

# Implementation and Evaluation of a Distance Education Course on the Management of Cholera and Diarrheal Diseases

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 **BASICS**

INCAP

The Institute of Nutrition of Central America and Panama (INCAP)



as created by the Ministers of Health of Costa Rica, El Salvador, Guatemala, Honduras, and Panama and the Director of the Pan American Health Organization (PAHO) in 1949. INCAP's mission is to contribute to the development of nutrition science, promote its application, and strengthen the Member Countries' capacity to solve their food and nutrition problems.

### **PAHO**

The Pan American Health Organization (PAHO), a regional office of the World Health Organization, is an international agency specializing in health. Its mission is to cooperate technically with the Member Countries and to stimulate cooperation among them in order that, while maintaining a healthy environment and charting a course to sustainable human development, the peoples of the Americas may achieve *Health for All and by All*.

### **BASICS**

BASICS is a global child survival support project funded by the Office of Health and Nutrition of the Bureau for Global Programs, Field Support, and Research of the U.S. Agency for International Development (USAID). The agency's Child Survival Division provides technical guidance and assists in strategy development and program implementation in child survival, including interventions aimed at child morbidity and infant and child nutrition.

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### **Abstract**

To respond to the high prevalence of cholera and diarrheal diseases and observed inadequacies in health worker knowledge and practice in Central America, the Institute of Nutrition for Central America and Panama (INCAP) developed and implemented a distance education course on the management of cholera and diarrheal diseases in El Salvador, Guatemala, Honduras, and Nicaragua. The course included preprinted educational materials delivered to participants one chapter at a time, group meetings at the beginning and end of the nine-month program, and field-based tutors who provided a day-long practice session at mid-program, written responses to homework submitted by the participants at the end of each chapter, and one-on-one tutoring. The course's impact on the knowledge and practices of participating doctors and nurses in Guatemala was evaluated. Results showed significant improvements in patient assessment and diagnostic practices as well as knowledge.

### **Credit**

*Cover photograph courtesy of WHO, MCH-El Salvador.*

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# Acronyms

BASICS	Basic Support for Institutionalizing Child Survival
CDD	Control of Diarrheal Diseases
HFS	Health Facility Survey
INCAP	Institute of Nutrition for Central America and Panama
MOH	Ministry of Health
NGO	nongovernmental organization
ORS	oral rehydration salts
PAHO	Pan American Health Organization
PRITECH	Primary Technologies for Health Care Project
USAID	U.S. Agency for International Development
WHO	World Health Organization



# Introduction

Although cholera and diarrheal diseases are highly prevalent in Central America, earlier studies by the Institute of Nutrition for Central America and Panama (INCAP) showed that health worker knowledge and practices concerning these diseases was inadequate (Hermida 1992; Robles et al. 1992, 1993). In response, the Ministries of Health in the region decided to increase health worker skills in the management of these diseases through training.

INCAP had previously developed and implemented seven distance education courses for health and food workers. These courses used a combination of printed educational materials mailed to the participating students one module at a time, individualized written feedback, and general meetings of the participants. Pre- and post-course evaluations demonstrated that the courses increased participants' knowledge.

Given this experience, along with the need to retrain large numbers of health workers in diarrhea case management and the high cost of traditional methods of in-service training, the Pan American Health Organization (PAHO) and INCAP decided to use a distance education methodology to provide in-service training to health workers in the management of cholera and diarrheal diseases. The course that INCAP subsequently developed, *Update in the Management of Cholera and Diarrheal Diseases*, was based on the INCAP's previous experience with distance education, but one-on-one tutoring was added to increase the impact on practices.

Funds to implement the course in El Salvador, Guatemala, Honduras, and Nicaragua were provided by the PAHO Director Emergency Cholera Funds administered through the Regional Control of Diarrheal Diseases (CDD)/Cholera Program. Course materials were developed with funds from the PRITECH Project, while the BASICS Project provided funds and technical assistance for the course's evaluation; both projects were funded by the U.S. Agency for International Development (USAID).

An evaluation of the course's impact on health worker knowledge and practices was carried out in Guatemala using pre- and post-course measurements in both a program and a control group. The evaluation shows that the course improved the assessment of diarrhea and the diagnosis of the degree of dehydration in patients. Both practices are key to the control and treatment of cholera and diarrhea. This report provides a detailed description of the implementation and evaluation of this course.



# Implementation

## Objectives

The following objectives were adopted for the implementation of the course in Central America:

1. Update the knowledge of doctors and nurses working in the public sector, private sector, and nongovernmental organizations regarding prevention and case management of cholera and diarrhea.
2. Give special priority to reaching health professionals who do not generally participate in traditional training activities.
3. Determine the impact of the course on knowledge and practice related to the case management of diarrheal diseases, including cholera, in five areas of Guatemala.
4. Strengthen the capacity of health education institutions to provide training in the prevention and case management of diarrheal diseases.

## Overview of Educational Approach

Course participants were trained in standard case management of acute diarrhea, including cholera, as well as in distance education methods, including individual and group instruction. The training approach included teaching materials organized into seven topic-specific modules and associated homework, group meetings of participants, and individual tutoring at the participant's workplace. The teaching modules were delivered to the participants by mail or in person, one module at a time. Each participant was assigned a tutor who reviewed the homework assignments, provided written feedback and the next module by mail, and sometimes communicated with assigned participants by telephone.

Three group meetings were organized for the participants. The first meeting presented general information about the course, introduced the first study module, provided training in how to study in a distance education course, and measured the level of knowledge of participants in case management of cholera and diarrhea. In the second meeting, the tutors provided clinical training to participants at health facilities. In the last meeting, gain in knowledge was measured and diplomas were handed out.

## Development of Curriculum and Educational Materials

INCAP developed and validated the materials for the distance education course with financial and technical assistance from the PRITECH project.

It took approximately 10 months to develop the teaching materials for the course. The process involved several expert work groups, including medical educators from INCAP's technical committee, multi-disciplinary technical groups from different Central American countries who also served on INCAP's technical committee, and an expert committee in the management of cholera and diarrheal diseases that was composed of external consultants and staff from PAHO and PRITECH.

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The expert committee helped to develop the course objectives and content and revise the content of the teaching modules. The medical educators refined the course content, revised the bibliography, and further developed the teaching modules and self-evaluation exercises (homework assignments) at the end of each module. Subsequently, the country-based multidisciplinary groups validated the course content and teaching modules. Staff from various Ministries of Health in the region also assisted in the review and revision of the technical contents of the course.

The course curriculum and materials were organized around seven teaching modules, each covering a different topic:

1. Introduction and general information
2. Etiological and epidemiological considerations
3. Physiology of diarrheal diseases
4. Clinical manifestations of diarrhea and cholera, and methods of treatment
5. Management of patients with cholera
6. Prevention and control
7. Organization of health facilities

Each teaching module included the following eight elements: title, index, introduction, specific objectives, development of the topics, self-evaluation exercises, glossary, and bibliography. The modules were supported by a variety of complementary materials, including additional texts and lectures, study guides, audiovisual materials (videotapes and slides), and contact information for the tutors.

## **Organization at the Country Level**

INCAP implemented the course in four Central American countries: El Salvador, Guatemala, Honduras, and Nicaragua. The course was organized in each country by the INCAP coordinator for that country, with technical assistance from INCAP headquarter staff in cooperation with the local PAHO representative, the Ministry of Health, and others from the health sector in the country, including medical and professional schools. Except in Guatemala, where the overall coordinator of the course implementation was located, INCAP contracted through the local PAHO office for an individual to function as the national coordinator responsible for the day-to-day implementation of the course in each country.

In each country, the INCAP country coordinators and Ministry of Health staff, both national and subnational, promoted the course among health professionals and recruited the tutors. Planning meetings were held with health vice-ministers, director or subdirector generals, and other technical staff of the Ministry of Health.

Particular health regions or departments were selected to receive the course in each country on the basis of epidemiological indicators of diarrhea. A coordinator was named for each department and one or more tutors were retained, the number depending on how many course participants were anticipated for that area. Frequently, the coordinator was also a tutor, which proved beneficial in most cases; however, difficulties were sometimes experienced in getting coordinator-tutors to complete their tutorial duties.

In El Salvador, the implementation methodology was adapted to meet local conditions and needs:

- Tutors were selected by geographical zones around hospitals to take advantage of the existing training program.
- To maintain personalized instruction, each tutor was limited to a maximum of 15 students.
- Tutors delivered materials personally to their students (the mail was not used).
- The course coordinator in each department also functioned as a technical-administrative assistant within the hierarchy of the Ministry of Health.
- To maintain frequent contact between tutors and their students, tutorial sessions were no more than three weeks apart.

The cost of the tutors in El Salvador was covered by external funding, and the educator from the country PAHO office supported the entire development effort in the country. The assistance and motivation provided by the tutors were fundamental to the participants' success.

In Honduras, the course was implemented through the supervision of the national coordinator, who was assisted by 14 tutors and a technical coordinator from INCAP. Approximately every two months, the tutors made presentations and discussed progress with the national coordinator. The experience in Honduras was very positive owing both to the excellent selection of the national coordinator and tutors and to the planning and local support provided.

## Training and Role of Tutors

Following an introductory presentation about the course to health officials in the country and the completion of plans by the technical groups, INCAP technical staff and the country course coordinator trained the tutors in one-week workshops. The workshop curriculum included the distance education methodology and course content, using lectures and discussions.

The tutorial training accomplished the following:

- Trained 87 tutors in the distance education course *Update in the Management of Cholera and Diarrheal Diseases*.
- Imparted to the tutors epidemiological information about cholera by country health regions.
- Developed and approved course schedules for each country, with the understanding that local adjustments to the schedules would be needed.

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- Adapted supervisory guidelines.
- Registered participants; delivered teaching materials, self-evaluation exercises, and answer keys to tutors; obtained participant qualifications and registration certificates; and defined the method of communication.

After the tutors received the materials, they began the process of enrolling the doctors and nurses in the course and organizing the course's inaugural meeting in each health region, with assistance from local health officials. During this inaugural meeting, the tutors conducted the baseline survey of participant knowledge, presented the course methodology, and distributed the first teaching module.

As soon as a participant finished a module and sent in the completed self-evaluation exercise for that module, the participant's tutor received the self-evaluation, reviewed it, and returned written comments to the participant along with the next module. The objective was to keep the average time to complete a module at about three weeks. During the "case management of cholera" module, the tutors were supposed to carry out a hands-on practice session at a local clinic or hospital for each participant. However, this practice session was held only in about 50 percent of the health districts owing to conflicts with the participants' work schedules.

During the course, tutors monitored participants' progress by visiting them at their workplaces and talking with them by telephone. To reinforce the information in the teaching modules, the tutors used complementary lectures, study guides, and slides and videos about acute diarrhea and how to treat it. Tutoring usually took place face-to-face; when participants were unable to meet with a tutor, the tutors and other project staff from INCAP held telephone conversations with them.

When most of the participants in an area had completed the course—usually about nine months after the inaugural meeting—the tutors organized the last meeting of participants, at which unanswered questions were addressed and an attempt was made to reach consensus about the technical aspects of the course. Diplomas were handed out and participants asked to complete a post-test of their knowledge about the management of cholera and diarrheal diseases. Some participants did not finish all the modules by the time of the final meeting, in which case their tutors continued to work with them until they had completed the course.

## Number of Students and Tutors

The number and the location of tutors, decided upon through consultation with the district office of the Ministry of Health, were based largely on the expected enrollment in the course. Table 1 shows the number of tutors and of participants who started and completed the course, listed by country. A participant who started the course is defined as one who signed up, attended the inaugural meeting, completed the baseline survey, and received the first teaching module. Guatemala averaged 51 participants per tutor at the start of the course and 22 by the end of the course. The average number of participants per tutor at the end of the course in Honduras, El Salvador, and Nicaragua was 27, 13, and 10, respectively.

**Table 1. Number of Participants and Tutors by Country**

Country	Participants		Tutors
	Started Course	Completed Course	
Guatemala	818	352	16
El Salvador	316	284	22
Nicaragua	430	365	35
Honduras	400	380	14
Total	1,964	1,381	87

The participant desertion rate varied by country. In Guatemala, 57 percent of the starting participants left the course before finishing. However, Guatemala desertion rates varied widely among health areas, ranging from a low of 5 percent to a high of 86 percent. Nicaragua, El Salvador, and Honduras reported desertion rates of 15 percent, 10 percent, and 5 percent, respectively.

On average, in the four countries, each tutor was responsible for 16 participants at the end of the course.

## Observations

In Guatemala, the following information was obtained from semistructured interviews with tutors after the course had been completed:

- The participants concluded that the course's classification of diarrheal diseases is correct and more functional than previous classifications.
- Nevertheless, the course's classification of diarrhea does not correspond to national norms, and it was not possible to systemize its use in Ministry health services.
- Most of the professional nurses taking the course thought that the content of the unit on the physiopathology of diarrheal diseases was complete.
- In some health areas, the participants did not complete the hands-on practice session because either the tutor or the participant could not find the time.
- In Guatemala, the number of participants was too large for the number of tutors.
- The tutors felt that the course content was complete but that the written material should be simplified so that it could be given to paramedics, auxiliary nurses, lab technicians, and rural health technicians.

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Although a formal evaluation of the participants' satisfaction with the course was not undertaken, many favorable comments about the course content were received. Nevertheless, some participants wished they had received more support from their chiefs. In some cases, participants noted that available dates for practice sessions were not communicated to the tutors.

Following completion of the course in El Salvador, the program staff there concluded that it is important to (1) select tutors carefully, (2) train tutors ahead of time in the distance education methodology and offer accelerated distance education support for participants who want to go faster, (3) appoint a national coordinator who can provide consistent support to tutors and help resolve problems, and (4) ensure that tutors visit every participant individually.

Following completion of the course in Honduras, the minister of health and the PAHO representative decided to offer the course a second time. This demonstrates that once the course methodology has been implemented in a country, it has the potential to be reproduced and extended and thus become institutionalized as an ongoing program of the Ministry.

# Evaluation

## Background

The effectiveness of distance education is controversial. While one study (White et al. 1985) found a small but significant improvement in patient care six months after the implementation of a distance medical education course, another (Evans et al. 1986) found that, although there was short-term improvement in knowledge about the management of hypertension following a distance education course, the course had no effect on practice in either the short term or long term. Both studies used randomized controlled designs.

Evaluation studies of distance education programs for health workers that use rigorous and objective evaluation methodologies are rare, according to several reviews (Haynes et al. 1984; Lloyd and Abrahamson 1979; Raymond 1986). The findings reported by the few rigorous studies that have been done, such as the studies by Evans et al. and White et al., are inconsistent with one another, and the causes of the inconsistency have not been systematically analyzed. Some studies indicate that distance education can cause a short-term improvement in health worker knowledge, but careful studies showing improvements in practice—including prescription practices—are rare.

The distance education course *Update in the Management of Diarrheal Diseases and Cholera* was evaluated to determine the impact of the course on health worker practices in the case management of diarrhea and cholera. For purposes of this evaluation, a significant impact is considered to be an increase in the prevalence of correct practices of at least 20 percentage points between the pre- and post-course measurements relative to the control.

The evaluation, which was carried out in Guatemala, uses a pre-post, program and control group, panel design. Data on the knowledge and practices of a representative sample of doctors and nurses, of whom some participated in the course while others did not, were obtained before and after the course, using a modified version of the *Health Facility Survey Manual, Diarrhoea Case Management* (Program for the Control of Diarrheal Diseases 1992) as the data collection instrument. In addition, a pilot study was conducted on the validity of the information obtained by this survey instrument. The methodology and results of this validity study will be presented in a subsequent report; the present report describes the methodology, results, and interpretation of the evaluation.

## Methodology

### Design

The quasi-experimental design used in the evaluation involved pre- and post-course measurements of diarrhea case management by Guatemalan health workers in a program group and a nonequivalent control group (Cook and Campbell 1979). The program group included doctors and nurses selected randomly from three health areas in Guatemala where the course was offered (Guatemala Norte, Amatitlan, and Esquintla), while the control group included doctors and nurses selected randomly from three health areas in Guatemala where the course was not offered (Guatemala Sur, Solala, and

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Sacatepequez). Both the program and control pre-course samples comprised health workers who, prior to the course, had expressed a desire to take the course. The post-course *program* sample included only health workers in the pre-course sample who completed the course, whereas the post-course *control* sample included all of the health workers in the pre-course control sample who could be found for the post-course measurement. It is a panel design because the same health workers were measured in the pre- and post-course surveys. The modified *Health Facility Survey Manual, Diarrhoea Case Management* was used to collect data on the management of one diarrhea patient for each health worker in the pre-course survey and a second patient for each health worker in the post-course survey. In both the pre- and post-course surveys, data were obtained on the first diarrhea patient presenting to the health worker after the INCAP observer arrived.

### Samples

During the planning of the evaluation, it was decided that the evaluation should be able to detect a change of 20 percentage points in the prevalence of each practice, assuming a confidence level of 95 percent and statistical power of 80 percent. By using the STATCALC model in Epi Info (Dean et al. 1994), the minimum sample size required to detect a 20 percentage point difference was determined to be 64. It was assumed that the desertion rate from the program would be 40 percent and that 10 percent of the pre-course sample would not be located for the post-course sample.

These assumptions imply that the required pre-course sample size should be 158 for the program group and 74 for the control group. Table 2 shows the actual pre- and post-course sample sizes in both the program and control groups. The original program group included 158 health workers who had signed up to take the course, but only 80 of these actually started the course. Seventy-eight who signed up did not attend the opening session or attempt to start the course, possibly because they were enrolled by their supervisors and never personally committed themselves to participate in the course.

The 17.5 percent desertion rate in the program group sample is much lower than the 40 percent figure assumed during the planning phase. Furthermore, all program participants in the pre-course sample who completed the course were located for the post-course survey. This is much better than the 10 percent loss rate assumed during the planning phase. In the control group, 10.8 percent of those in the pre-course sample were not found in the post-course sample. The final sample size for both the program and control panels turned out to be the same (n=66), which is large enough to detect differences of at least 20 percentage points, as originally planned.

**Table 2. Sample Sizes for the Program and Control Groups**

Sample	Pre-Course Survey	Post-Course Survey
Program		
Did not start	78	0
Deserted	14	0
Completed and found	66	66
Completed and lost	0	0
Total	158	66
Control		
Found	66	66
Lost	8	0
Total	74	66

### Variables

Measurements of health worker practices were obtained with a modified version of the *Health Facility Survey Manual, Diarrhoea Case Management*. The modifications are summarized in Appendix 1. Section 1 of the survey records measurements on the management of one diarrhea case by a health worker, obtained by direct observation by a trained observer; it is organized by assessment, examination, treatment, and counseling. Section 2 summarizes the results of an examination of the patient by the trained observer. Section 3 contains data about the health worker, and section 4 contains information about the health facility where the case was observed.

The four sections contain 152 data items, 46 of which describe health worker knowledge. These 46 knowledge data items were redefined into 38 variables associated with correct knowledge, as determined by objective criteria in accordance with the course curriculum. Average values of the 38 correct knowledge variables for the program and control groups are given in Appendix 3. There are also 38 variables describing whether or not correct practices were followed during case management, as shown in Appendix 2. Four composite practice variables suggested by PAHO and WHO were constructed from the data obtained during the health facility survey: (1) the percentage of under-5 diarrhea cases (i.e., cases in which the patient was under 5 years of age) correctly assessed by the health worker, (2) the percentage of under-5 dehydration cases correctly rehydrated, (3) the percentage of under-5 diarrhea cases given correct counseling on home care, and (4) the percentage of under-5 dysentery cases given appropriate medicine (see Table 3). In addition, three other composite practice variables were used: (1) the percentage of diarrhea cases correctly assessed according to the trained observer, (2) the percentage of all dehydration cases correctly assessed according to the trained observer, and (3) the percentage of all dehydration cases for which the treatment plan was correct according to the trained observer.

**Table 3. WHO/PAHO Composite Indicators**

Indicator <sup>1</sup>	Formula	Definition
1. Diarrhea cases correctly assessed	<b>a/b</b> <b>a.</b> Children with diarrhea correctly assessed by a health worker <b>b.</b> Children with diarrhea seen at a health facility	<b>a.</b> Cases for whom health worker asked when episode began, if blood in stool, and agreed with observer on degree of dehydration <b>b.</b> All children with diarrhea seen in the health facility (plans A, B, and C) <sup>2</sup>
2. Diarrhea cases correctly rehydrated <sup>3</sup>	<b>c/d</b> <b>c.</b> Dehydrated children correctly rehydrated by a health worker <b>d.</b> Dehydrated children seen at a health facility	<b>c.</b> 1. Plan B cases for whom a health worker prepared ORS correctly, started administration of ORS within 30 minutes after assessment, and ordered the correct amount of ORS; and 2. Plan C cases for whom a health worker gave correct type of IV fluid, started administration of IV within 30 minutes after the assessment, and ordered correct amount of IV fluid <b>d.</b> Children classified as plan B or plan C by the observer
3. Diarrhea cases whose caretakers were correctly advised on treatment at home	<b>e/f</b> <b>e.</b> Children with diarrhea but no signs of dehydration whose caretakers were correctly advised on home care management of diarrhea <b>f.</b> Children with diarrhea but no signs of dehydration seen at a health facility	<b>e.</b> Children whose caretakers were advised to increase fluids, advised to continue feeding, told of at least two danger signs indicating a need to return to a health facility (possible signs: many watery stools, repeated vomiting, marked thirst, not eating or drinking well, fever, blood in stool, not getting better in three days) <sup>4</sup> <b>f.</b> Children with diarrhea but no signs of dehydration (plan A only)
4. Dysentery cases given appropriate antibiotics <sup>3</sup>	<b>g/h</b> <b>g.</b> Children with dysentery given an appropriate antibiotic by a health worker <b>h.</b> Children with bloody dysentery seen at a health facility	<b>g.</b> Children classified by the observer as having dysentery, who were given an appropriate antibiotic by a health worker <b>h.</b> Children classified by the health worker as having dysentery

<sup>1</sup> The indicators apply only to children under 5 years of age.

<sup>2</sup> Plan A = no dehydration; home case management only. Plan B = give ORS in health facility. Plan C = give IV solution in health facility.

<sup>3</sup> Indicators 2 and 4 were not calculated because the number of cases encountered in the sample was too small.

<sup>4</sup> The danger sign “not getting better in three days” was not included in this evaluation because this data was not collected.

### Data Collection

The pre-course survey was carried out from August through October 1995 and the post-course survey from July through October 1996. Both periods fall within the high-incidence diarrhea season. For the pre-course survey, nine physicians were recruited, trained, and standardized as observers for the health facility survey during the three weeks prior to the survey. The first week of training covered the clinical management of diarrhea and cholera cases; the second week covered the process of observing, interviewing, and completing the survey forms; and the third week was devoted to standardizing data collection among the observers (see Appendix 1). Five physician observers were recruited, trained, and standardized for the post-course survey in the same manner as for the pre-course survey. The 14 trained physician observers are referred to as “INCAP observers.”

All nine INCAP observers were recent medical school graduates, which contributed to their rapid mastery of the course content. During the second week of observer training, the INCAP observers contributed to the formulation of the questions in the survey, which helped standardize data collection during the third week.

Each INCAP observer visited health facilities where the health workers in the sample saw diarrhea patients, observing each health worker manage one case of diarrhea. Once the case management had been observed, the observer interviewed the health worker and evaluated the materials at the facility. The observer then moved on to the next health worker and facility, until all health workers in the sample had been observed.

### Processing and Analyzing the Data

Four databases were created in Epi Info (Dean et al. 1994), each based on one of the four sections of the survey. Each observer entered the data that he or she had collected into the Epi Info databases with the Epi Info ENTER module, reentered the same data with the VALIDATE module, and finally corrected the data entry errors.

Later, composite and other new variables were generated, and the difference in pre- to post-course improvement between the program and control groups was analyzed by comparing averages and by using analysis of variance. When appropriate, Fisher’s Exact Method from the Epi Info ANALYSIS module was used. For the pre-post comparisons, McNemar’s Test, also from the Epi Info ANALYSIS module, was used.

## Results

The percentage of child diarrhea cases correctly assessed according to the PAHO/WHO definition increased by 16 percentage points in the program group and decreased by 9 percentage points in the control, for a net gain of 25 percentage points ( $p < .05$ ) (see Table 4). Similarly, the percentage of child diarrhea cases correctly assessed according to the INCAP observer increased by 45 percentage points in the program group and increased by only 18 percentage points in the control, for a net gain of 27 percentage points ( $p < .05$ ).

The number of cases requiring oral or intravenous rehydration and the number of children with dysentery were very small, so it was not possible to obtain meaningful results for the PAHO/WHO rehydration

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indicators. Instead, two other indicators were defined. One compared the health worker's diagnosis of dehydration to that of the INCAP observer and assigned a correct value when the diagnoses of the health worker and the INCAP observer agreed. The second indicator addressed treatment planning for dehydration; it assigned a correct value when the rehydration treatment plan of the health worker agreed with the INCAP observer's plan.

**Table 4. Changes in Practices and Knowledge in the Program and Control Groups**

Variables <sup>1</sup>	Program				Control				Net Gain (pp) <sup>2</sup>	
	n	Pre (%)	Post (%)	Gain (pp) <sup>2</sup>	n	Pre (%)	Post (%)	Gain (pp) <sup>2</sup>		
Diarrhea cases correctly assessed										
PAHO/WHO definition	36	39	55	16	34	41	32	-9	25	
INCAP observer	36	19	64	45	34	17	35	18	27	
Dehydration cases correctly diagnosed (INCAP observer), all ages										
	66	15	59	44	66	16	36	20	24	
Rehydration treatment plan correct (INCAP observer), all ages										
	66	77	64	-13	66	54	56	2	-15	
Diarrhea cases correctly counseled for home treatment (PAHO/WHO definition), children < 5										
	28	0	43	43	18	0	28	28	15	
Average % correct cases across variables										
Assessment (15)		47	63	16		45	59	14	2	
Diagnosis (4)		53	69	16		32	48	16	0	
Counseling (19)		28	45	17		20	28	8	9	
Average % correct cases across variables										
Assessment (13)		49	61	12		47	58	11	1	
Management (13)		36	52	16		39	38	-1	17	
Counseling (12)		35	61	26		30	53	23	3	

<sup>1</sup> Numbers in parentheses are numbers of variables.

<sup>2</sup> pp = percentage points.

The percentage of all dehydration cases correctly assessed according to the INCAP observer increased by 44 percentage points in the program group and by 20 percentage points in the control, for a net gain of 24 percentage points ( $p<.05$ ). The percentage of rehydration plans that were correct according to the INCAP observer decreased by 13 percentage points in the program group and increased by 2 percentage points in the control, for a net decrease of 15 percentage points ( $p<.05$ ).

The percentage of child diarrhea cases for which correct advice for home treatment was given according to the PAHO/WHO definition increased by 43 percentage points in the program and by 28 percentage points in the control, for a net gain of 15 percentage points ( $p<.05$ ).

The 38 noncomposite *practice* variables can be grouped into three categories: assessment, diagnosis, and counseling. The average increase of the 15 variables associated with assessment practices (Appendix 2, variables 1–15) is 16 percentage points in the program group and 14 percentage points in the control, for a net gain of 2 percentage points. There is no difference between the program and control groups for the four variables associated with diagnosis practices (Appendix 2, variables 16–19). The average increase of the 19 variables associated with counseling practices (Appendix 2, variables 20–38) is 17 percentage points in the program group and 8 percentage points in the control, for a net gain of 9 percentage points.

The 38 *knowledge* variables can also be grouped into three categories: assessment, case management, and counseling. The average increase of the 13 variables associated with assessment knowledge (Appendix 3, variables 1–13) is similar for both the program and control group. The 13 variables associated with case management knowledge (Appendix 3, variables 14–26) increased by an average of 16 percentage points in the program group but decreased by 1 percentage point in the control group, for a net gain of 17 percentage points. The average increase of the 12 variables associated with counseling knowledge (Appendix 3, variables 27–38) is nearly the same in both the program and control groups, yielding a net gain of 3 percentage points.

## Discussion

The evaluation showed that the distance education course caused a significant improvement in patient assessment practices related to diarrhea case management. Relative to the control, the proportion of diarrhea cases assessed correctly by the program group showed a 25 percentage point gain according to the PAHO/WHO definition and a 27 percentage point gain according to the INCAP observers. Nevertheless, at the end of the course, only 55 percent of diarrhea cases were assessed correctly by the program group and only 32 percent by the control group according to the PAHO/WHO definition (Table 4). Both figures are well below an acceptable public health level. The Ministries of Health should define an acceptable level for this practice.

Although the net gains in assessment practice were similar for both the PAHO/WHO and INCAP observer indicators, the corresponding absolute values sometimes differed widely between the two indicators, even when applied to the same case. The numerator of the PAHO/WHO assessment indicator requires three conditions for the practice to be considered correct: the health worker (1) asks when the episode started, (2) asks about blood in the stool, and (3) agrees with the observer about the level of dehydration. The numerator of the INCAP observer assessment indicator requires only that the health worker's assessment of the type of diarrhea agree with the observer's. The different definitions for the two indicators may explain the difference in values.

## Distance Education Course

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The course also produced a positive impact on the practice of diagnosis of dehydration: The post-course program group diagnosed correctly 59 percent of the time according to the INCAP observers, 24 percentage points higher than the control.

These measured improvements in assessment and diagnostic practice are consistent with some of the results reported in the literature (Haynes et al. 1984; Johnson et al. 1982; Klein et al. 1981). However, there are very few studies in the literature that evaluate distance education programs for physicians in Latin America, and even fewer that include diarrhea. None of the Latin American studies showed positive results based on a rigorous evaluation methodology.

This study shows a statistically insignificant net loss in the percentage of correct rehydration treatment plans by the program group relative to the control as defined by the INCAP observers. This negative result might be explained in part by the fact that the pre-course survey value of this indicator was much higher in the program group (77 percent) than in the control (54 percent); thus there were fewer health workers in the program than in the control who could improve. Additional insight is provided by analyzing the changes of individual health workers. Fifty-three percent of the program participants improved (from incorrect in the pre-course survey to correct in the post-course survey), compared with 50 percent in the control. Meanwhile, 33 percent of the program participants got worse, compared with 39 percent of the control. Because of these evaluation results, as well as concerns raised by participants about the contents of the dehydration module, it is suggested that the module's contents and its method of application be revised.

It was not possible to analyze the effect of the program on rehydration practice or on the treatment of dysentery because of the small number of health workers in the panel who treated dehydration or dysentery in both the pre- and post-course surveys. When a panel design is used, as in this study, very few health workers encounter dehydrated patients or patients with dysentery in both the pre- and post-course surveys. The design of future studies of these two indicators should address this issue explicitly.

The course showed a positive but statistically insignificant effect on practices related to patient counseling for home care.

Appendices 2 and 3 show the results for 76 different variables of health worker practice and knowledge obtained from the pre- and post-course surveys. In Table 4, these results are summarized and clustered into six groups. A confusing and sometimes inconsistent picture emerges when all of these variables are analyzed individually; great care should be taken before using the results of any particular variable without resorting to the entire pattern of results. This situation underscores the importance of carefully defining a few meaningful impact indicators at the start of an evaluation. It suggests that deeper analysis and understanding is needed of the variables in the modified *Health Facility Survey Manual, Diarrhoea Case Management* in order to use these variables for an impact evaluation. For example, although the course showed a significant net improvement in diarrhea assessment according to both the PAHO/WHO and the INCAP observer definitions, the course showed essentially no effect on the 15 practice variables and 13 knowledge variables related to assessment.

The average cost of the course per initial participant was roughly U.S.\$60. This appears to be very low relative to the results achieved, namely, significant improvements in two key practices (assessment and diagnosis) and possibly improvement in a third (counseling).



# Conclusions

- The course produced a positive impact on the correct assessment of diarrhea and on the correct diagnosis of the state of dehydration in diarrhea patients. Both of these improvements are extremely important to public health.
- The course has the potential to modify other practices related to diarrhea.
- The level of performance of those completing the course, although substantially improved, remained below an adequate level for good public health in several indicators. As a result, it is recommended that the course be complemented with other educational options.
- A cost-effectiveness analysis is needed to compare this course with other training approaches. However, little is known about the cost-effectiveness of other approaches.
- In accordance with the opinions of the course participants, it is recommended that the classification of diarrheal diseases and the methods for diarrhea case management taught by the course be incorporated into national norms.
- It is recommended that each tutor serve no more than 25 participants, so that the tutors have enough time to follow up each participant and provide the individualized help needed.
- Rigorous evaluations of health training programs should be continued, using a methodology that permits objective comparisons among various training interventions.



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# Appendices

Appendix 1. Survey Forms Used to Assess Diarrhea Case Management

Appendix 2. Net Gains in Health Worker Practices

Appendix 3. Net Gains In Health Worker Knowledge

Appendix 4. Flow Diagram of the Process of Implementing and Evaluating the Distance Education Course

Appendix 5. Timetable of Activities



# Appendix 1. Survey Forms Used to Assess Diarrhea Case Management

## Purpose

To develop instruments to measure improvements in the knowledge and practice of health workers taking the distance education course *Update in the Management of Cholera and Diarrheal Diseases*.

## Strategy

As the data collection instrument, use the *WHO/PAHO Health Facility Survey (HFS)* modified to agree with the contents of the distance education course *Update in the Management of Cholera and Diarrheal Diseases*. Give priority to variables that can be used to measure changes in the practices and knowledge of health workers.

## Methodology

Drs. Guillermo Guibovich (PAHO/Peru), Juan Urrutia (consultant), Rolando Cerezo (INCAP Coordinator for course implementation), and Junio Robles (INCAP Coordinator for course evaluation) met for two weeks in Guatemala City while the implementation of the course was being planned. During the first week, Drs. Guibovich, Cerezo, and Robles trained the physician observers in the use of HFS.

Meanwhile, the group revised the HFS to make it compatible with the contents of the course.

## Objectives

1. Develop four modified survey forms: (1) observation of the management of a diarrhea case, (2) examination of the patient by the surveyor, (3) knowledge level of the health worker, and (4) costs associated with the facility where observations were made.
2. Make the content of the survey forms compatible with the course content.
3. Give priority to variables of greatest interest to PAHO /WHO, including the correct patient assessment, state of consciousness, thirst, and skin turgidity, among others.

During the second week of the group meeting, the observers practiced applying the forms in simulated conditions and then in actual health facilities. This experience enabled the group to identify the variables best suited to measuring knowledge and practice associated with diarrhea case management. By the end of the two-week session, the survey forms were ready for use in the pre-course survey.

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## Modifications Made to the HFS Forms

### Form 1

HFS Form 1 follows the organization of the course content. The first section deals with the health worker's assessment and diagnosis of the patient and includes information obtained by questioning the patient and examining the patient physically, conclusions about the patient's condition, and finally the health worker's diagnosis. The modification process added one variable on questioning the patient ("number of evacuations in 24 hours") and three physical examination variables ("pulse," "blood pressure," and "nailbed pallor"), indicating whether or not the health worker obtained this information. One variable on the condition of the patient was added ("severe malnutrition"), indicating whether or not the patient was judged by the health worker to be severely malnourished.

The course emphasizes that it is important to distinguish between liquid diarrhea, dysentery, persistent diarrhea, and cholera before establishing the degree of dehydration. Two variables in the HFS reflect the health worker's diagnosis, one that records the health worker's judgment on the type of diarrhea and the other on whether there is any suspicion of cholera.

Item 9 in Form 3 of the original HFS, about counseling mothers and patients on the use of oral rehydration salts and home fluids, was moved to the treatment section of Form 1. Several items related to prevention that are emphasized in the course were added to the patient counseling section of Form 1. The final questions about the quantity of liquid received by dehydrated patients were dropped because the health worker orders treatment but does not administer it.

### Form 2

The variables added to Form 1 were also added to Form 2, including the following: evacuations in the last 24 hours, conclusions about the type of diarrhea, and whether or not cholera is suspected. Item 5 in Form 2 of the original HFS was dropped because the same information is available in the diagnosis of diarrhea type. The second part of Form 2 was omitted because it is not relevant to the present evaluation.

### Form 3

Form 3 contains information about health worker training and knowledge of diarrhea case management, as determined by the expert observer during an interview with the health worker. It begins with information on the health worker's previous training in diarrhea case management (corresponding to items 10 to 10.3 in the HFS). Several variables have been added to the original HFS. In the section on health worker's knowledge about what to ask the patient, a variable about number of evacuations in the last 24 hours was added. In the section on knowledge about treatment, variables were added on the following: type of IV solution to treat severe dehydration, definition of suspected cholera, and procedure to calculate the magnitude of a cholera epidemic and the national cholera attack rate. The section in the HFS on supervisory activities was dropped because this topic was not part of the course.

### **Form 4**

It was decided that Form 4 should only include information about supplies and medications that are essential to the management of cholera and diarrheal diseases. Therefore, the only variables from the HFS used in the modified version are related to the application of oral rehydration salts and oral rehydration therapy. Several other variables were added, including the following: availability of appropriate hospital beds, chloride for stool treatment, and venoclysis equipment.

Finally, the four modified forms were incorporated into the HFS structure.

## Appendix 2. Net Gains in Health Worker Practices

Variable	Control Group (n=66)					Program Group (n=66)					Net Gain in Percentage Points	
	No. correct (%)		Percentage Point Gain	No. correct (%)		Percentage Point Gain						
	Pre	Post		Pre	Post							
<b>Questions asked the patient</b>												
1. Duration of diarrhea [1.1.1]	64.7	(97.0)	66/66	(100.0)	3.0	62/66	(93.9)	66/66	(100.0)	6.1	3.1	
2. Number of evacuations [1.1.2]	47.7	(71.2)	57/66	(86.4)	15.2	58/66	(87.9)	61/66	(92.4)	4.5	-10.7	
3. Blood in stools [1.1.3]	33.7	(50.0)	33/66	(50.0)	0.0	30/66	(45.5)	43/66	(65.2)	19.7	19.7	
4. Other illnesses [1.1.4]	27.7	(40.9)	29/66	(43.9)	3.0	30/66	(45.5)	33/66	(50.0)	4.5	1.5	
<b>Obtained during physical examination</b>												
5. Signs of thirst [1.2.1]	10/66	(15.2)	19/66	(28.8)	13.6	11/66	(16.7)	21/66	(31.8)	15.1	1.5	
6. General condition [1.2.2]	26/66	(39.4)	53/66	(80.3)	40.9	21/66	(31.8)	50/66	(75.8)	44.0	3.1	
7. Eyes [1.2.3]	36/66	(54.5)	57/66	(86.4)	31.9	41/66	(62.1)	58/66	(87.9)	25.8	-6.1	
8. Tears [1.2.4]	24/66	(36.4)	47/66	(71.2)	34.8	31/66	(47.0)	53/66	(80.3)	33.3	-1.5	
9. Mouth and tongue [1.2.5]	55/66	(83.3)	62/66	(93.9)	10.6	61/66	(92.4)	66/66	(100.0)	7.6	-3.0	
10. Skin pinch [1.2.6]	37/66	(56.1)	53/66	(80.3)	24.2	43/66	(65.2)	59/66	(89.4)	24.2	0.0	
11. Pulse [1.3]	4/66	(6.1)	9/66	(13.6)	7.5	4/66	(6.1)	9/66	(13.6)	7.5	0.0	
12. Blood pressure [1.4]	10/66	(15.2)	2/66	(3.0)	-12.2	4/66	(6.1)	8/66	(12.1)	6.0	18.2	
13. Nailbed pallor [1.5]	5/66	(7.6)	6/66	(9.1)	1.5	3/66	(4.5)	8/66	(12.1)	7.6	6.1	
14. Temperature [1.7]	33/66	(50.0)	42/66	(63.6)	13.6	36/66	(54.5)	45/66	(68.2)	13.7	0.1	
15. Weighed [1.8]	32/66	(48.5)	44/66	(66.7)	18.2	27/66	(40.9)	47/66	(71.2)	30.3	12.1	
<b>Diagnosis</b>												
16. Type of diarrhea [1.9]	11/66	(16.7)	24/66	(36.4)	19.7	10/65	(15.4)	39/65	(60.0)	44.6	24.9	
17. Suspicion of cholera [1.10]	58/66	(87.9)	65/66	(98.5)	10.6	62/65	(95.4)	65/65	(100.0)	4.6	-6.0	
18. Degree of dehydration [1.11]	11/66	(16.7)	24/66	(36.4)	19.7	57/65	(87.7)	56/65	(86.1)	-1.6	-21.3	
19. Treatment of dehydration [1.12]	5/66	(7.6)	14/66	(21.2)	13.6	9/65	(13.8)	23/65	(35.4)	21.6	8.0	

**Appendix 2. Net Gains in Health Worker Practices (Continued)**

Variable	Control Group (n=66)					Program Group (n=66)					Net Gain in Percentage Points	
	No. correct (%)		Percentage Point Gain	No. correct (%)		Percentage Point Gain						
	Pre	Post		Pre	Post							
<b>Instructions given on rehydration</b>												
20. Use of ORS and home fluids [1.15]	6/24	(25.0)	6/24	(25.0)	0.0	32/40	(80.0)	35/40	(87.5)	7.5	7.5	
21. Preparation of ORS [1.16.1]	11/23	(47.8)	16/23	(69.6)	21.8	27/36	(75.0)	27/36	(75.0)	0.0	-21.7	
22. ORS replaces lost liquid [1.16.2]	5/23	(21.7)	10/23	(43.5)	21.8	11/36	(30.6)	12/36	(33.3)	2.7	-19.1	
23. How much liquid to give [1.16.3]	15/23	(65.2)	20/23	(87.0)	21.8	32/36	(88.9)	32/36	(88.9)	0.0	-21.8	
24. Verify listener understands [1.16.4]	2/23	(8.7)	9/23	(39.1)	30.4	10/36	(27.8)	19/36	(52.8)	25.0	-5.4	
<b>Counseling on home management</b>												
25. Continue feeding [1.17.1]	10/23	(43.5)	16/23	(69.6)	26.1	20/36	(55.6)	30/36	(83.3)	27.7	1.6	
26. Return if no improvement [1.17.2a]	6/23	(26.1)	6/23	(26.1)	0.0	6/36	(16.7)	23/36	(63.9)	47.2	47.2	
27. Return if many evacuations [1.17.2b]	4/23	(17.4)	3/23	(13.0)	-4.4	4/36	(11.1)	16/36	(44.4)	33.3	37.7	
28. Return if frequent vomiting [1.17.2c]	2/23	(8.7)	5/23	(21.7)	13.0	3/36	(8.3)	14/36	(38.9)	30.6	17.6	
29. Return if marked thirst [1.17.2d]	1/23	(4.3)	4/23	(17.4)	13.1	1/36	(2.8)	5/36	(13.9)	11.1	-1.9	
30. Return if not eating well [1.17.2e]	3/23	(13.0)	1/23	(4.3)	-8.7	2/36	(5.6)	3/36	(8.3)	2.7	11.5	
31. Return if blood in stools [1.17.2f]	0/23	(0.0)	0/23	(0.0)	0.0	1/36	(2.8)	7/36	(19.4)	16.6	16.6	
32. Return if fever [1.17.2g]	2/23	(8.7)	3/23	(13.0)	4.3	1/36	(2.8)	10/36	(27.8)	25.0	20.7	
<b>Instructions on prevention</b>												
33. Purify the water [3.16.a]	4/23	(17.4)	5/23	(21.7)	4.3	9/36	(25.0)	20/36	(55.6)	30.6	26.3	
34. Wash hands [1.18.b]	6/23	(26.1)	6/23	(26.1)	0.0	12/36	(33.3)	18/36	(50.0)	17.7	17.7	
35. Elimination of excreta [1.18.c]	3/23	(13.0)	2/23	(8.7)	-4.3	3/36	(8.3)	8/36	(22.2)	13.9	18.2	
36. Food management [1.18.d]	5/23	(21.7)	5/23	(21.7)	0.0	10/36	(27.8)	15/36	(41.7)	13.9	13.9	
37. Breastfeeding practices [1.18.e]	3/16	(18.8)	3/16	(18.8)	0.0	4/26	(15.4)	8/26	(30.8)	15.4	15.4	
38. Measles immunization [1.18.f]	0/16	(0.0)	2/16	(12.7)	12.7	0/26	(0.0)	2/26	(7.7)	7.7	-5.0	

**Notes:** The numbers in brackets following the variable descriptions refer to the section of the INCAP form.

Each variable in the table reflects a correct practice, except variables 15–19, in which the practice is considered to be correct only if the health worker's practice agrees with that of the INCAP observer.

### Appendix 3. Net Gains in Health Worker Knowledge

Variable	Control Group (n=66)					Program Group (n=66)					Net Gain in Percentage Points
	No. correct (%)		Percentage Point Gain			No. correct (%)		Percentage Point Gain			
	Pre	Post				Pre	Post				
<b>Knowledge on questioning patients</b>											
1. Duration of diarrhea [3.2.1]	56	(84.8)	63	(95.5)	10.7	58	(87.9)	61	(92.4)	4.5	-6.2
2. Number of evacuations [3.2.2]	48	(72.7)	59	(89.4)	16.7	59	(89.4)	60	(91.9)	2.5	-14.2
3. Blood in feces [3.2.3]	30	(45.5)	41	(62.1)	16.6	37	(56.1)	41	(62.1)	6.0	-10.6
4. Other illnesses [3.2.4]	16	(24.2)	27	(40.9)	16.7	18	(17.3)	22	(33.3)	6.0	-10.7
<b>Knowledge on examining patients</b>											
5. Signs of thirst [3.3.1]	13	(19.7)	19	(28.8)	9.1	9	(13.6)	23	(34.8)	21.2	12.1
6. General condition [3.3.2]	24	(36.4)	43	(65.2)	28.8	24	(36.4)	46	(69.7)	33.3	4.5
7. Sunken eyes [3.3.3]	38	(57.6)	55	(83.3)	25.7	44	(66.7)	57	(86.4)	19.7	-6.0
8. Presence of tears [3.3.4]	33	(50.0)	48	(72.7)	22.7	33	(50.0)	54	(81.8)	31.8	9.1
9. Dry mouth and tongue [3.3.5]	62	(93.9)	64	(97.0)	3.1	62	(93.9)	65	(98.5)	4.6	1.5
10. Skin pinch [3.3.6]	57	(86.4)	61	(92.4)	6.0	59	(89.4)	66	(100.0)	10.6	4.6
11. Pulse [3.3.7]	7	(10.6)	8	(12.1)	1.5	4	(6.1)	10	(15.2)	9.1	7.6
12. Blood pressure [3.3.8]	10	(15.2)	5	(7.6)	-7.6	8	(12.1)	10	(15.2)	3.1	10.7
13. Nailbed pallor [3.3.9]	7	(10.6)	6	(9.1)	-1.5	4	(6.3)	4	(6.3)	0.0	1.5
<b>Knowledge on case management</b>											
14. Some dehydration [3.4]	47	(71.2)	9	(13.6)	-57.6	50	(75.8)	25	(37.9)	-37.9	19.7
15. ORS in first 4 hours [3.5]	21	(31.8)	23	(34.8)	3.0	19	(28.8)	44	(66.7)	37.9	34.9
16. Severe dehydration [3.6]	60	(90.9)	59	(89.4)	-1.5	58	(87.9)	58	(87.9)	0.0	1.5
17. Type of IV solution [3.7]	57	(86.4)	55	(83.3)	-3.1	58	(87.9)	61	(92.4)	4.5	7.6
18. IV solution in first 3 hours [3.8]	27	(40.9)	16	(24.2)	-16.7	18	(27.3)	50	(75.8)	48.5	65.2

## Distance Education Course

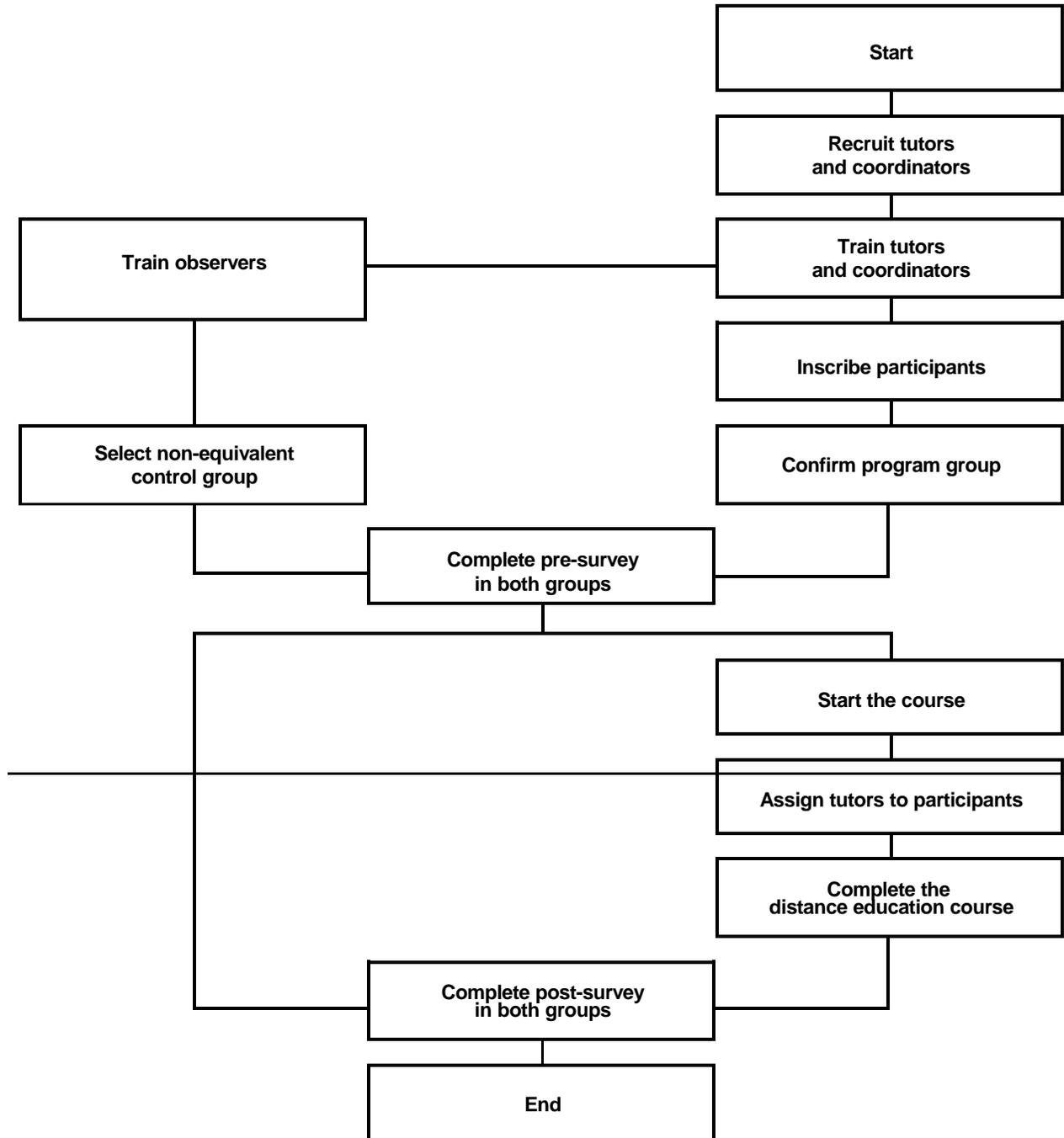
### Appendix 3. Net Gains in Health Worker Knowledge (Continued)

Variable	Control Group (n=66)					Program Group (n=66)					Net Gain in Percentage Points
	No. correct (%)		Percentage Point Gain			No. correct (%)		Percentage Point Gain			
	Pre	Post				Pre	Post				
<b>Knowledge on use of antibiotics</b>											
19. Dysentery [3.9.1]	26	(39.4)	37	(56.1)	16.7	28	(42.4)	55	(83.3)	40.9	24.2
20. Cholera [3.9.2]	5	(7.6)	6	(9.1)	1.5	13	(19.7)	18	(27.3)	7.6	6.1
21. Other related illnesses [3.9.3]	2	(3.0)	0	(0.0)	-3.0	3	(4.5)	0	(0.0)	-4.5	-1.5
22. Other situations [3.9.4]	9	(13.6)	36	(54.5)	40.9	9	(13.6)	50	(75.8)	62.2	21.3
<b>Knowledge on epidemiology</b>											
23. Definition of suspected cholera [3.11]	31	(47.0)	20	(30.3)	-16.7	31	(47.0)	29	(43.9)	-3.1	13.6
24. Calculate cholera strike magnitude [3.12]	35	(53.0)	46	(69.7)	16.7	13	(19.7)	18	(27.3)	7.6	-9.1
25. National cholera attack rate [3.13]	1	(1.5)	0	(0.0)	-1.5	0	(0.0)	20	(30.3)	30.3	31.8
26. Use of other medications [3.14]	15	(22.7)	19	(28.8)	6.1	10	(15.2)	15	(22.7)	7.5	1.4
<b>Knowledge on counseling for home management</b>											
27. Increase liquids [3.15.1]	46	(69.7)	56	(84.8)	15.1	56	(84.8)	59	(89.4)	4.6	-10.5
28. Continue feeding [3.15.2]	28	(42.4)	55	(83.3)	40.9	39	(59.1)	66	(100.0)	40.9	0.0
29. Return if no improvement [3.15.3a]	12	(18.2)	29	(43.9)	25.5	25	(37.9)	46	(69.7)	31.8	6.1
30. Return if many watery stools [3.15.3d]	17	(25.8)	43	(65.2)	39.4	18	(27.3)	49	(74.2)	46.9	7.5
31. Return if repeated vomiting [3.15.3c]	13	(19.7)	33	(50.0)	30.3	7	(10.6)	35	(53.0)	42.4	12.1
32. Return if marked thirst [3.15.3d]	2	(3.0)	19	(28.8)	25.8	1	(1.5)	22	(33.3)	31.8	6.0
33. Return if not eating well [3.15.3e]	4	(6.1)	20	(30.3)	24.2	3	(4.5)	21	(31.8)	27.3	3.1
34. Return if blood in stools [3.15.3f]	1	(1.5)	6	(9.1)	7.6	2	(3.0)	15	(22.7)	19.7	12.1
35. Return if fever [3.15.3g]	10	(15.2)	13	(19.7)	4.5	5	(7.6)	22	(33.3)	25.7	21.2
<b>Knowledge on instructions for using ORS</b>											
36. ORS replaces fluid loss [3.16.1]	11	(16.7)	25	(37.9)	21.2	18	(27.3)	31	(46.9)	19.6	-1.6

37. How much ORS to give [3.16.2]	42	(63.6)	57	(86.4)	22.8	47	(71.2)	59	(89.4)
38. Show how to prepare ORS [3.16.3]	48	(72.7)	63	(95.5)	22.8	57	(86.4)	56	(84.8)

**Note:** Numbers in brackets following the variable descriptions refer to the section of the INCAP Form.

**Appendix 4. Flow Diagram of the Process of Implementing and Evaluating the Distance Education Course**



**Distance Education Course**

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