evaluation project that would best meet the stated goals of identifying barriers and directing implementation Please be specific about how this information could then be utilized to direct the TOT

CASE STUDY POSTPARTUM/NEWBORN CARE

Scenario Pediatrics has agreed to try rooming-in for a period of three months at your institution Continuation after three months depends on consumer and providers satisfaction and effect on maternal and infant morbidity It is your job as Chief of OB to design and execute an evaluation plan to ascertain the requested results at the end of the trail period

Problem Describe in detail the evaluation plan that you will design Be specific about all of the components, that is who will administer what aspects to which groups and how results will be interpreted and presented to the administrative and clinical staff including pediatrics

Appendix I

Obstetric Practices and Benchmarks for Success

GOAL:
The maternity department at DONETSK and ODESSA will implement a program which includes the following 14 obstetric practices They are recommended by the World Health Organization and supported by the preponderance of scientific literature as reported in Effective Care in Pregnancy and Childbirth by Chalmers et al

1 Practice - The staff will promote the family centered maternity care program

Benchmark - <50% of women will participate in the family centered maternity care program

2 Practice - The maternity staff will encourage and support breastfeeding to begin as soon as possible, right in the delivery room in most instances

Benchmark - 80% of mothers and babies will begin breastfeeding in the delivery room

3 Practice - The maternity staff will exercise appropriate discrimination in their indications for Cesarean section

Benchmark - <12% of all births will be by C/Section

4 Practice - The maternity staff should arrange for patients with a prior C/section (except those with a vertical incision in the uterus) to be given a trial of labor

Benchmark - 80% of patients with a prior low transverse C/Section will have a trial of labor and 50% will deliver vaginally

5 Practice - The maternity staff will use continuous electronic fetal heart rate monitoring for obstetric indications only (not routinely)

Benchmark - <40% of women will have continuous fetal heart rate monitoring during their labor

6 Practice - The maternity staff will be very discriminate in their use of an episiotomy

Benchmark - <10% of women will have an episiotomy performed

7 Practice - The maternity staff will induce labor only for medical obstetric problems or for pregnancy that goes beyond 41 completed weeks

Benchmark - <10% of labors will be induced

8 Practice - The maternity staff will recognize the importance of women delivering their babies with a sense of awareness, control, and accomplishment and also be aware of the potential adverse effects of analgesics and anesthetics They will therefore exercise appropriate discrimination in their use

Benchmark - >70% of women will feel that they delivered their babies with a sense of control and accomplishment

Benchmark - <50% of women will receive analgesic drugs during labor

Benchmark - <20% of women will receive a conduction anesthetic for labor or a spontaneous vaginal birth delivery (excludes C/Section or assisted delivery)

9 Practice - The maternity staff will assist women to participate in decisions about their care

Benchmark - >90% of women will feel that they played an active role in making the decisions about their obstetric care

10 Practice - The mother will receive extensive support from the family, the maternity staff, during labor and delivery

Benchmark - >95% of women will state that they felt supported physically and emotionally during labor

11 Practice - The maternity staff will recognize and encourage the advantages of the upright position and ambulation during labor, and the variety of positions available for delivery

Benchmark - >60% of women will ambulate significantly during labor and delivery

12 Practice - The maternity staff will not administer an enema to laboring women prior to delivery

Benchmark - <5% of women will have an enema prior to delivery

13 Practice - The maternity staff will not shave the pubic hair of laboring women prior to delivery

Benchmark - <5% of women having a vaginal delivery will have their pubic hair shaved

14 Practice - The maternity staff will arrange for healthy mothers and healthy newborns to remain together whenever possible

Benchmark - 90% of mothers and babies will room-in together

Appendix II

Post-Partum Delivery Record

To be completed by the maternity staff soon after delivery

Name_____ Date_____

• The patient particpated in our family centered maternity program	1 ☐ Yes	☐ No
• The 1st breastfeeding occurred in the delivery room	2 ☐ Yes	☐ No
• This birth was by C/Section If yes, indication?_____	3 ☐ Yes	☐ No
• This patient had a prior transverse uterine C/Section	4 ☐ Yes	☐ No
-If yes, had a trial of labor?	☐ Yes	☐ No
-Delivered vaginally?	☐ Yes	☐ No
• This patient had continuous fetal heart rate monitoring for more than 45 minutes during the labor and delivery	5 ☐ Yes	☐ No
• An episiotomy was performed for this delivery	6 ☐ Yes	☐ No
• This labor was induced If yes, indication?_____	7 ☐ Yes	☐ No
• Analgesic drugs were used during this labor	8 ☐ Yes	☐ No
• Was a conduction anesthetic used either for labor or a spontaneous vaginal birth?	9 ☐ Yes	☐ No

We read your comments in order to continue what is working for the families and yourselves and try to change what is not Please record your comments and suggestions

_____

_____

_____

_____

Appendix III

Post-Partum Questionnaire

To be completed by mother and family 24-48 hours after delivery

Name_____ **Date**_____

• I feel that the maternity staff invited me to participate in the decisions about my obstetric care, and they also provided me with enough information to make intelligent decisions	12 ☐ Yes	☐ No
• Someone from my family was with me almost 100% of the time and additionally, one of the maternity staff was with me at least 50% of the time during my labor and delivery	13 ☐ Yes	☐ No
• The maternity staff encouraged and assisted me to be out of bed for more than 50% of my labor (even when I was pushing)	14 ☐ Yes	☐ No
• I delivered my baby with a sense of control and I feel a great sense of accomplishment	15 ☐ Yes	☐ No
• I received an enema prior to my delivery	16 ☐ Yes	☐ No
• My pubic hair was shaved	17 ☐ Yes	☐ No
• My baby was in the same room with me almost the entire time I was in the hospital	18 ☐ Yes	☐ No
• The maternity staff has been very helpful and encouraging to help me establish breastfeeding with my baby	19 ☐ Yes	☐ No

We read your comments in order to continue what pleases you and change what does not Please record your comments and suggestions

_____

_____

_____

_____

Appendix IV

Continuous Improvement Strategy

1 The post partum questionnaires and delivery reports (Appendix 2, 3) will be sent to the administrative maternity office

2 The data will be tabulated monthly, on a tally sheet (Appendix 5) and the totals entered into an Excel spreadsheet

3 Monthly reports comparing results to the established Benchmarks will be generated from the Excel spreadsheet (see example Appendix 6)

4 The reports will be distributed, discussed, and future strategies considered at the monthly maternity staff meeting

5 A performance, progress, and planning report will be sent to the maternity director on a quarterly or semi-annual basis

Appendix V

_____ **Hospital Monthly Tally Sheet**

otals to be tallyed monthly from post-partum delivery record **mo/yr** _____

Family Centered Maternity Care		Totals	
yes	no		
1		Yes	No

Breast Feeding		Totals	
yes	no		
2		Yes	No

Cesarean Section		Totals	
yes	no		
3		Yes	No

Prior C-Section		Totals	
yes	no		
4		Yes	No

Trial of Labor		Totals	
yes	no		
5		Yes	No

Successful VBAC		Totals	
yes	no		
6		Yes	No

Fetal Monitoring		Totals	
yes	no		
7		Yes	No

Episiotomy		Totals	
yes	no		
8		Yes	No

Labor Induction		Totals	
yes	no		
9		Yes	No

Analgesics		Totals	
yes	no		
10		Yes	No

Anesthetics		Totals	
yes	no		
11		Yes	No

totals to be tallyed monthly from post-partum questionnaire

Participation in Decisions		Totals	
yes	no		
12		Yes	No

Family / Staff Attendance		Totals	
yes	no		
13		Yes	No

Ambulation in Labor		Totals	
yes	no		
14		Yes	No

Control and Accomplishment		Totals	
yes	no		
15		Yes	No

No Enema		Totals	
yes	no		
16		Yes	No

No Perineal Shave		Totals	
yes	no		
17		Yes	No

Newborn Rooming-in		Totals	
yes	no		
18		Yes	No

Breast Feeding		Totals	
yes	no		
19		Yes	No

APPENDIX A

ROLE PLAY
SCENARIOS/ACTIVITIES/SKILLS

NORMAL LABOR

- Position change/movement
- Massage/touch
- Counter pressure/acupressure/knee press/double hip squeeze
- Superficial heat/cold
- Hydrotherapy
- Vocalese/words/music/visualization
- Attention focusing/eye contact/breathing
- Role model for spouse/partner/labor support person

LABOR "CHALLENGES" and COMPLICATIONS

- Posterior position
- Prolonged latent phase of labor
- Prolonged active phase of labor
- Prolonged second stage of labor
- Decreased maternal pain tolerance
- Fetal heart rate changes
- Maternal anxiety/family anxiety

APPENDIX B

Family-Centered Maternity Care
Training of Trainers
Clinical Skills Checklist - EVALUATION

Name _____

Date _____

Clinical skills are performed when indicated, in a timely manner, correctly, safely, and with consideration for the women's understanding, comfort, privacy and confidentiality

	Date								
	Client Number	1	2	3	4	5	6	7	8
I	**SUPPORTIVE - DIRECT CARE ACTIVITIES**								
	a. Physical comfort measures								
	1 Use cool cloths, warm compresses								
	2 Assists with shower								
	3 Linen and underpad change for women s comfort								
	4 Offer/encourage oral fluids								
	5 Position of comfort encouraged								
	6 Massage back or other body part								
	7 Assist with ambulation								
	8 Reassuring touch e g hand holding, stroking brow								
	b **Emotional Support**								
	9 Reassurance, encouragement, praise								
	10 Stay with woman to keep company								
	11 Laughter, joking, social chat								
	c **Instruction/Information**								
	12 Instruct/coach e g breathing, relaxation, pushing								
	13 Give advise e g suggest techniques to promote relaxation, comfort								
	14 Instruct/coach partner/labor support person in care								
	15 Explain, provide information e g progress fetus								
	16 Explain physical findings e g exam fetal position								
	d Advocacy								
	17 Support woman s decisions								

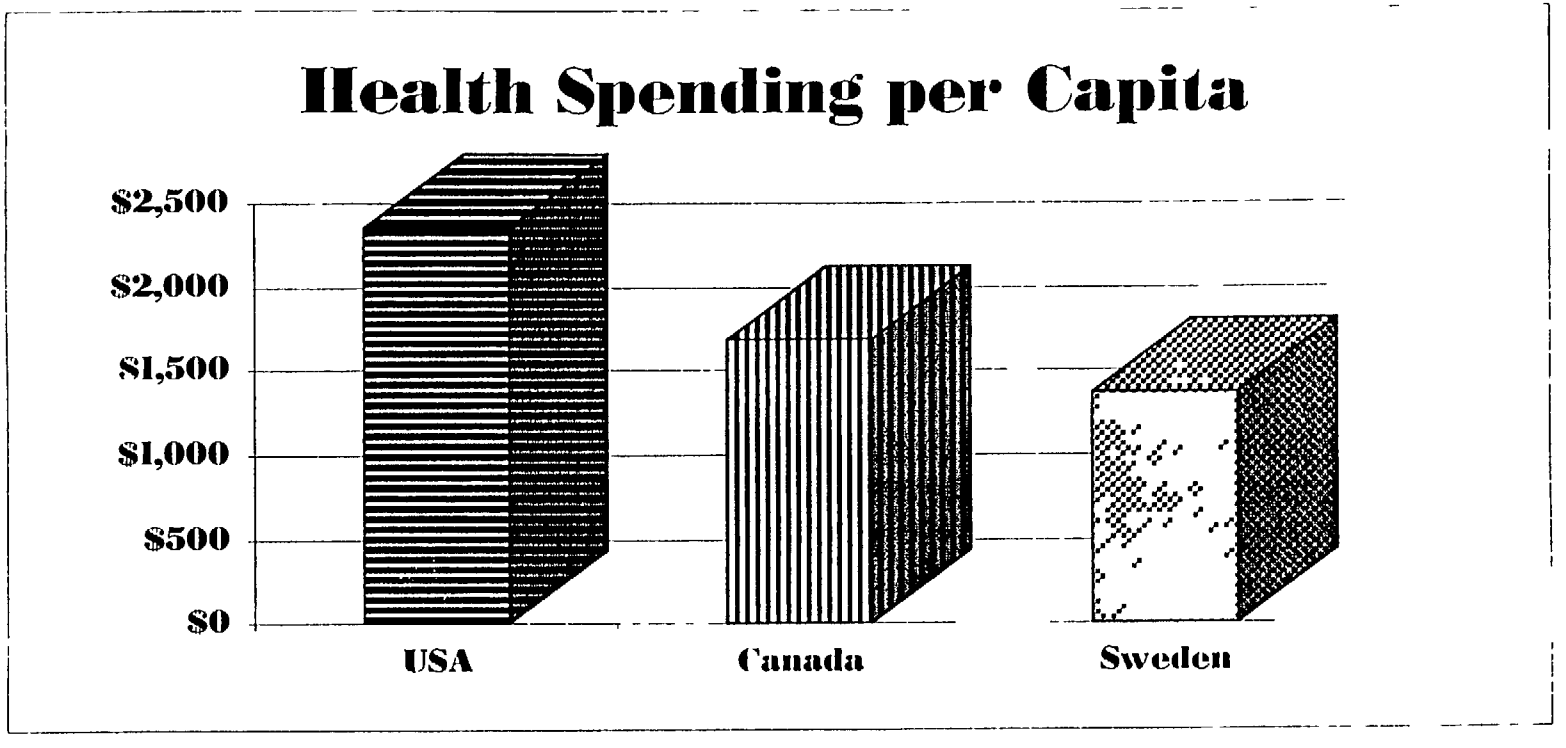
	Date								
	Client Number	1	2	3	4	5	6	7	8
	18 Negotiate woman s wishes with other team members e g desire for natural childbirth, family present								
	19 Facilitate presence of family/support persons								
II	PHYSICAL EXAMINATION								
	a Abdominal exam								
	b Fetal heart rate assessment								
	c Vaginal exam								
	d Enema and shave deferred								
III	LABOR PROGRESS CHALLENGE								
	a Power								
	b Position								
	c Passenger								
	d Pelvis								
	e Psychological								
	f Physical								
	g Intervention								
	Comments								
IV	SECOND STAGE AND BIRTH								
	a Position								
	1 Sitting/semi sitting								
	2 Standing								
	3 Squatting								
	4 Side-lying								
	5 Hands and knees								
	6 Lithotomy								
	7 Other								
V	MATERNAL/INFANT ATTACHMENT (BONDING)								
	a Skin-to-skin (keep infant warm)								
	b Initiate breastfeeding prior to infant care								
	c Facilitate maternal/infant/family attachment								

Health Spending per Capita

$2500
$2000
$1500
$1000
$500
$0

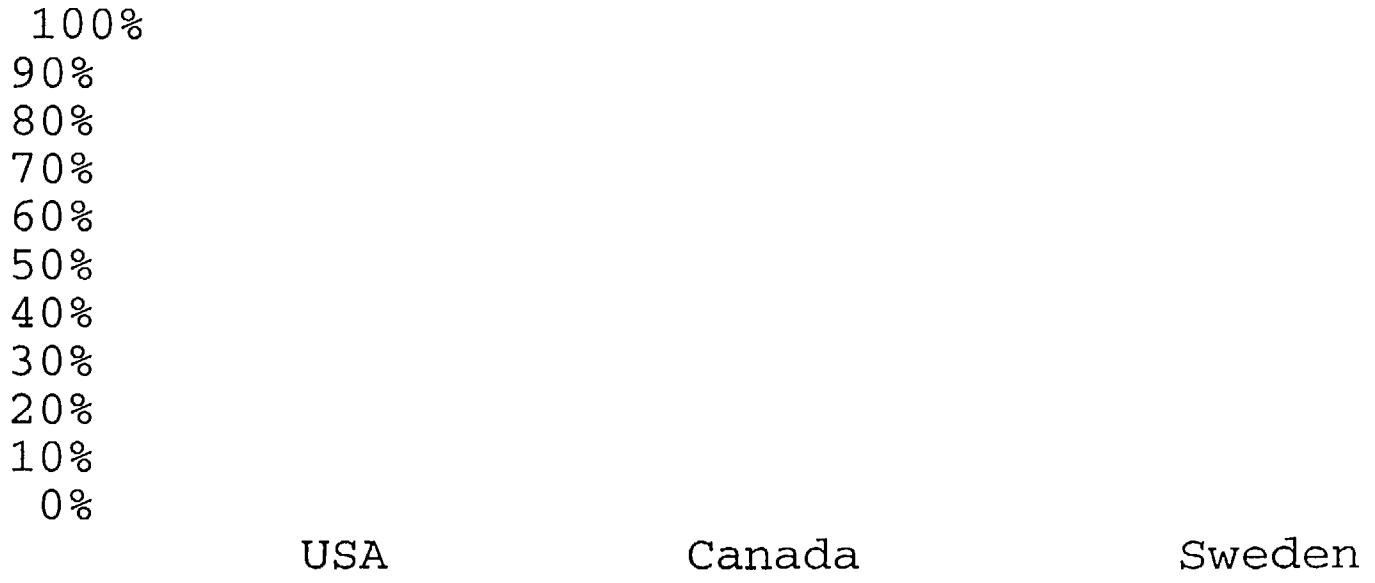
USA Canada Sweden

CONCLUSION The countries with the greatest use of Obstetric Technologies are associated with the highest <u>Per Capita Spending</u>

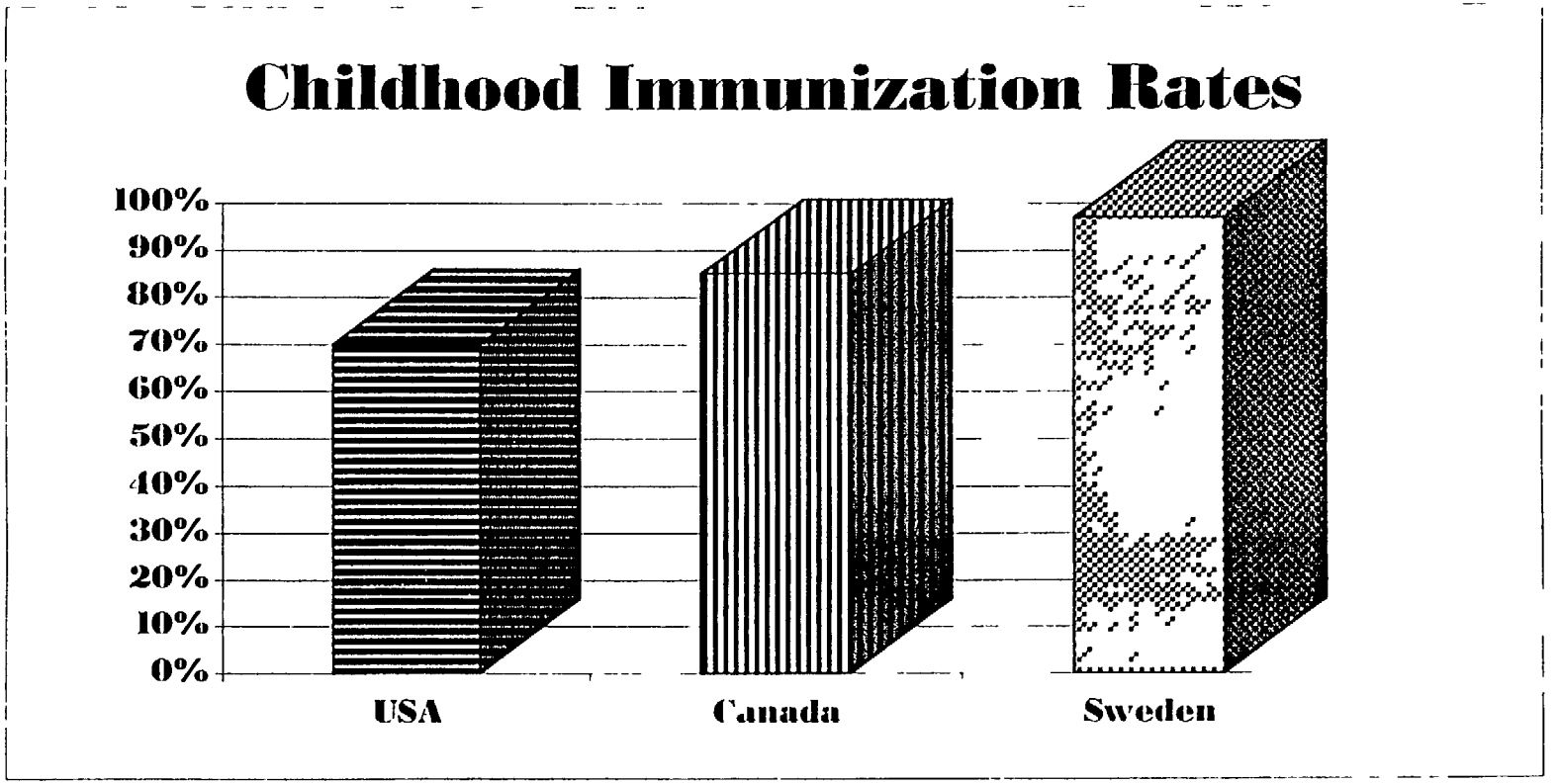


Conclusion : The countries with the greatest use of Obstetric Technologies are associated with the highest **Per Capita Spending.**

Childhood Immunization Rates



CONCLUSION. The countries with the highest cost and the greatest use of Obstetric Technologies are associated with the poorest Immunization Rates

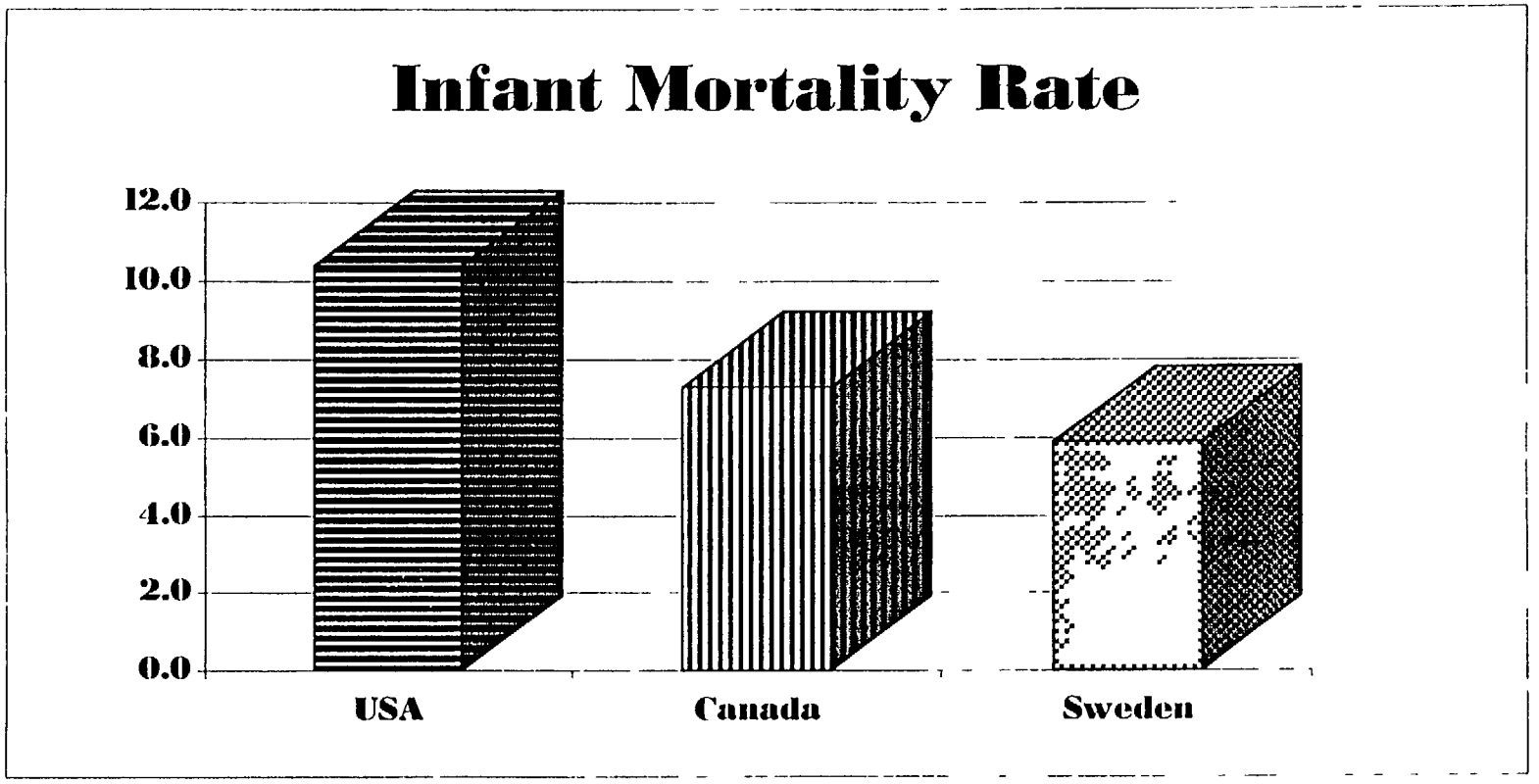


Conclusion : The countries with the highest cost and the greatest use of Obstetric Technologies are associated with the poorest **Immunization Rates**

Infant Mortality Rate

12.0
10.0
8.0
6.0
4.0
2.0
0 0

CONCLUSION. The countries with the highest cost and the greatest use of Obstetric Technologies are not associate with the best Infant Mortality Rates



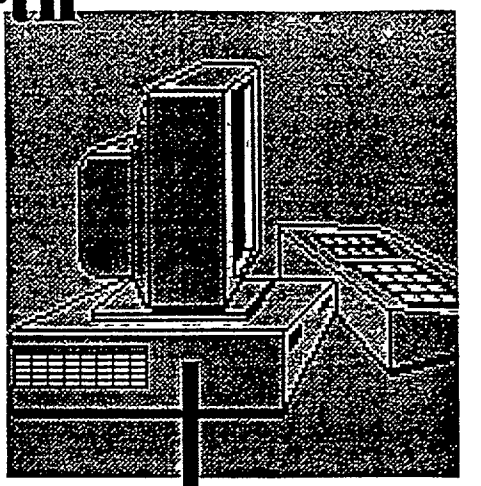
Conclusion : The countries with the highest cost and the greatest use of Obstetric Technologies are not associated with the best **Infant Mortality Rates**.

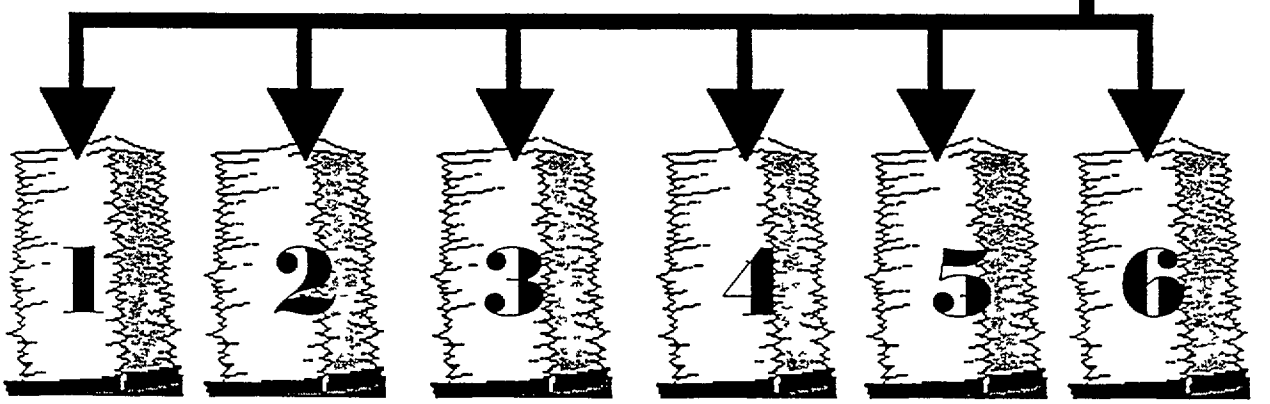
Effective Care in Pregnancy and Childbirth

1 2 3 4 5 6

1. Beneficial
2. Likely Beneficial
3. Both Beneficial and Adverse
4. Unknown
5. Unlikely of Benefit
6. Ineffective or Harmful

Effective Care in Pregnancy and ChildBirth





Beneficial

1. ~~Benficial~~

2. Likely Beneficial

3. Both Beneficial and Adverse

4. Unknown

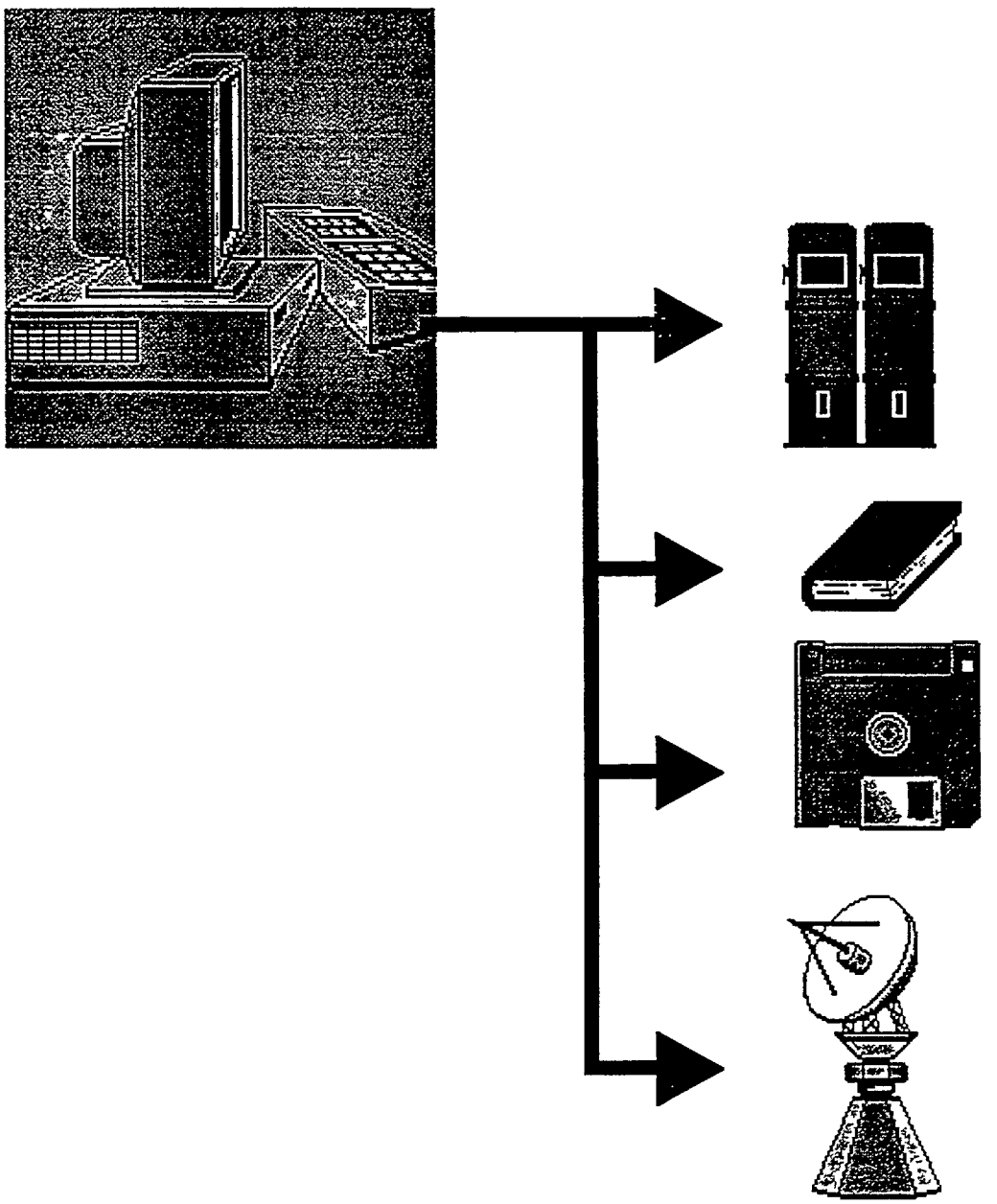
5. Unlikely of Benefit

6. Ineffective or Harmful

Effective Care in Pregnancy
and Childbirth

CONCLUSION: The literature reviews on Effective Care in Pregnancy and Childbirth are continuously being updated and the information is disseminated in 4 ways

Effective Care in Pregnancy and ChildBirth



Conclusion : The literature reviews on **Effective Care in Pregnancy and ChildBirth** are continuously being updated and the information is disseminated in **4 ways**

Obstetric Technologies

1 Obstetrician Specialty Care

2 Hi-Risk Maternity Hospital Care

3 Cesarean Section

4. Pitocin

5 Fetal heart rate Monitoring

6. Continuous Epidural Anesthesia

CONCLUSION: The extensive and routine use of Obstetric Technologies in normal pregnancy <u>has not</u> been associated with the best outcomes.

Obstetric Technologies

1. **Obstetrician Specialty care**
2. **Hi-Risk Maternity Hospital care**
3. **Cesarean Section**
4. **Pitocin**
5. **Fetal heart rate Monitoring**
6. **Continuous Epidural Anesthesia**

Conclusion : The extensive and routine use of Obstetric Technologies in normal pregnancy **has not** been associated with the best outcomes

Netherlands

	Nurse Midwife Care	Obstetrician Care
cesarean section	5.9%	16%
oxytocin use	4.5%	21.3%
perinatal mortality	0 7%	0.7%

CONCLUSION· The routine use of specialized care is associated with more frequent interventions, but not with improvement outcomes

Netherlands

	Nurse Midwife Care	Obstetrician Care
cesarean section	5 9%	16%
oxytocin use	4 5%	21 3%
Perinatal Mortality	0 7%	0 7%

Conclusion : The **routine** use of **specialized care** is associated with more frequent **interventions**, but **not** with improved **outcomes**

Family Centered Maternity Care

1 Family Support

2 Family Informed Decision

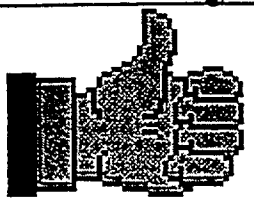
3. Ambulation in Labor

4. Breastfeeding emphasized

5 Newborn Rooming-in

CONCLUSION The routine use of Family Centered Maternity Care in all pregnancies <u>has been</u> associated with improved outcomes

Family Centered Maternity Care



1. **Family Support**
2. **Family Informed Decisions**
3. **Ambulation in Labor**
4. **Breast Feeding emphasized**
5. **Newborn Rooming-In**

Conclusion : The routine use of Family Centered Maternity Care in all pregnancies **has been** associated with improved outcomes.

SHARP The BirthPlace

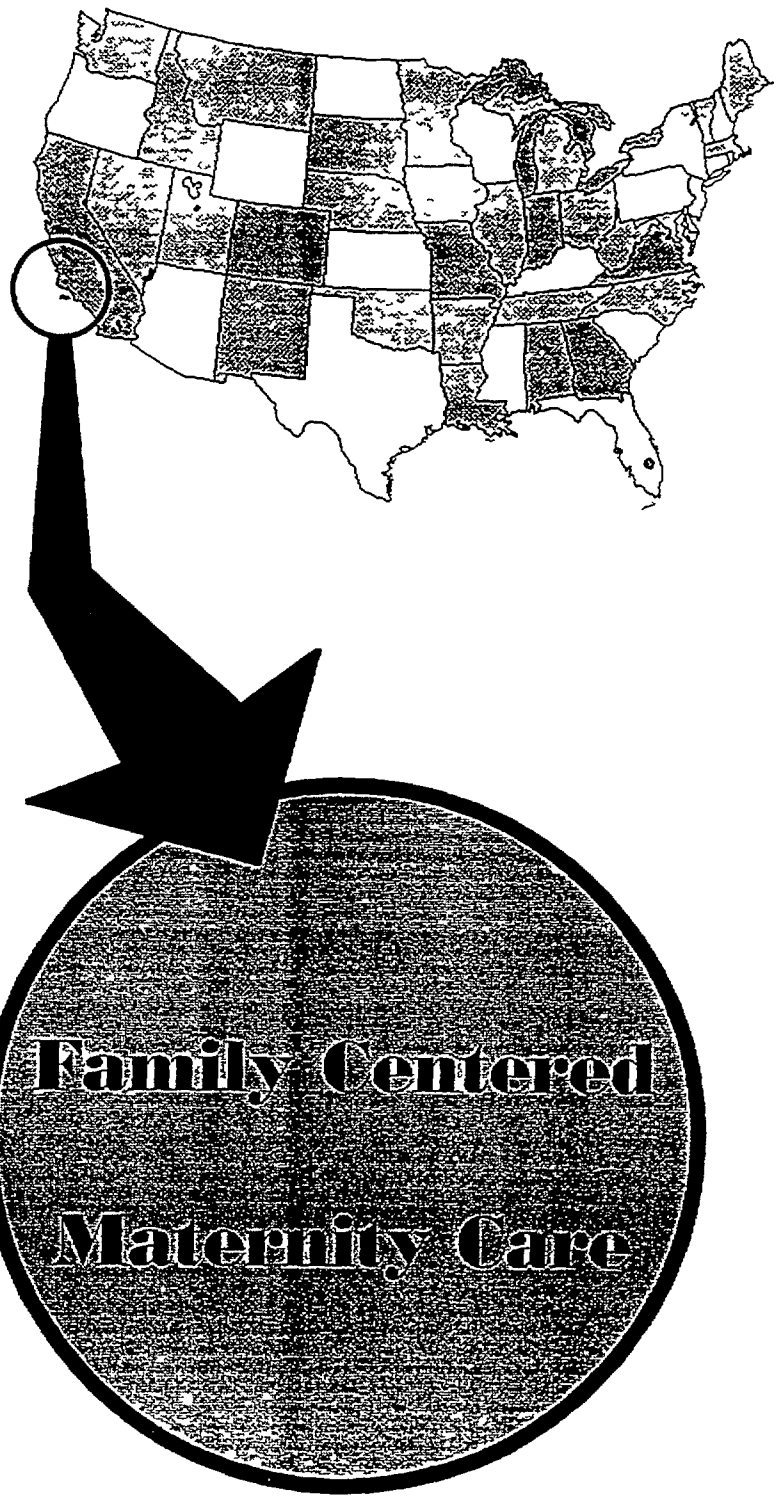
San Diego, California

Family Centered Maternity Care

186

Sharp The BirthPlace

San Diego, California

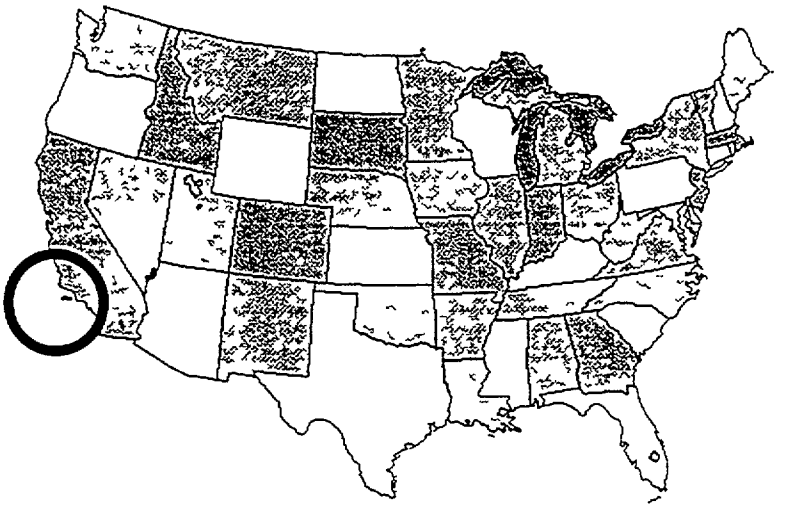


USA

	Birth Center	California Hospitals
routine care by Obstetrician specialist	5%	96%
cesarean section	13%	23%
hospital stay	1.3 days	2 2 days
low birth weight	4.7%	5 9%
perinatal mortality	.08%	1 1%

CONCLUSION: Family Centered Maternity Care for all pregnancies, together with selective use of Specialization and Technology is associated with the best outcomes

USA



	Birth Center	California Hospitals
routine care by Obstetrician specialist	5%	96%
cesarean section	13%	23%
hospital stay	1 3 days	2 2 days
low birthweight	4 7%	5 9%
perinatal mortality	0 8%	1 1%

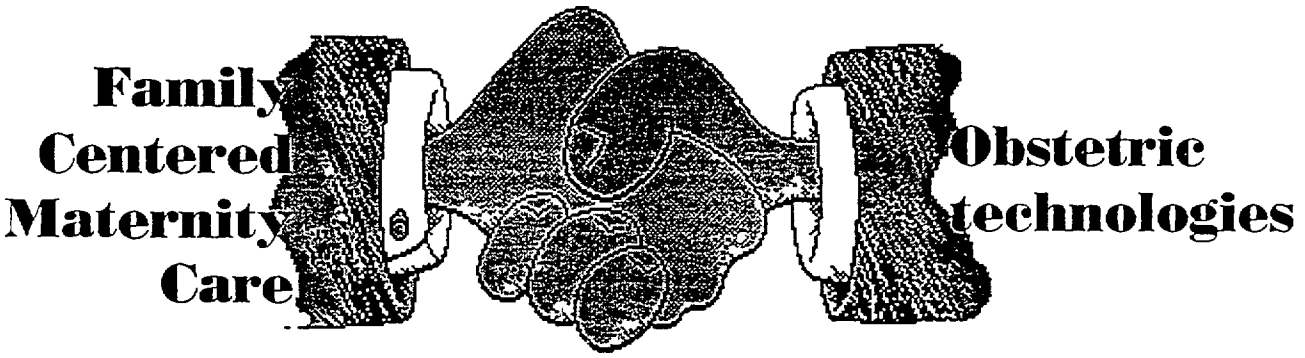
Conclusion :

Family Centered Maternity Care for all pregnancies, ~~and~~ together with the selective use of **Specialization and Technology** is associated with the best outcomes

Family Centered
Maternity Care

Obstetric
Technologies

CONCLUSION· The best outcomes are associated with the <u>routine</u> use of Family Centered Maternity Care together with the <u>selective</u> use of Obstetric Specialization and Technology



Conclusion : The best outcomes are associated with the **routine** use of Family Centered Maternity Care ~~and~~ together with the **selective** use of Obstetric Specialization and Technology

Risk Assessment

complication

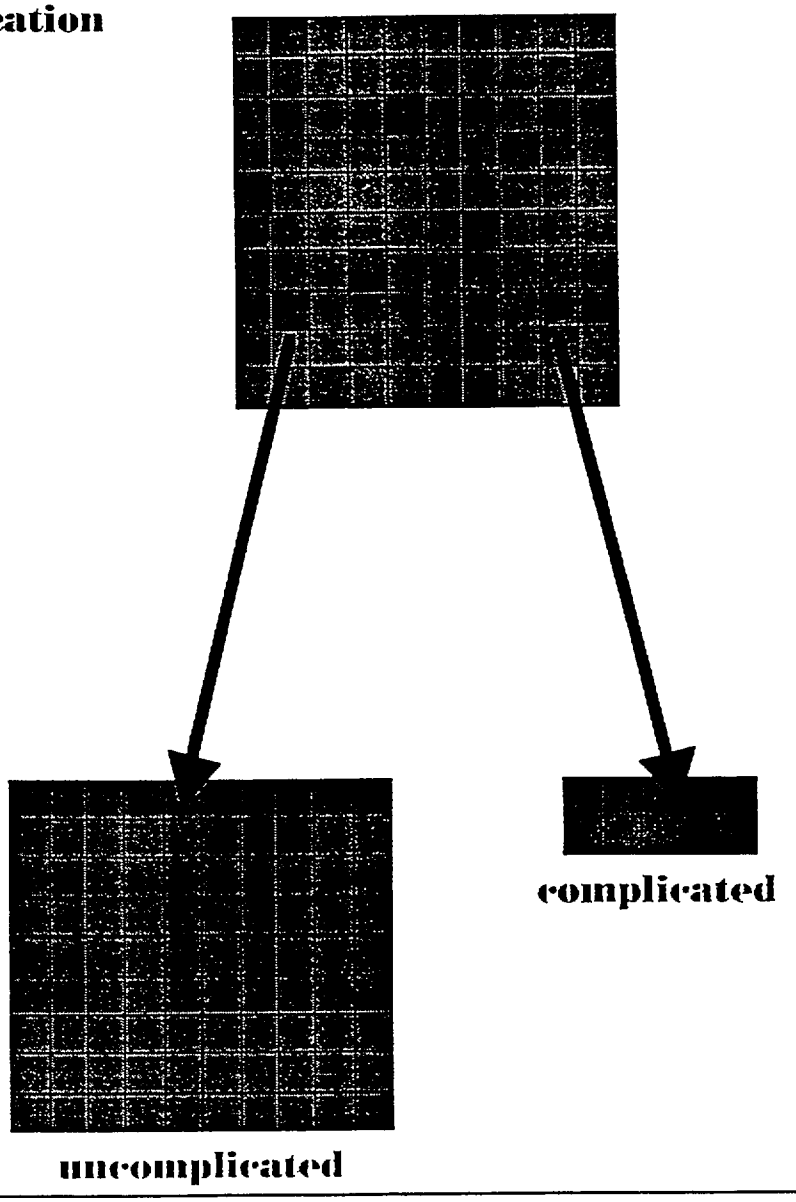
complicated

uncomplicated

CONCLUSION. 10% of pregnancies are associated with significant <u>Complications</u>

Risk Assessment

■ = complication



Conclusion : 10% of pregnancies are associated with significant **Complications**

Risk Assessment

complication

low-risk

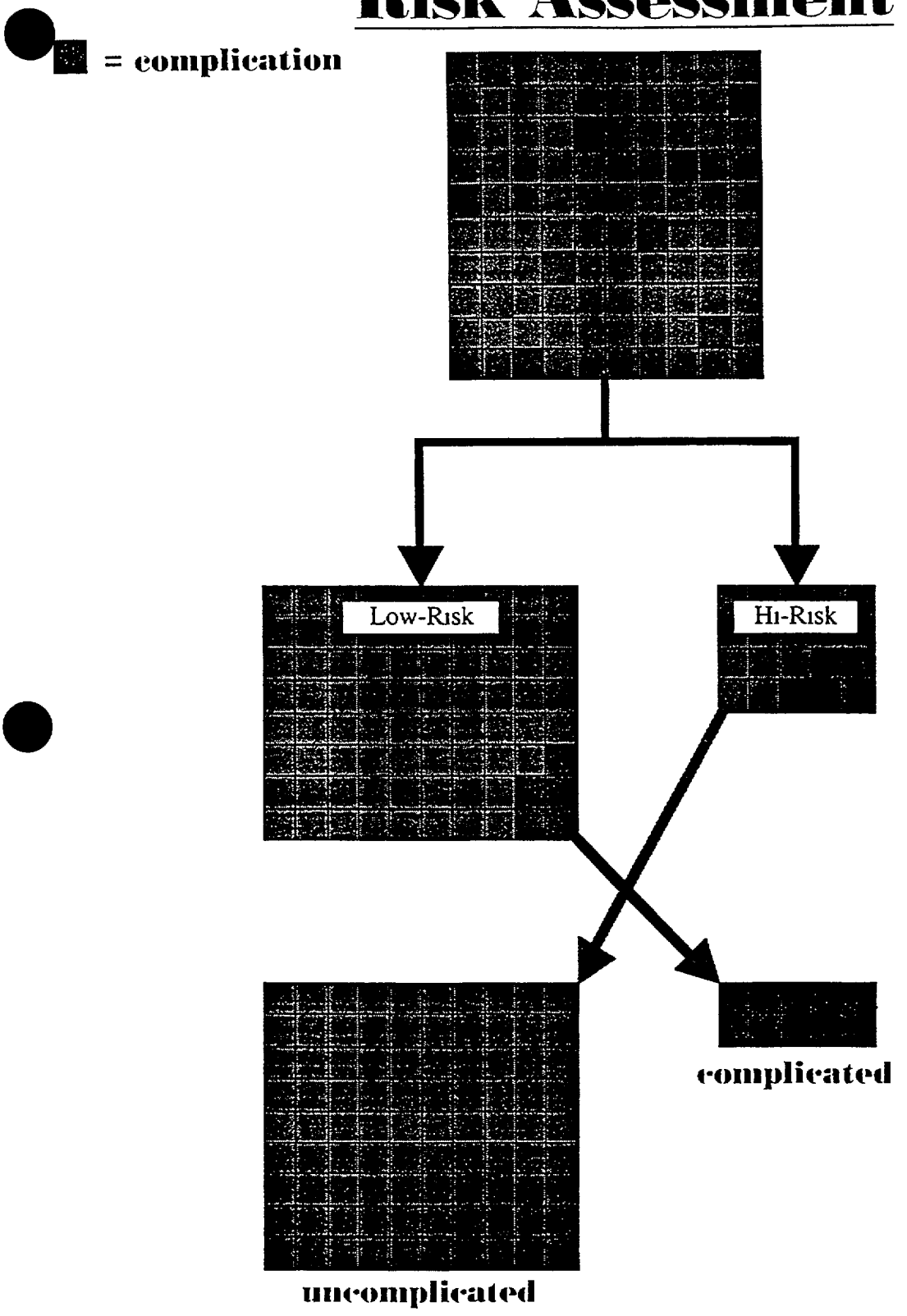
hi-risk

complicated

uncomplicated

CONCLUSION· 75% of hi-risk patients are uncomplicated, and 50% of complications occur in patients who were low-risk

Risk Assessment

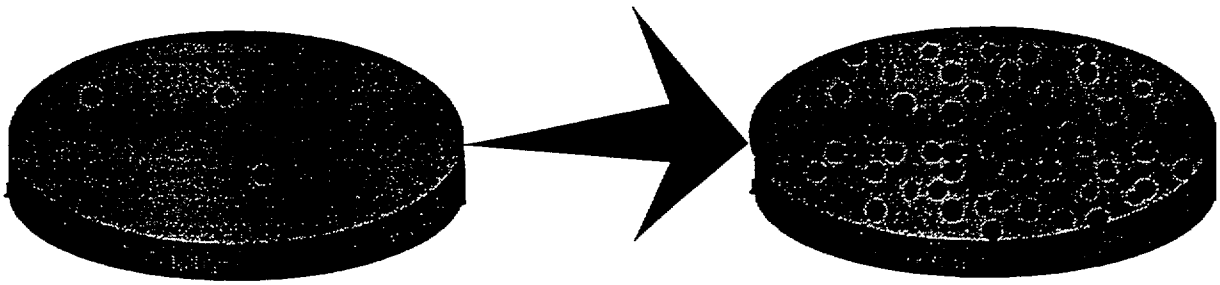


Conclusion : 75% of Hi-Risk patients are uncomplicated, and 50% of complications occur in patients who were Low-Risk

Definition of Clinical Infection

CONCLUSION· When bacteria grow to exceed 100,000 colonies per cc of fluid, or gram of tissue, clinical infection becomes apparent - redness, heat, pain, fever, etc

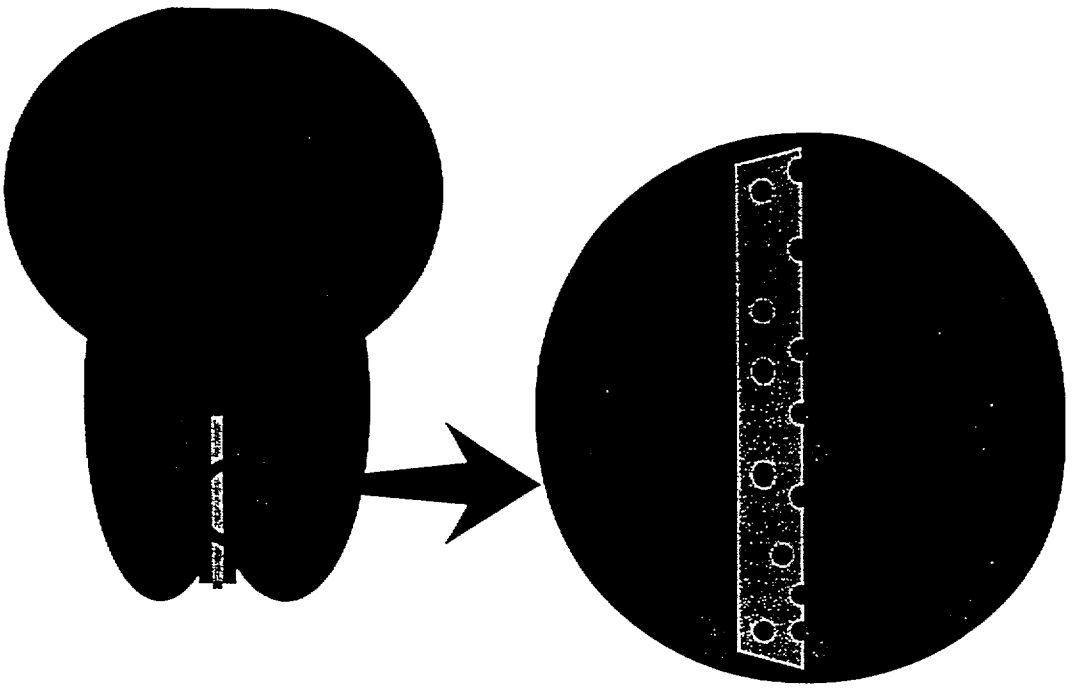
Definition of Clinical Infection



Conclusion : When bacteria grow to exceed 100,000 colonies per cc of fluid, or gram of tissue, clinical infection becomes apparent - redness, heat, pain, fever, etc

CONCLUSION: Whether or not bacterial contamination will progress to a clinical infection is dependent upon;

1. the numbers and virulence of the bacteria
2 a portal of entry
3 a suitable culture medium
4 host resistance factors



Conclusion : Whether or not bacterial contamination will progress to a clinical infection is dependant upon ;

1. the numbers and virulence of the **bacteria**
2. a **portal of entry**
3. a suitable **culture medium**
4. **host resistance** factors

Endocervical Contamination

CONCLUSION The endocervix is routinely <u>contaminated</u> with gram positive and gram negative bacteria

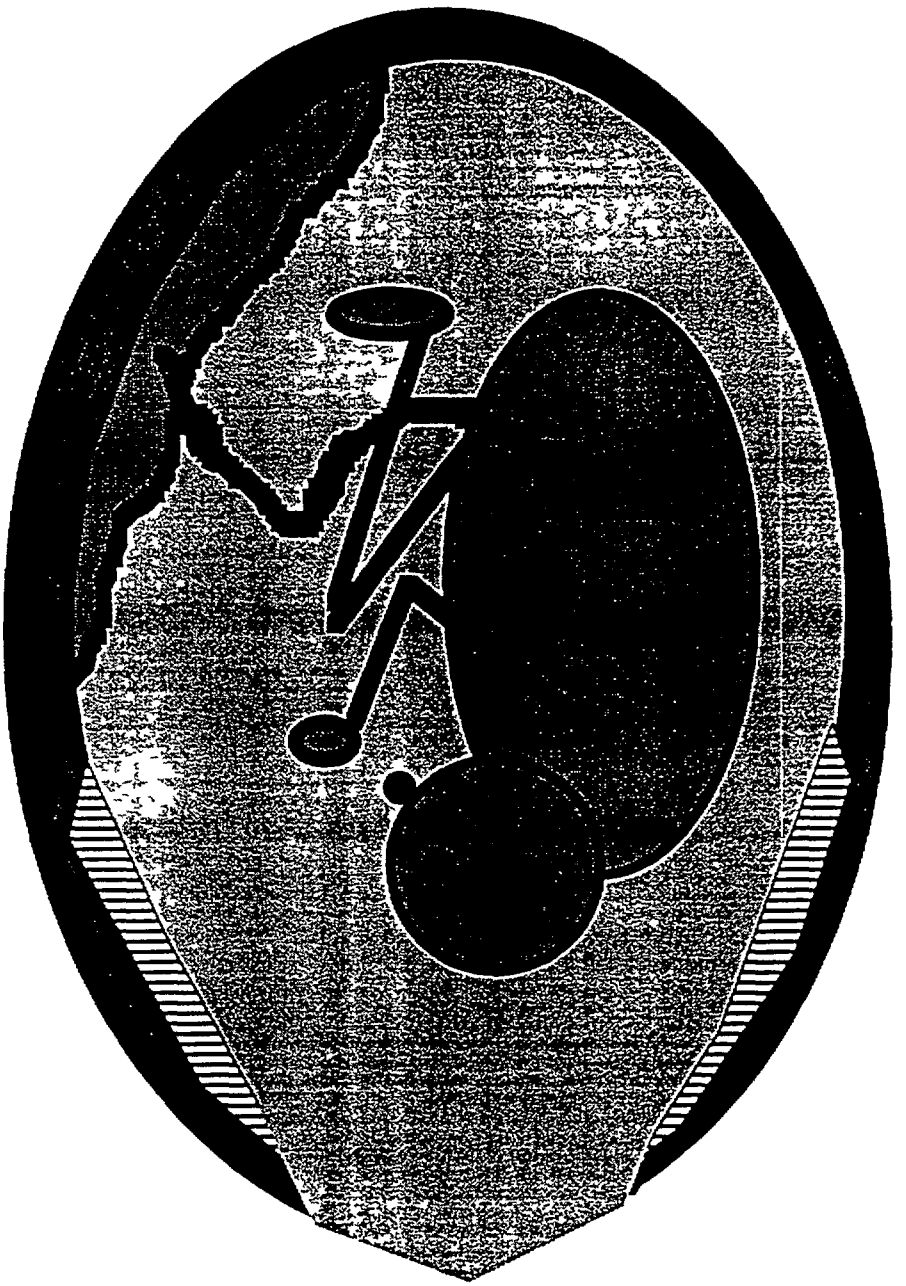
Endocervical Contamination

Conclusion : The Endocervix is routinely **contaminated** with gram positive and gram negative bacteria

Effacement of Labor

CONCLUSION· The cervical affacement of labor and rupture of the membranes routinely contaminate the lower uterus and amnion with endocervical bacteria

Effacement of Labor

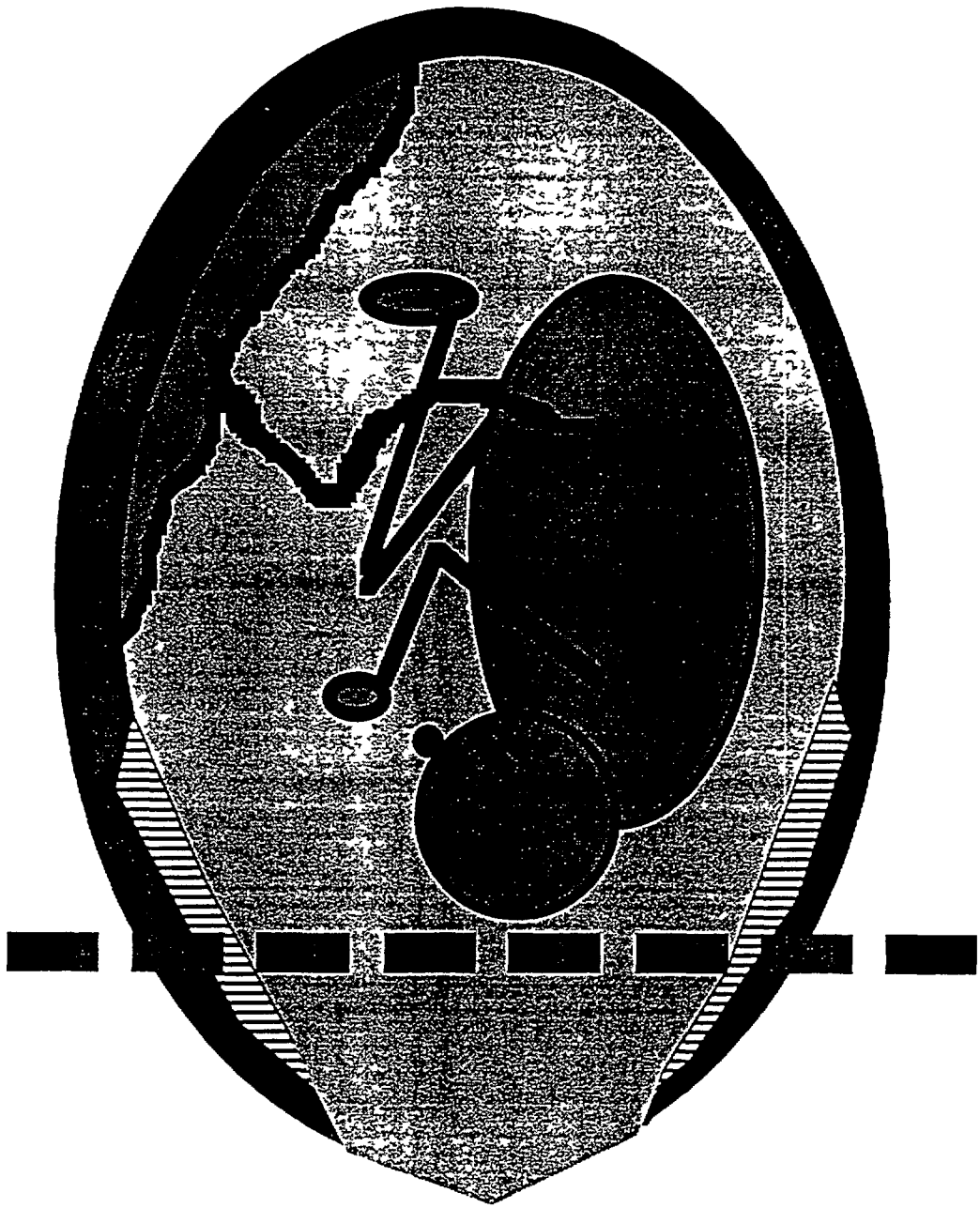


Conclusion : The cervical effacement of labor and rupture of the membranes routinely contaminate the lower uterus and amnion with endocervical bacteria

Lower Segment C-Section

CONCLUSION: A lower segment Cesarean section performed in active labor, routinely incises and sutures through tissues contaminated with Endocervical bacteria

Lower Segment C-Section

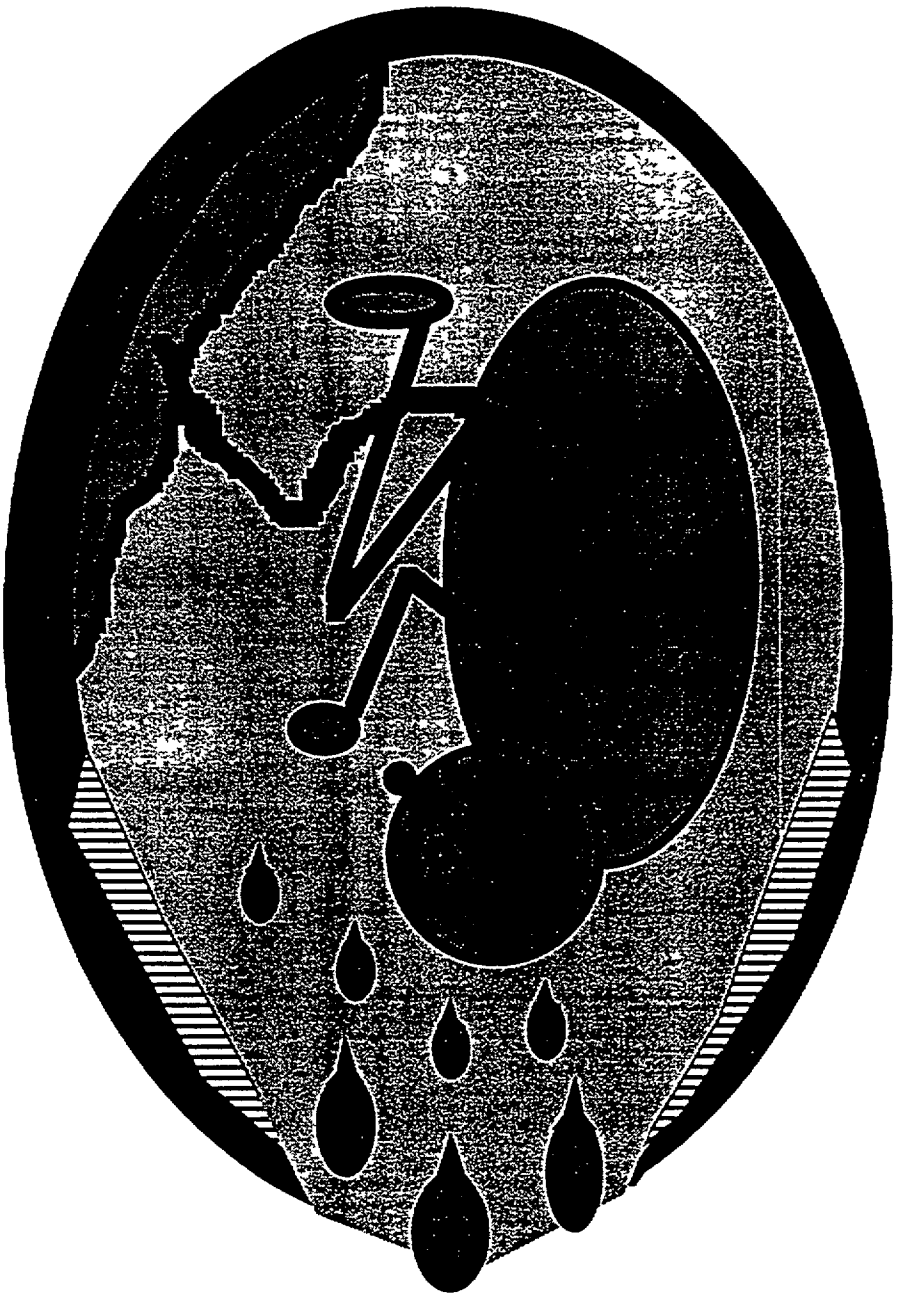


Conclusion : A Lower segment Cesarean section performed in active labor, routinely incises and sutures through tissues contaminated with Endocervical bacteria

Rupture of the Membranes and Labor

CONCLUSION Rupture of the Membranes followed by more than 12 hours of labor, is routinely associated with contamination of the amniotic fluid and the fetus with Endocervical bacteria (especially Group B streptoccus)

Rupture of the Membranes and Labor



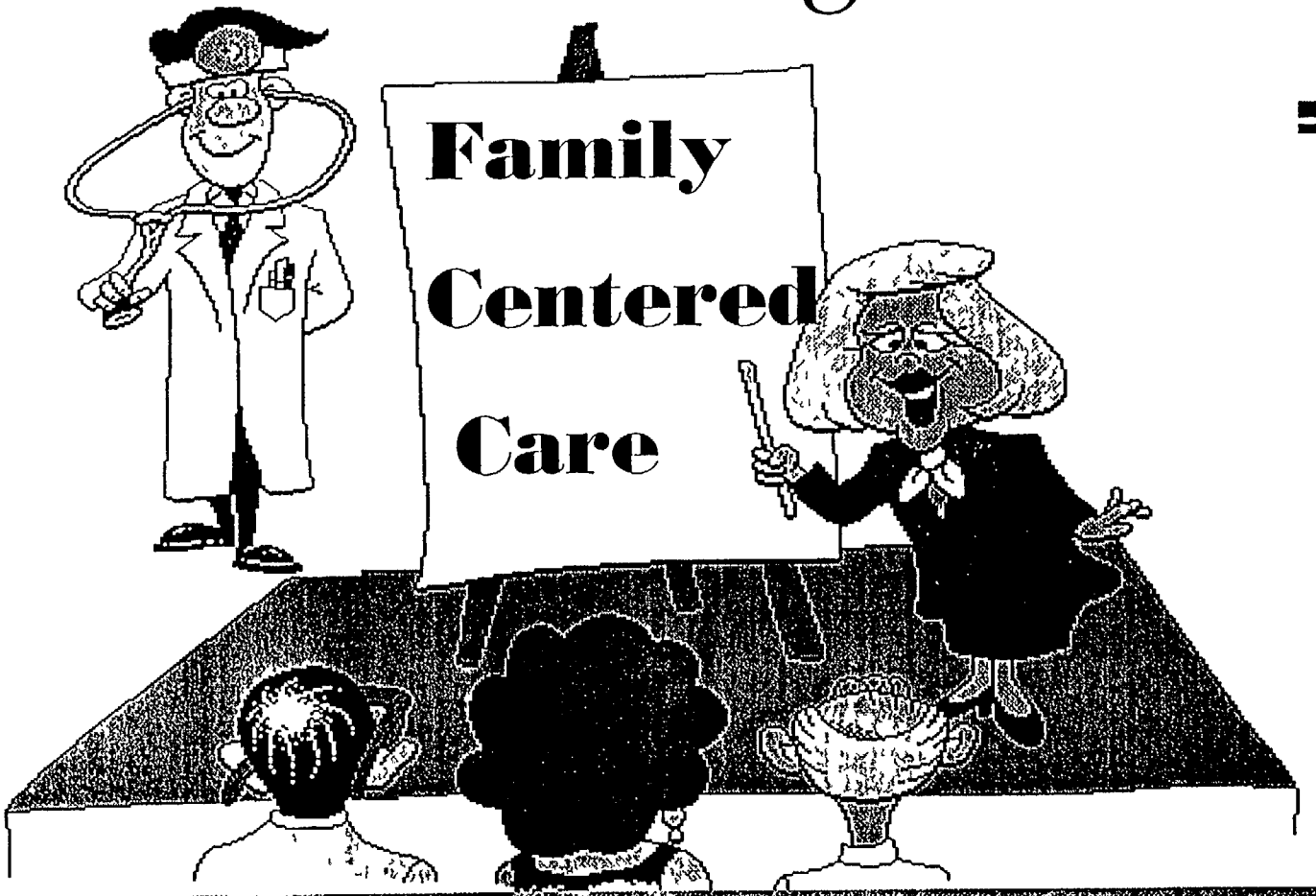
Conclusion : Rupture of the Membranes followed by More than 12 hours of labor, is routinely associated with contamination of the amniotic fluid and the fetus with Endocervical bacteria (especially **Group B streptoccus**)

Staff Encouragement

Family
Centered
Care

CONCLUSION. More than 50% of women will choose to participate in the Family Centered Maternity Care Program

Staff Encouragement

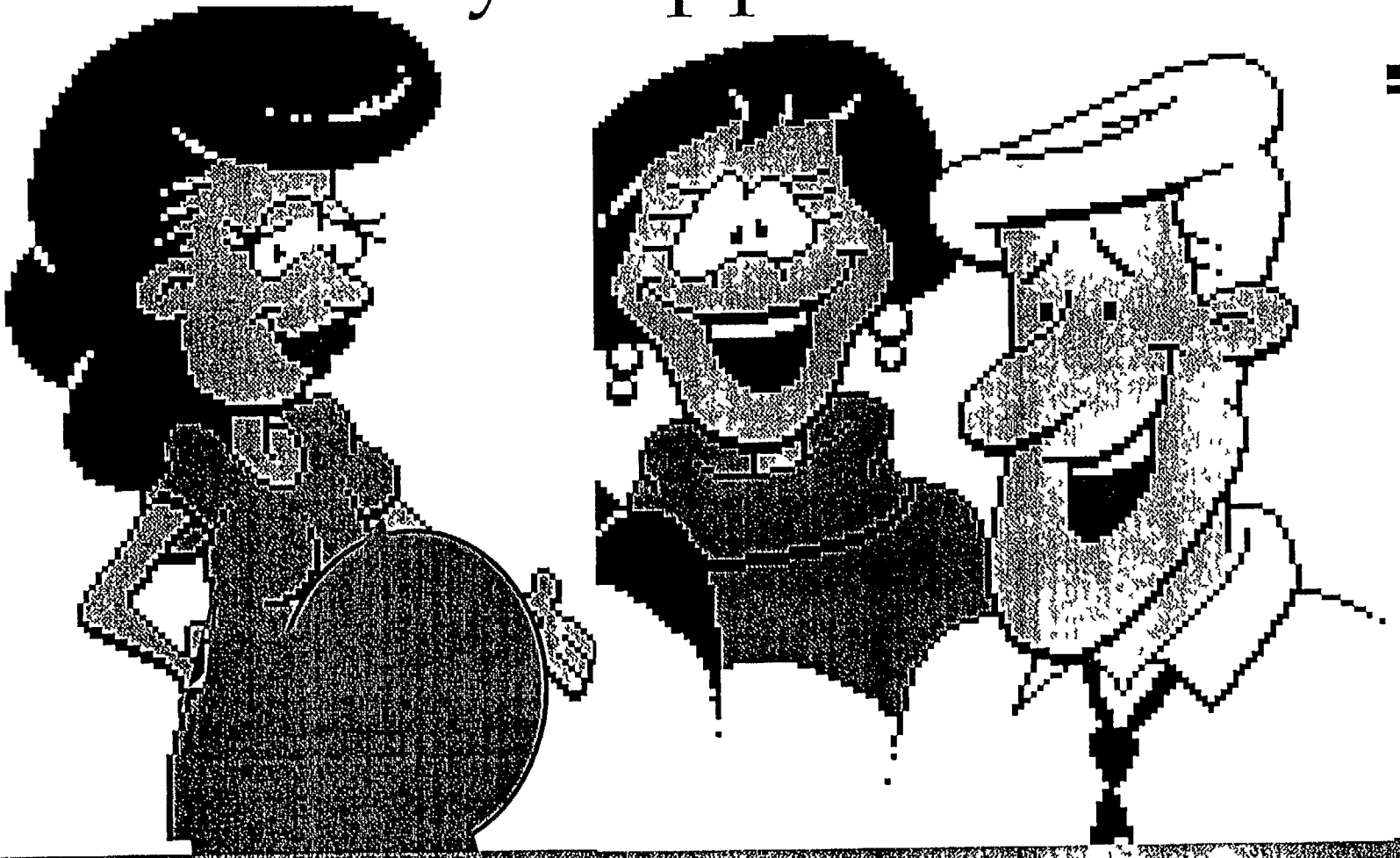


Conclusion : More than 50% of women will choose to participate in the Family Centered Maternity Care Program .

Family Support in Labor

CONCLUSION. More than 95% of women will receive Family Support in labor.

Family Support in Labor

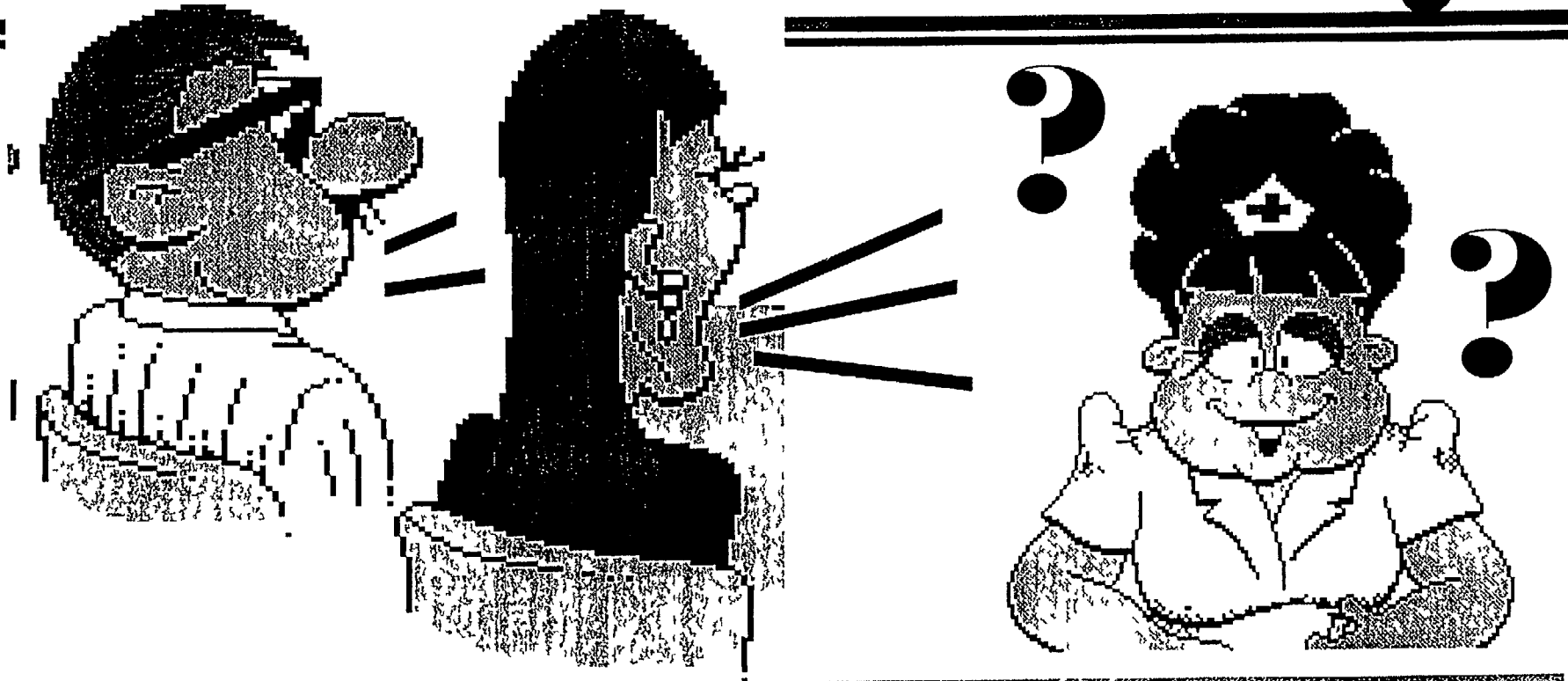


Conclusion: More than 95% of women will receive Family Support in labor

Decisions'''

CONCLUSION· The Maternity Staff will assist families to play an active in the Decisions about their Obstetric care

Decisions !!!

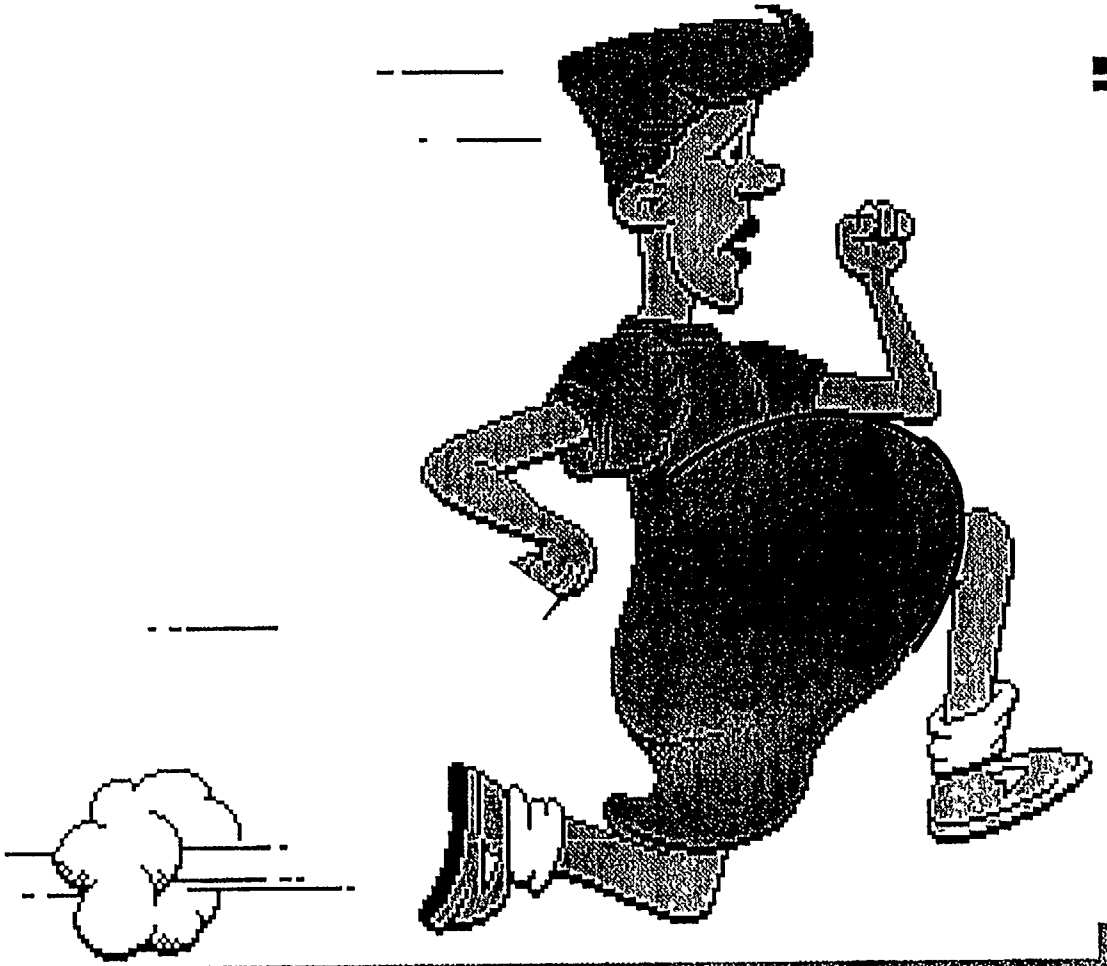


Conclusion : The Maternity Staff will assist families to play an active in the Decisions about their Obstetric care

Ambulation in Labor

Conclusion. More than 60% of women will <u>ambulate</u> during most of their labor

Ambulation in Labor



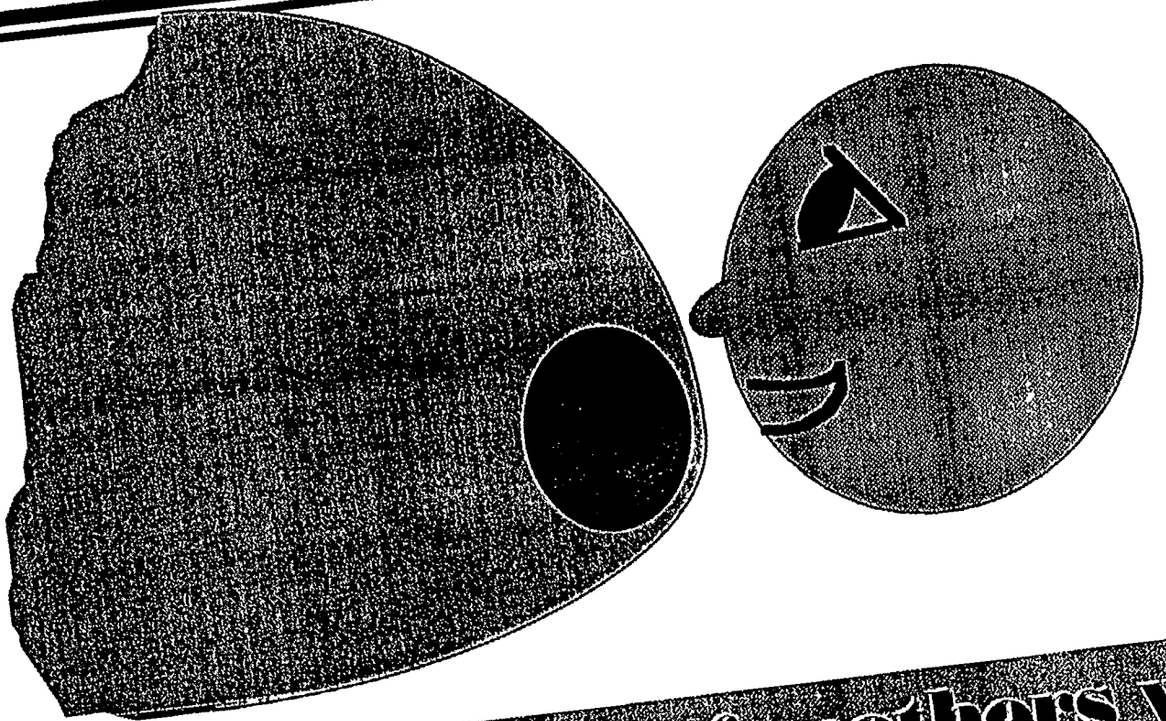
Conclusion 8: More than 60% of women will Ambulate significantly in labor

during most of their

Breastfeeding

Conclusion 80% of mother will begin <u>breastfeeding</u> in the delivery room.

Breast Feeding

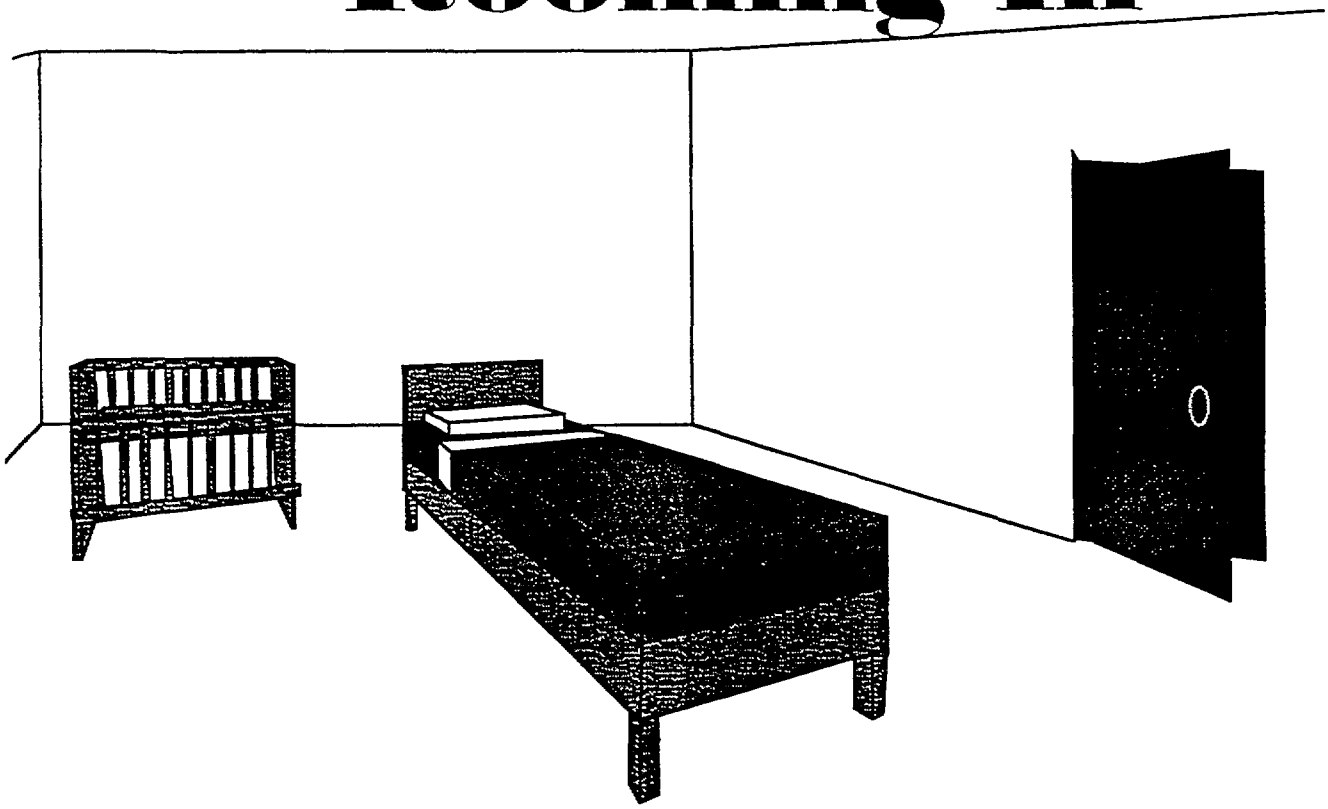


Conclusion: 80% of mothers will begin <u>Breast Feeding</u> in the delivery room.

Rooming-In

CONCLUSION: 90% of Mother will <u>room-in</u> with their baby during their entire hospital stay

Rooming-In



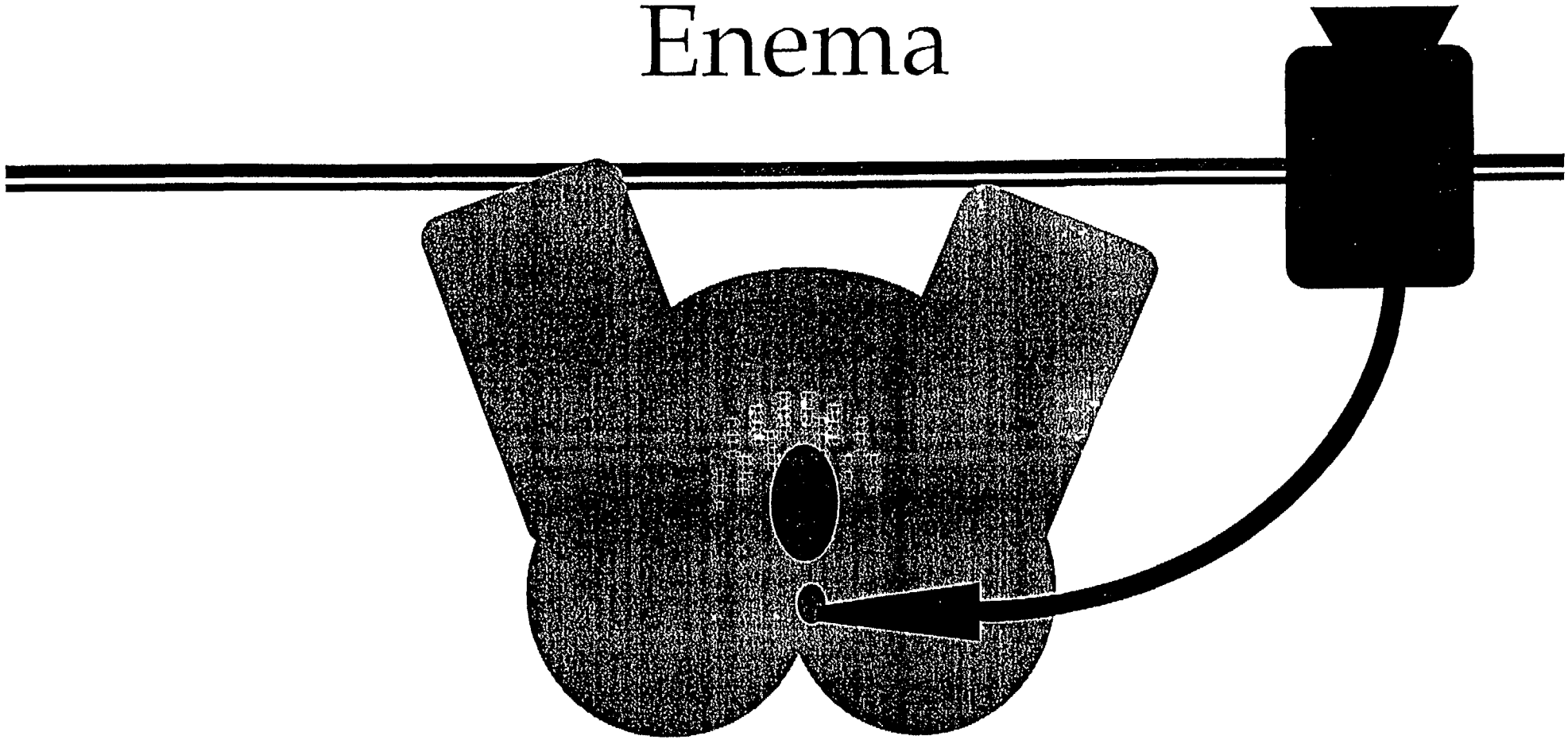
Conclusion : 90% of Mothers will **Room-In** ~~together~~ during their entire hospital stay.

with their baby

Enema

CONCLUSION less than 5% of women will have an <u>enema</u>.

Enema

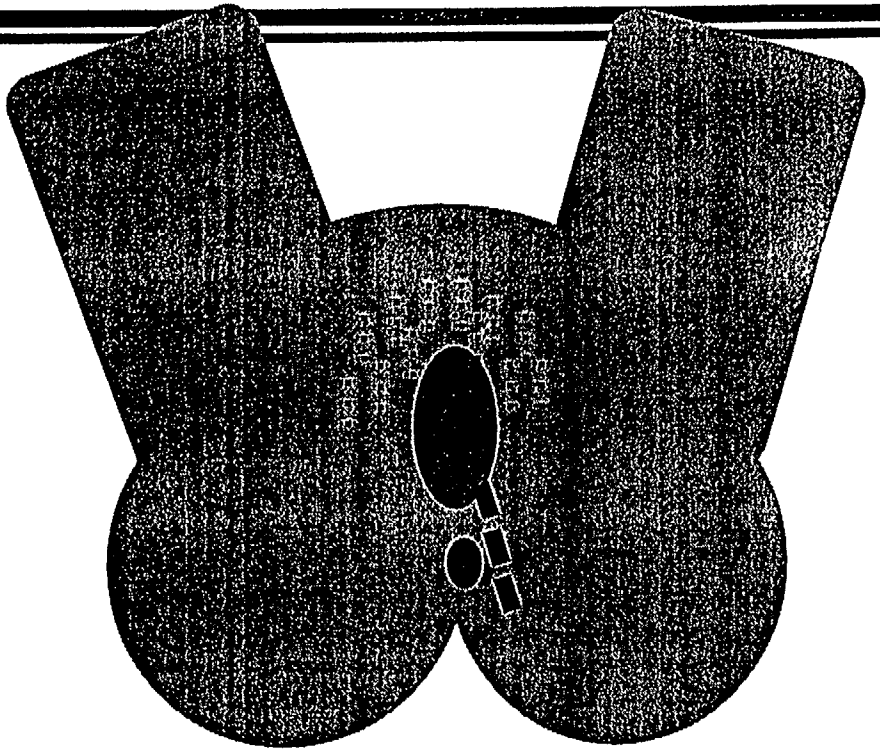


Conclusion: less than 5% of women will have an Enema

Episiotomy

CONCLUSION less than 10% of women will have an <u>episiotomy</u>

Episiotomy

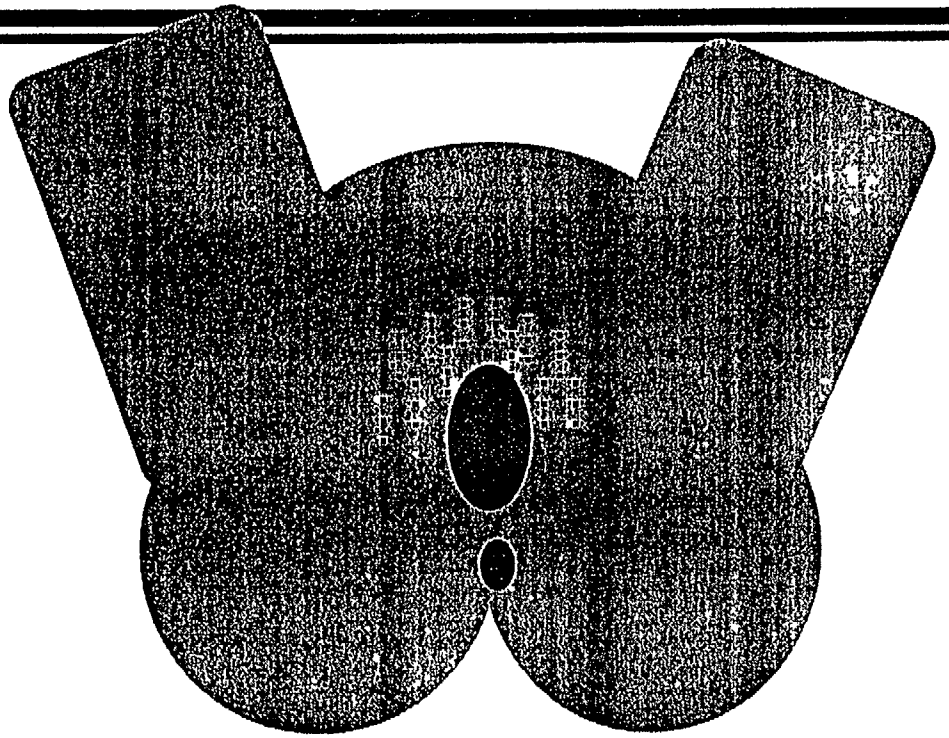


Conclusion: less than 10% of women will have an Episiotomy

Shaving

CONCLUSION· Less than 5% of women will have a <u>Perineal Shave</u>

Shaving

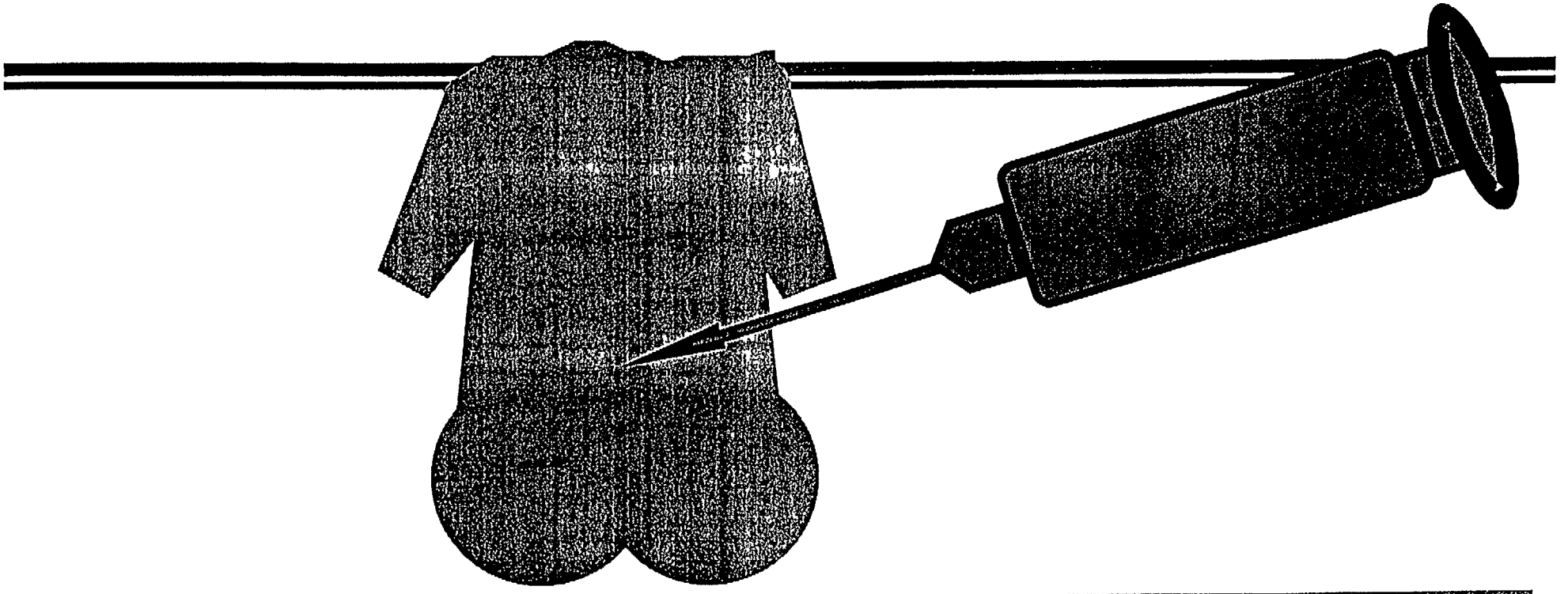


Conclusion : Less than 5% of women will have a <u>Perineal Shave</u>

Anesthesia

CONCLUSION. More than 70% of women will feel a sense of <u>accomplishment</u> that they delivered their baby with awareness and control, without Anesthesia

Anesthesia



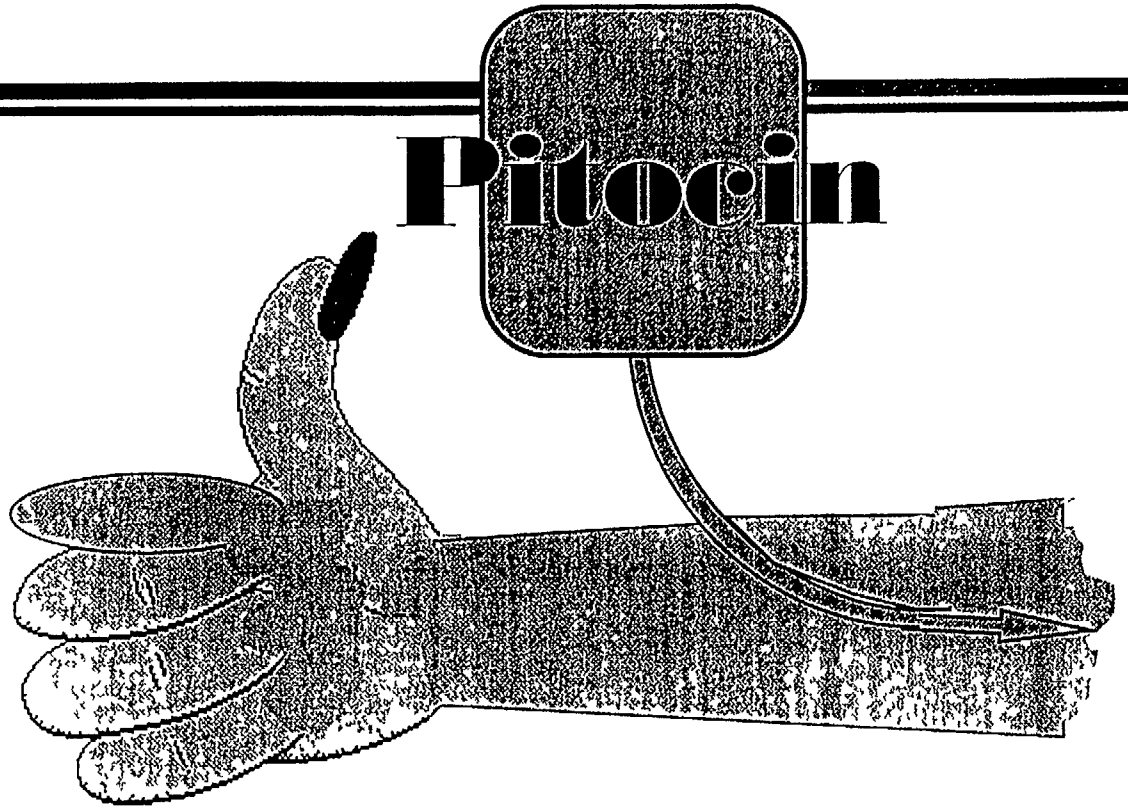
Conclusion: More than 70% of women will feel a sense of Accomplishment that they delivered their baby with awareness and control, without Anesthesia.

Induction of Labor

Pitocin

CONCLUSION· Less than 10% of labors will be <u>induced</u>

Induction of Labor

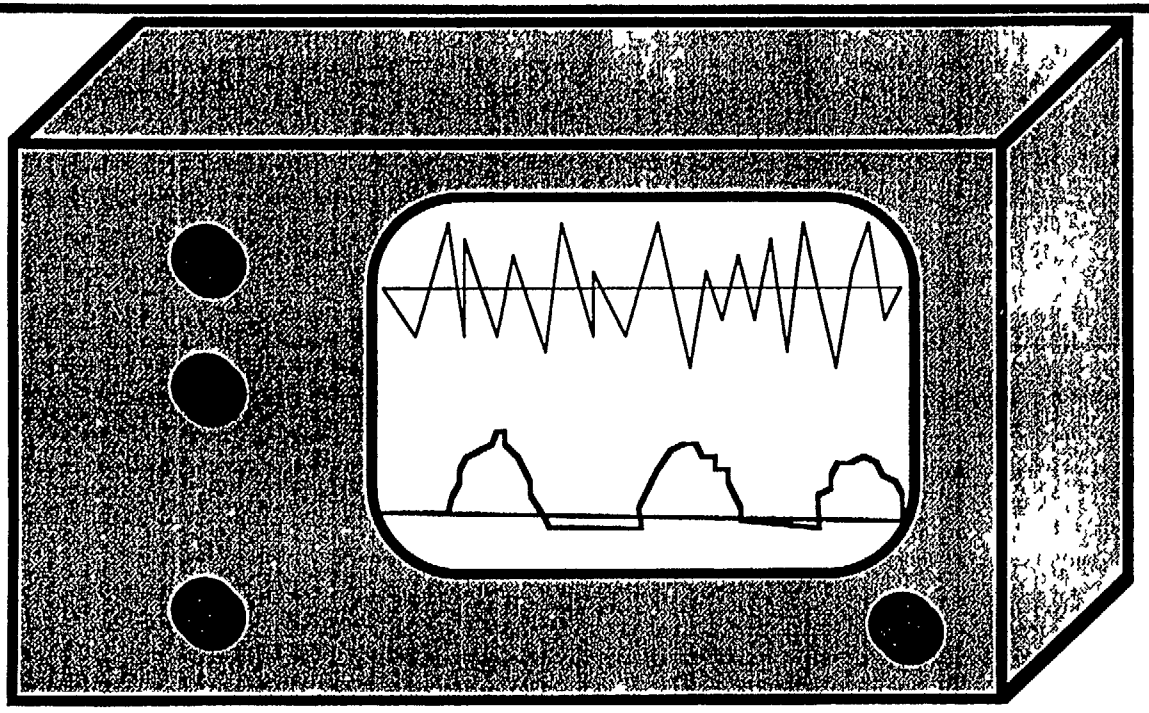


Conclusion: Less than 10% of labors will be Induced

Electronic Fetal Monitoring

CONCLUSION: Less than 40% of women will have continuous <u>Electronic Fetal Monitoring</u> during their labor

Electronic Fetal Monitoring

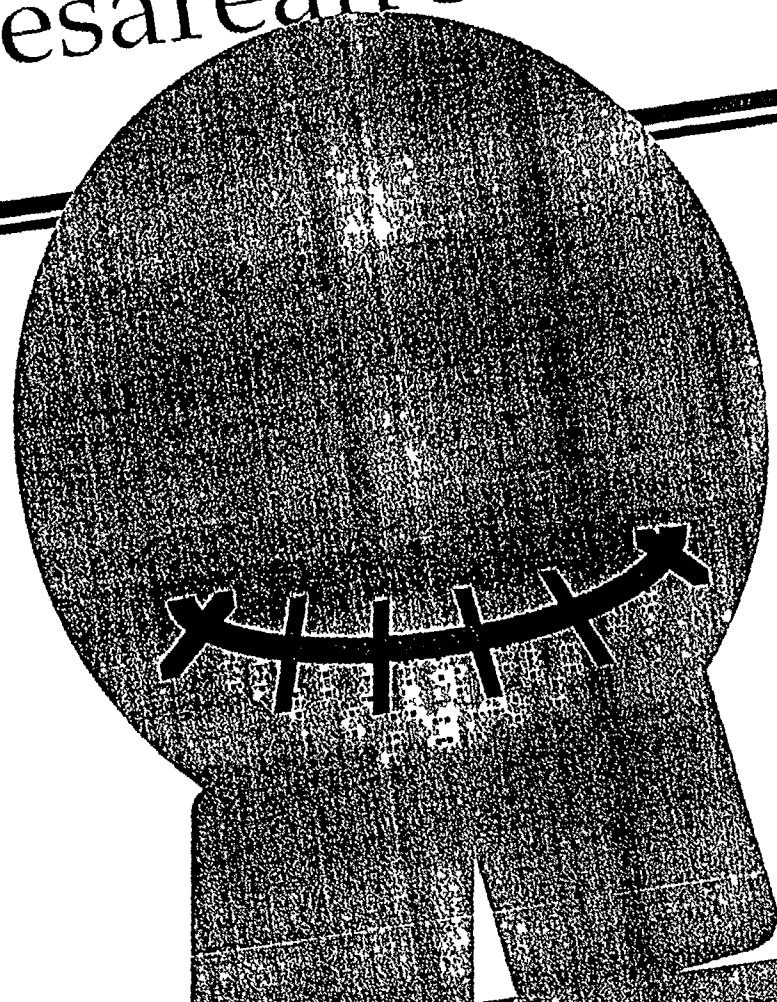


Conclusion : Less than 40% of women will have continuous Electronic Fetal Monitoring during their labor.

Cesarean Section

CONCLUSION. Less than 12% of births will be by <u>Cesarean Section</u>

Cesarean Section

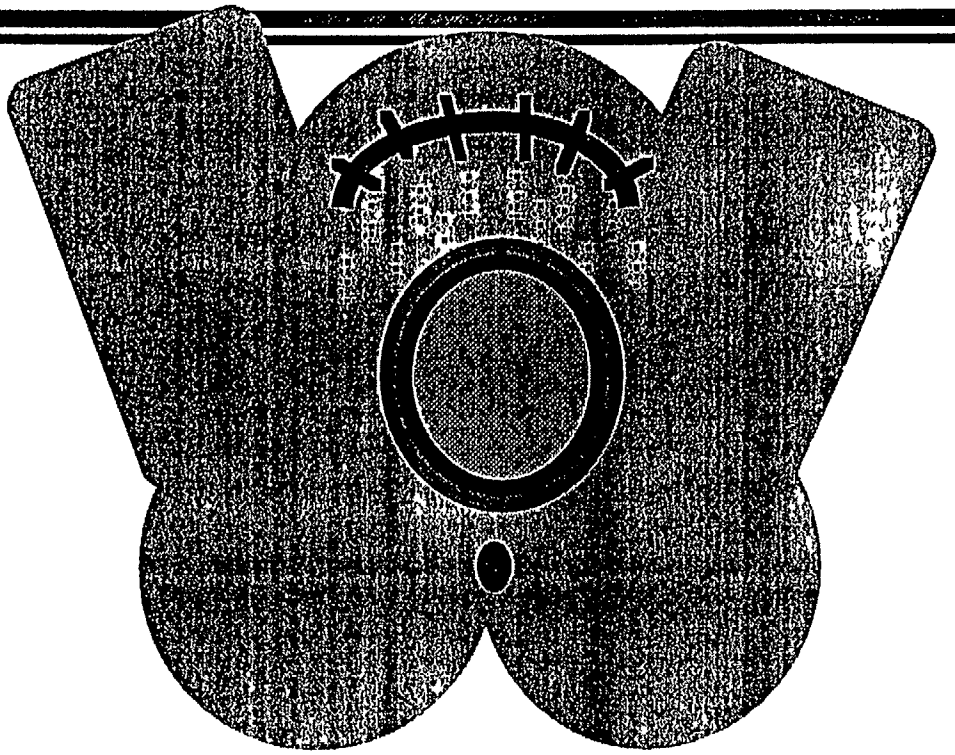


Conclusion : Less than 12% of births will be by Cesarean Section .

Vaginal Birth after C-Section

CONCLUSION· 80% of patients with a prior C-Section will have a Trial of Labor, and 50% will deliver vaginally

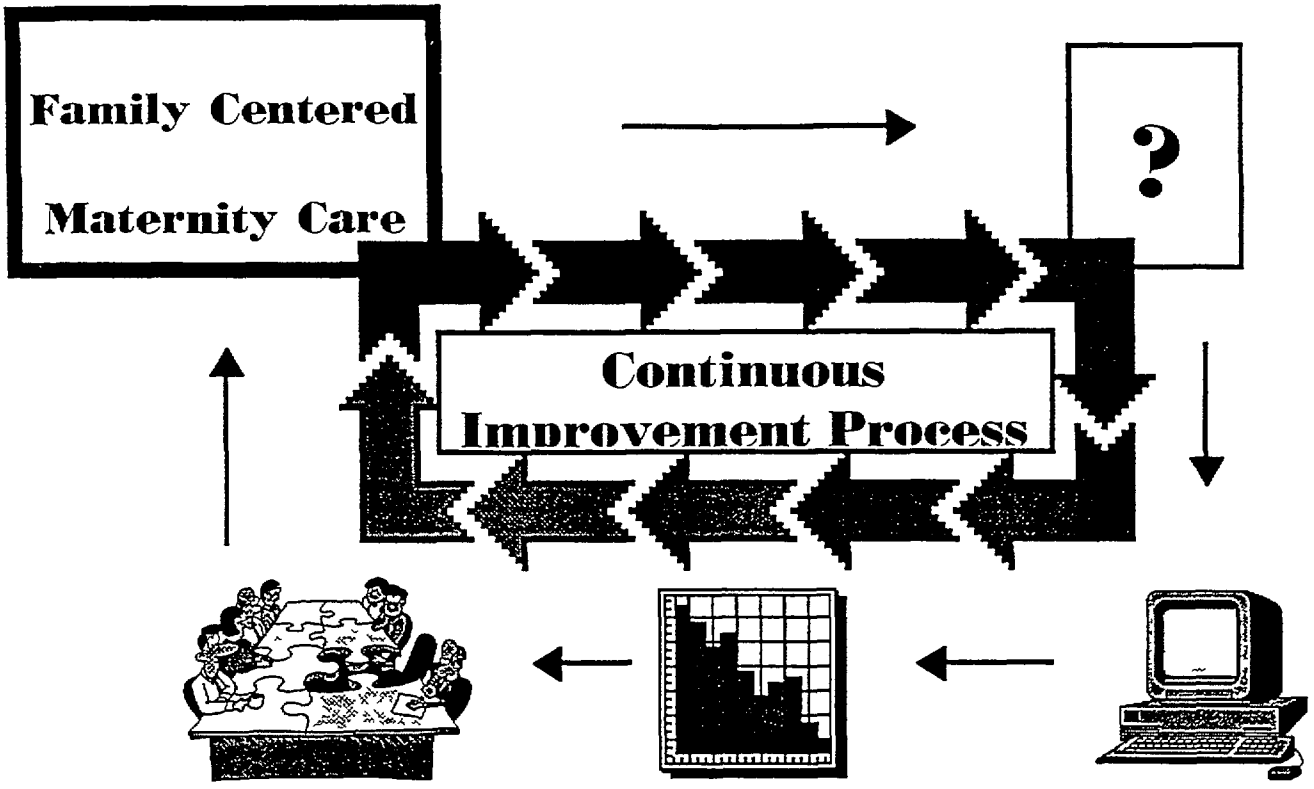
Vaginal Birth after C-Section



Conclusion : 80% of patients with a prior C-Section will have a Trial of Labor, and 50% will deliver vaginally

Continuous
Improvement Process

CONCLUSION <u>Reports</u> on Family Centered Maternity Care will be used to evaluate and modify the program.



Conclusion : <u>Reports</u> on Family Centered Maternity Care will be used to evaluate and modify the program

HISTORY OF THE FAMILY-CENTERED MATERNITY CARE PROJECT

- 1994 USAID and Ukraine MOH cooperative agreement
- Overall objective provide 3 year comprehensive Reproductive Health program in Ukraine
- Original emphasis on family planning
- FCMC added per request of Ukraine providers
- MotherCare provides FCMC component

OVERALL GOALS OF USAID/ UKRAINE REPRODUCTIVE HEALTH PROGRAM

- Improve quality of reproductive health services
- Improve access to reproductive health services

OVERALL GOAL OF FAMILY-CENTERED MATERNITY CARE PROJECT

- Integrate FCMC philosophy and practice into the maternity care services of Ukraine

GOALS OF THE FCMC TRAINING OF TRAINERS

- Create a core group of FCMC trainers
- Develop action plans for integration of FCMC into each training site
- Develop training strategies for use in each training site

GOALS OF THE FCMC TRAINING OF TRAINERS

- Commitment to implementation of FCMC demonstration projects at the trainers institutions
- Develop strategies to reduce barriers to FCMC practices
- Maintain Technical Working Groups to oversee the project

EVALUATION OF MATERNITY CARE SERVICES

- Chalmers et al review maternity care studies internationally for
  - efficacy of study
  - effectiveness of particular maternity care practice
- Maternity care practices are classified as
  - beneficial
  - likely beneficial
  - trade-off beneficial vs adverse effects
  - unkown effectiveness
  - unlikely beneficial
  - ineffective or harmful

EVALUATION OF MATERNITY CARE PRACTICES

- Publications
  - Chalmers,I et al (eds) (1989) *Effective Care in Pregnancy and Childbirth* Vol I&II, Oxford University Press Oxford
  - Enkin,M et al (eds) (1995) *A Guide to Effective Care in Pregnancy and Childbirth* Oxford University Press Oxford
  - *The Cochrane pregnancy and childbirth database* (regularly updated electronic database of reviews)
- United Kingdom using Chalmers to review and change current maternity care practices

BENEFICIAL PRACTICES

- Emotional and psychological support during labor and birth
- Maternal mobility and choice of position in labor and birth
- Free mobility during labor to augment slow labor

  Consistent support for breastfeeding mothers
- Unrestricted breastfeeding

LIKELY BENEFICIAL

- Midwife care for women with no serious risk factors
- Antenatal classes for women and their partners who want them
- Respecting women's choice of companions during labor and birth
- Respecting women's choice of place of birth
- Presence of a companion on admission to the hospital
- Giving women as much information as they desire

LIKELY BENEFICIAL

- To relieve pain in labor
  - maternal movement and position change
  - counter pressure
  - superficial heat or cold
  - touch and massage
  - music and audio-analgesia
  - attention focusing and distraction
- Woman's choice of position for second stage of labor and /or giving birth
- Encouraging early mother-infant contact

242

BENEFICIAL/LIKELY BENEFICIAL

- Beneficial
  - fetal acid-base assessment as an adjunct to fetal heart rate monitoring in labor
- Likely beneficial
  - Selective use of ultrasound
  - Trial of labor after previous lower-segment cesarian section

TRADE-OFF BETWEEN BENEFICAL AND ADVERSE EFFECTS

- Continuity of caregiver for childbearing women
- Formal systems of risk scoring
- Routine early ultrasound
- Continuous electronic fetal monitoring plus scalp sampling versus intermittent auscultation during labor

UNLIKELY BENEFICIAL

- Routinely involving physicians/obstetricians in the care of women during pregnancy and childbirth
- Not involving obstetricians in the care of women with serious risk factors
- Routine withholding of food and drink from women in labor
- Routine intravenous infusion in labor
- Restriction of sibling visits to babies in the hospital

INEFFECTIVE OR HARMFUL

- Routine enema in labor
- Routine pubic shave in preparation for delivery
- Electronic fetal monitoring without access to fetal scalp sampling during labor
- Routine episiotomy for birth
- Routine use of the lithotomy position for the second stage of labor

INEFFECTIVE OR HARMFUL

- Limitation of suckling time for breastfeeding babies
- Routine restriction of mother-infant contact
- Routine nursery care for babies in the hospital

IMPACT OF ULTRASOUND

- <u>POSITIVE IMPACT</u> *Selective use* for specific indications during pregnancy is likely beneficial
- <u>NEGATIVE IMPACT</u> *Safety* has *not* been convicingly established and *routine use* in pregnancy has *not* been shown to imporove fetal outcomes

IMPACT OF CONTINUOUS ELECTRONIC FETAL MONITORING

- POSITIVE IMPACT Effective in detecting *specific* fetal compromised conditions

- NEGATIVE IMPACT Has *not* improved overall fetal outcome, interpretation of fetal heart rate tracings open to *wide variation*, and has significantly *increased* the rates of both cesarian sections and operative vaginal deliveries

IMPACT OF INCREASED CESARIAN SECTION RATES

- POSITIVE IMPACT Cesarian sections are life saving for *unequivocal* indications such as placenta previa and transverse lie

- NEGATIVE IMPACT Cesarian sections *increase* maternal and infant morbidity rates and elective repeat cesarian section without trial of labor still practiced

IMPACT OF EPIDURAL ANALGESIA

- POSITIVE IMPACT Pain *relief* for women during labor and birth

- NEGATIVE IMPACT *Increased* use of oxytocin and *increased* risk of cesarian section and operative vaginal deliveries

IMPACT OF OXYTOCIN STIMULATION

- POSITIVE IMPACT Oxytocin use to augment labor with premature rupture of membranes may subsequently *reduce* the rate of infection and when accompanied by amniotomy, oxytocin use can reduce morbidity in cases such as post-datism

- NEGATIVE IMPACT *Hyperstimulation* may lead to reduced fetal oxygenation and induction of labor with oxytocin *increases* the incidence of neonatal hyperbilirubinemia

MCH TRENDS:SWEDEN

- Health care access for all
- Primarily hospital births
- IMR is 5 9/1000 live births (ranks 3rd)
- Boasts a very high rate of prenatal visits (average 14 per pregnancy) conducted by midwives

MCH TRENDS: NETHERLANDS

- Health care access for all
- About one-half midwife-attended births
  36% of all births at home
- IMR is 7 06/1000 live births (ranks 10th)
- Offers choice of birth site
- Utilizes national risk assessment criteria for determination of type of provider and site of care

MCH TRENDS:UNITED KINGDOM

- Health care access for all
- Midwife-attended hospital births
- IMR is 7 8/1000 live births (ranks 17th)
- Undergoing major evaluation and revision of their current MCH practices

MCH TRENDS:UNITED STATES

- Inadequate access to health care for a large portion of the population
- Primarily hospital births, 5% midwife-attended
- IMR is 9 22/1000 live births (ranks 24th)
- High use of technology with high cesarian section rates
- In the midst of a major health care reform for both policy and provision of care

349

INSTITUTIONAL BARRIERS TO FCMC

- Regulations/policies which contradict FCMC practices

- Administrative concerns
  - compliance with national/oblast regulations
  - provider/staff response
  - consumer response
  - facility impact
  - costs

PROVIDER BARRIERS TO FCMC

- Comfortable with known practices

- Reluctant to change current practices

- Resistant to accept effectiveness of certain practices which challenge current beliefs

CONSUMER BARRIERS TO FCMC

- Lack of knowledge about safety
- Lack of trust for new medical procedures/ policies
- Lack of experience with or questioning of medical care practices and providers

EVOLUTION OF FCMC PRACTICES

- Women's movement with attention to birth practices
- Increased consumer awareness of impact of medical care practices
- Chalmer's text and others questioning legitimacy of current practices
- Peer reviewed studies evaluating current accepted standards of practice and birth technology

-51

BENEFITS OF FCMC: INSTITUTIONS AND MEDICAL CARE PROVIDERS

- Improved outcomes for mothers and babies
- Lower infection rates
- Personal job satisfaction
- Cost efficiency
- Improved provider-client relations

BENEFITS OF FCMC: WOMEN, INFANTS AND FAMILIES

- Clinical safety
- Promotion of family attachment (bonding)
- Personal and family satisfaction
- Increased maternal self esteem, autonomy and control

52

AMBULATION IN LABOR

Women randomized to the ambulatory group

- significantly shorter labor
- significantly less use of analgesia
- significantly less fetal heart rate abnormalities

(n = 34)

Flynn, A.M., et al, British Medical Journal, August 26, 1978

EATING & DRINKING IN LABOR

- Provides hydration & nourishment
- Reduces stress
- Provides comfort

Ludka, L.M. & Roberts, C.C. , Journal of Nurse-Midwifery, 38(4); 1993

FASTING IN LABOR

- Based on tradition rather than current scientific research
- May result in dehydration and ketosis
- Doesn't ensure an empty stomach

Enkin, M. et al (1995)
Ludka & Roberts (1993)

SHAVING

- Evidence does not support as decreasing infection
- Compromises integrity of skin
- Causes itching and burning as hair grows back
- Humiliating procedure

Mahan, C. & McKay, S. Contemporary OB-Gyn, November, 1983

ENEMA

- Does not prevent fecal contamination
- Does not effect infection rates
- Do not use soapsuds
- Routine use not justified

Mahan & McKay, (1983)

ineffective or harmful

ELECTRONIC FETAL MONITORING

Continuous electronic fetal monitoring

- significantly increased caesarean sections
  BUT
- did <u>not</u> improve perinatal outcomes

Prospective clinical trial of 34,995 women

Leveno, K.J. et al. <u>The New England Journal of Medicine</u>, 315;1986

358

trade-off

EPIDURAL

- significant increase in risk of caesarean section
- significant increase in risk of instrument delivery
- more effective for pain relief

Morton, S.C. et al, Obstetrics and Gynecology, 83(6), 1994

Ineffective
wrongful

EPISIOTOMY

- Routine episiotomy does <u>not</u> decrease trauma
- Predispose to extensions into rectal sphincter and rectal mucosa
- Does not deter future pelvic relaxation

Thorp, J. & Bowes, W. <u>American Journal of Obstetrics and Gynecology</u>, 160(5) 1989.

SKIN - TO - SKIN CONTACT

- warmest babies - earliest skin-to-skin contact

- coolest babies - no skin-to-skin contact

($p < 0.001$)
($n = 51$ dyads)

Färdia, J.A., Journal of Nurse-Midwifery, 25(1), 1980

MATERNAL - INFANT BONDING

Extended contact for mothers & infants

- greater soothing behaviors
- significantly more eye contact and fondling

(n = 28)

Klaus, M. et al. New England Journal of Medicine, 286(6), 1971

BREASTFEEDING

Breastfeeding within the first 2 hours after birth increases the duration of breastfeeding compared to delayed initial feeding $\geq$ 4 hours.

Enkin, M. et al. A Guide to Effective Care in Pregnancy and Childbirth, 2nd edition, 1995

30

unlikely beneficial

VISITATION RESTRICTIONS

- Restricting visitation not supported as infection prevention
- Visitation of sibling does not effect infant colonization rate

Enkin, M. et al. A Guide to Effective Care in Pregnancy and Childbirth, 2nd Edition, 1995

364

what's current vs future role -

ESSENCE OF EFFECTIVE POSTPARTUM CARE

- Treat mother as responsible adult
- Give accurate and consistent information
- Let her make own decisions
- Support her in those decisions

Enkin, M. et al. A Guide to Effective Care in Pregnancy and Childbirth, 2nd Edition, 1995

365

The Adult Learner

Learns best when:

-the format is interactive

-there is recognized relevance to his/her role

The Adult Learner

Has responsibility to:

-to actively participate in learning

-to adequately prepare

-to accept responsibility for learning

-to communicate with faculty

Adult Learning Techniques

Audio-visual aides: tape, video, overhead
Role Play
Demonstration
Small group work
Case Studies
Team teach
Large group work
Discussion

Frustration Persistence

CHANGE

Flexibility Inaction

Realistic

Insider

Advantages Disadvantages

OR

Outsider

Advantages Disadvantages

Lewin's Stages of Change

Stage I

UNFREEZING

- create disequilibrium

- avoid extremes

Lewin's Stages of Change

Stage II

MOVING

- provide environment conducive to behavioral change
- rewards - external / internal

Lewin's Stages of Change

Stage III

REFREEZING

- Stabilize change
- Positive feedback

OR

- Constructive criticism
- Ongoing evaluation

REINKMEYER'S
Model of change

7 Stages

- Develop need & desire
- Develop change relationship
- Clarify problem / objective
- Examine routes, goals, actions
- Intentions to Actions
- Stabilize
- End change relationship

Restraining Forces

CHANGE

Driving Forces

RESISTANCE

- Costs
- Status Quo
- Threat perceived
- Fear of failure

RESISTANCE

Positive Effect

- Forces clarity of purpose

CONFLICT RESOLUTION

- individuals or groups
- reflects value system
- lack of clarity
- open honest dialogue
- mediation / confrontation

EVALUATION

Validate
for

- internal community
- broader community

EVALUATION

Techniques

- Written questionnaire or survey
- In-person interview
- Pre- and Post-tests
- Focus groups
- On-site review

QUESTIONNAIRE

INTERVIEWS

PRE- AND POST-TESTS

FOCUS GROUPS

ON-SITE REVIEW

385

FOCUS GROUPS

Purpose

- Discuss specific topic
- Open-ended manner
- Facilitator necessary

FOCUS GROUPS

Method

- Facilitator - led
- May be audio or video taped
- Open-ended questions

OR

- Topic directed questions

CONSUMER INVOLVEMENT

Purpose

- Evaluate need from consumer perspective
- Increase identification with change
- Guide effectiveness & alterations

CONSUMER INVOLVEMENT

CON

(negative)

CONSUMER INVOLVEMENT

Pro

(positive)

EVALUATION

Program Monitoring "How to Proceed"

- Determine goals & objectives
- Describe how program "should" work
- Decide on type of evaluation
- Decide on level of measurement
- Identify indicators to measure

(Bertrand, J., 1995)

EVALUATION

Selection of Indicators

- Availability of data needed to measure indicator
- Amount of time allotted to the evaluation
- Financial support available
- Donor agency requirements

(Bertrand, J., 1995)

EVALUATION

Purpose

- determine if project goals achieved
- evaluate effectiveness
- influence future plans