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STUDY REPORT

Assessment of HCWs compliance to IMCI guidelines at first and last supportive supervision visits: Results of three different training approaches carried out in the Lake Zone of Tanzania



JULY 2015

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ACRONYMS

AGPAHI	Ariel Glaser Pediatric AIDS Healthcare Initiative
AMREF	Africa Medical Research Foundation
CI	Confidence Interval
CM	Case Management
CTCs	Care and Treatment Centers
dIMCI	Distance Integrated Management of Childhood Illnesses Training
DMOs	District Medical Officers
FGDs	Focus Group Discussions
HC	Health Center
HCWs	Health Care Workers (facility-based)
HIV	Human Immunodeficiency Virus
IMCI	Integrated Management of Childhood Illnesses
MDGs	Millennium Development Goals
M&E	Monitoring and Evaluation
MoHSW	Ministry of Health and Social Welfare
mRDT	Malaria Rapid Diagnostic Test
MSH	Management Sciences for Health
NIMR	National Institute for Medical Research
PQITs	Pediatric Quality Improvement Teams
QI	Quality Improvement
RMOs	Regional Medical Officers
SCM	Supply Chain Management
SS&M	Supportive Supervision and Mentorship
THP	Tibu Homa Program
URC	University Research Co., LLC
USAID	United States Agency for International Development

1. INTRODUCTION

The Government of United Republic of Tanzania is fully committed to achieving the Millennium Development Goals (MDGs) which are part of the National Strategy for Growth and Reduction of Poverty. It is estimated that the current under-five mortality in Tanzania is 81 per 1,000 live births, infant mortality rate is 51 per 1,000 live births and new born mortality is 26 per 1,000 live births.¹ Despite progress being made, under-five mortality especially neonatal mortality remained significantly unchanged.

Integrated Management of Childhood Illness (IMCI) was developed by the World Health Organization and the United Nations International Children's Fund to reduce childhood morbidity and mortality in resource-limited settings. IMCI was introduced in Tanzania in 1996 and scaled up to all districts in the country in 1998.² In a multi-country study including Tanzania, IMCI implementation improved the quality of care provided by health care workers (HCWs), lowered under-five mortality by 13%, and was cost-effective.^{2,3,4} The 1996 IMCI guidelines were operational until 2011 when they were replaced with new guidelines adapted by the Ministry of Health and Social Welfare (MoHSW) with support from the USAID-funded Tibu Homa Program. In the new guidelines, the algorithm for fever directs treatment for malaria to begin only upon laboratory evidence and to manage malaria-negative children for other causes of fever. This was made possible with the Malaria Rapid Diagnostic Test (mRDT) national roll out since 2009⁵.

Although the National IMCI roll out was initiated in 1998 and 83% of districts had conducted at least one training course by 2005, national-level training coverage was only 14% in 2009⁶. One limiting factors was the cost of the 11 day training. Other studies conducted in the same region noted similar challenges in achieving national coverage^{6, 7,8,9,10,11}

A survey of 24 counties in 2007 found that all offered short IMCI courses ranging from 3-10 days (Goga et al. 2009).⁸ A systematic review found that there were too few rigorous direct comparisons of standard versus short trainings to conclude firmly on their effectiveness⁷, hence the need to evaluate the training options. Alternative lower cost, effective methods of IMCI training and greater advocacy for IMCI is needed both nationally and internationally (Hildegada et al. 2010).⁷

However, there was some concern that shortening training would adversely affect the quality of the training to the detriment of trained healthcare worker performance. Studies have shown that shorter training courses gave comparative results when accompanied with facility based supportive supervision^{12, 13}

Research has shown that many health workers do not adhere to IMCI guidelines, particularly for the management of severe illness even after the conventional standard IMCI training. Factors contributing to health workers' non-adherence to IMCI guidelines include use of single, narrow diagnoses rather than IMCI classifications; belief that chloramphenicol is unacceptably toxic; the perception that referring severely ill children is often unnecessary; shortage of medicines and supplies; frequent turnover of trained health workers; inadequate mentorship and supportive supervision; inadequate supplies of IMCI guidelines and job aids; and insufficient refresher courses.⁹ An approach that utilizes a bundle of interventions is therefore more likely to improve compliance with the standard guidelines.

The USAID-funded Tibu Homa Program (THP) has been working in the Lake Zone regions of Tanzania since 2011 to reduce morbidity and mortality of children under five years of age by developing health care worker capacity to manage cases of febrile illness at public and private

facilities. THP is implemented by University Research Co., LLC (URC) in collaboration with Management Sciences for Health (MSH) and Amref Health Africa.

2. PURPOSE OF THE ASSESSMENT

The assessment compares the quality of care to sick children managed by health care workers trained in the Integrated Management of Childhood Illnesses (IMCI) using three different approaches. The specific objectives are to:

1. Compare the quality of service delivery by HCWs in IMCI using three training options, (i) IMCI for three days with quality improvement (QI) and supply chain management training (SCM) using 11 day training materials, (ii) dIMCI with QI and SCM and (iii) dIMCI without QI nor SCM.
2. Determine the proportion of children under-five with fever who are managed according to IMCI guidelines
3. Determine health facility conditions associated with its abilities to manage sick children
4. Determine the effects of SCM and QI training to HCWs trained in case management
5. Determine the effects of supportive supervision and mentorship for trained HCWs in improving care for U5s with fever.

3. METHODOLOGY

3.1 Study Design

A Health facility based cross sectional, comparative randomized study using both qualitative and quantitative methods was applied. The study targeted three groups of health facilities whose HCWs who were:

- Trained in IMCI through a three-day class using the 11 days standard IMCI materials and in addition received SCM and QI training (Group 1);
- Trained in IMCI through the dIMCI approach and who in addition received SCM and QI training (Group 2); and
- Trained on IMCI through dIMCI approach and did not receive SCM and QI trainings (Group 3).

Health facilities supported by the Program in Kagera and Mara regions were sampled for assessment. These two regions were selected because they have both health care workers trained via dIMCI and those trained in IMCI for three days using the 11 days IMCI materials. In these two approaches, health care workers simultaneously received QI and SCM training followed by regular monthly supportive supervision and mentorship visits. The dIMCI group also received a 6 week after training follow-up which is usually considered part of the IMCI training. In Shinyanga and Simiyu health facilities whose health care workers received dIMCI training with the support of AGPAHI/MoHSW but did not receive QI and SCM training were sampled to provide the third training option group. This group had a 4-6 weeks follow up visit after training. The health facilities were randomly selected and stratified according to the health facility level status i.e. health center/dispensary and public/private status.

Quantitative data collection to assess the individual cases of under-fives with fever to generate information on how they were collected from case files review. Performance was assessed using a standard checklist based on the current IMCI case management guidelines.

A checklist containing information to review the health facility conditions that may affect health care workers' ability to manage sick children was developed and applied in focus group (FGs)

discussions. These were conducted to gather information on IMCI implementation and other challenges to health care workers.

3.1.1 Dependent variables:

Health facilities with HCWs who received (a) the three days training using the 11 days IMCI training materials plus SCM and QI trainings (b) dIMCI plus SCM and QI trainings, and (c) dIMCI without SCM and QI trainings

3.1.2 Independent variables:

- a. Three days training approach using the 11 days IMCI materials,
- b. dIMCI training,
- c. SCM training,
- d. QI Training,
- e. Supportive Supervision and Mentorship

3.1.3 Inclusion and exclusion criteria:

Inclusion: All the health facilities from which HCWs received case management training (either dIMCI or three days training approach using the 11 days IMCI materials) within the last two years.

Exclusion: Health facilities with HCWs who received case management training (either dIMCI or three days training approach using the 11 days IMCI materials) within the last two years but they received routine monthly supportive supervision for less than twelve months from THP supported HF's

3.2 Sampling

3.2.1 Study area

The study was conducted in the lake zone regions of Mara, Kagera, Shinyanga and Simiyu within selected health facilities supported by the Program and by AGPAHI/MOHSW. The multi-stage cluster sampling method was employed to select facilities. Primary clusters were districts and secondary clusters were health facilities. In the secondary clusters a random sample of two health centers and two dispensaries were selected from both private and public health facilities.

Table 1: Selected Health Facilities by level, ownership and study group

Category	Region	District	Health facility	Ownership
Grp 1	Mara	Serengeti	Natta HC	Public
	Mara	Serengeti	Nyakitono Disp	Public
	Mara	Musoma DC	Kyabakari HC	Private
	Mara	Musoma DC	Nyabange KMT Disp	Private
Grp 2	Kagera	Bukoba DC	Kanazi HC	Public
	Kagera	Bukoba DC	Kashozi HC	Private
	Kagera	Bukoba DC	Ibwera Disp	Public
	Kagera	Bukoba DC	Rwamurumba Disp	Private
Grp3	Shinyanga	Kahama DC	Ukene HC	Public
	Shinyanga	Kahama DC	Kagongwa Disp	Public
	Shinyanga	Kahama DC	Mpera HC	Private
	Shinyanga	Kahama DC	Mbulu Disp	Private

Total	12
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3.2.2 Study Population

The study involved children under-five years of age with fever attended to at selected health facilities. HCWs trained in IMCI were purposively selected for FGDs or in-depth interview.

3.2.3 Sample size estimation

A minimum sample of 720 records of children under-five years of age were estimated for recruitment on equal allocation per study group, 240 records per study group. This sample size was calculated for a cross sectional design at 5% margin of error and 99% confidence level. Oversampling was applied to take into consideration non responses and level of health facility (higher level has higher numbers of patients as compared to the lower level)

Table 2: Estimated number of records by facility level per group (private or private)

Facility level	Number of sites	Records	Total records
Health Centre	2	80	160
Dispensary	2	40	80
Total			240

There was no random selection of records per site. However to have a common starting point, records were reviewed from at first month after training and at last month of supportive supervision. Records were selected forward or backwards for first and last visit until the required sample is obtained.

The study selected two to six HCWs to participate in focus group discussion sessions based on their availability at the health facility. They were eligible for selection if trained in IMCI, managing U5s with fever in their respective facilities and had been in the facility for more than six months. Two FGDs were conducted in each study group (one for Health Center and one for Dispensary). In situations where a number of HCWs were not sufficient to form a group for discussion then an in-depth interview was applied.

3.3 Data Collection

The tools for collecting data were developed and the information collected on the child's age, sex, and other requirements appearing on IMCI recording form and information obtained from the patient files/exercise book. A FGD guide was also developed and consent of participants obtained prior to start of the discussions.

The research assistants were trained for the field assessment and the tools were pre-tested at Igoma Health Center in Mwanza. Based on the pre-test results the tools were finalized. The principal investigators oversaw data collection which included data review meetings held daily after field work. All completed tools with data were filed in an envelope once the reviewing process was completed.

3.4 Data Analysis

The unit of analysis was a child in the respective health facility and HCWs for focus group discussions. All outcomes were summarized by proportions. Stratification of the proportions was done across the study groups and ownership and health facility level. Statistical methods included uni-variate (frequencies), cross-tabulations and bi-variate logistic regression analysis to estimate independent factors associated with compliance to IMCI algorithm to under-fives with fever.

Data were collected on paper in the field and were double-entered on a pre-programmed Microsoft access application using two independent data entry clerks at the central office. Discrepancies between the two entries were resolved with reference to the original data forms. Standard range, consistency checks and analysis were carried out using STATA version 13.

A two-sample z test was conducted to compare the proportions of under- fives assessed correctly during the first and last visit, and between the three study groups. One-way Analysis of Variance (ANOVA) was used to assess the evidence that mean scores of health care workers across groups are not all the same. All reported p-values are two tailed and confidence intervals were calculated at the 95% level.

3.5 Quality control

All personnel involved in the study received an orientation on the research procedures. The M&E Advisor oversaw the field work processes. Data collection tools were standardized for consistency and were reviewed and checked for completeness daily so that all possible errors could be corrected. The field team reviewed data from each health facility at the end of each day for consistency and logic.

3.6 Ethics

3.6.1 Ethics Considerations

Approval for the study was granted from Institutional Review Boards of URC and National Institute for Medical Research, Tanzania (NIMR). The permission to conduct the study was given by from RMOs and DMOs and Health facility in-charges of selected facilities. This was a retrospective assessment of patients' charts/files of under- fives with fever and no names of patients were taken during the data collection and data analysis. Similarly in the FGDs no names of HCWs were collected or used during the actual discussions or analysis. All participants were asked for consent prior to starting discussions. Facilitator went through consent forms and let the participants read the document and ask questions before they signed the forms. These ethical considerations ensured there was no linkage between results of the assessment and individual patient's treatment results, or the qualitative assessment results and interviewed HCWs.

3.6.2 Confidentiality

Confidentiality was strictly observed by the research team by using coded numbers on the study tools. All computerized analytical software identified assessed patients with coded identification numbers only and the publications (journals, seminars, etc.) will not identify individual patients. All patients case files assessed were left at respective health facilities so the study did not collect any document with patient names.

3.7 Limitations of the Study

One of the potential limitations is the possibility for spill-over of advantages and benefits from the health facilities between the three groups especially group 1 and 2 which are more or less located in the same setting. This could be through the horizontal exchange of information (from one friend to another neighbor) or vertically by transfer of health personnel from health facilities of the intervention arm to those in the control arm.

4. FINDINGS

4.1 Description of Study Sample

The study reviewed 721 records, 206 (36%) from Group One, 256 (35%) and 205 (28%) from Group Three (Table 3). The total number of under-fives from all selected health centers was 507 (70%) and from dispensaries 214 (30%). The distribution of the sample based on facility

ownership was 474 (66 %) from public facilities and 247 (34%) from private health facilities. This discrepancy in sample per ownership was due to the fact that the “dIMCI only” training focused mainly on public health facilities with very few private health facilities trained in this group.

Table 3. Demographic distribution of under-fives by age group, health facility level, health facility ownership and training methodology stratified by visit type (N=721)

Characteristic	Under-fives at 1 st visit (N, %)	Under-fives at Last visit (N, %)	Total (N, %)
Gender			
Male	165 (50.6)	202 (51.1)	367 (50.9)
Female	161 (49.4)	192 (48.6)	354 (49.1)
Age group (in months)			
0-1.9	10 (3.1)	28 (7.1)	38 (5.3)
2-12	115 (35.3)	174 (44.1)	280 (40.1)
13-24	98 (30.1)	102 (25.8)	200 (27.7)
25-59	103 (31.6)	91 (23.0)	194 (26.9)
Health facility type			
Health centre	245 (75.2)	262 (66.3)	507 (70.3)
Dispensary	81 (24.8)	133 (33.7)	214 (29.7)
Health facility ownership			
Public	214 (65.6)	260 (65.8)	474 (65.74)
Private	112 (34.4)	135 (34.2)	247 (34.3)
IMCI Trained Methodology			
Three day IMCI + 3day QI+SCM	127 (38.9)	133 (33.7)	260 (35.1)
dIMCI + 3 day QI+SCM	124 (38.0)	132 (33.4)	256 (35.5)
dIMCI alone	75 (23.0)	130 (32.9)	205 (28.4)

N=Number of records

Table 4 shows geographical distribution of sampled under-fives by region, health facility and visit type. The male to female ratio at first and last visit is 1:1. Most children (40.1%) were aged 2-12 months. Only 5.3% of children aged 0-2 months had their files available for assessment. Table 4 shows that 395 under-fives were assessed with fairly equal numbers from Kagera (132) and Mara (133) and fewer facilities in Shinyanga (64) and Simiyu (66). For Shinyanga and Simiyu Regions, the first visit facilities had zero records as seen in the first visit column with exception of Bukundi Health Center in Meatu DC.

Table 4: Distribution of under-fives by region, health facility and visit type

Region	Health facility name	Under-fives at 1 st visit (N, %)			Under-fives at Last visit (N, %)		
		0-1.9month	2-59months	Total	0-1.9month	2-59months	Total
Mara	Natta HC	2 (66.7)	42 (33.9)	44	2 (66.7)	35 (30.2)	37
	Nyakitono Disp	0 (0.0)	20 (16.1)	20	0 (0.0)	18 (15.5)	18
	Kyabakari HC	0 (0.0)	41 (33.1)	41	3 (17.7)	42 (36.2)	45
	Nyabange KMT	1 (33.3)	21 (16.9)	22	2 (11.8)	21 (18.2)	22
	Subtotal	3 (30.0)	124(39.2)	127	17 (60.7)	116 (31.6)	133
Kagera	Kanazi HC	2 (100.0)	48 (39.3)	50	1 (33.3)	42 (32.6)	43
	Kashozi HC	0(0.0)	35 (28.7)	35	0(0.0)	41 (31.8)	41
	Ibwera Disp	0(0.0)	25 (20.5)	25	1 (33.3)	21 (16.3)	22
	Salient	0(0.0)	14 (11.5)	14	1 (33.3)	25 (19.4)	26

	Subtotal	2 (20.0)	122(38.6)	124	3 (10.7)	129 (35.2)	132
Shinyanga	Ukene HC	0(0.0)	0 (0.0)	0	7 (87.5)	34 (60.7)	41
	Kagongwa Disp	0(0.0)	0 (0.0)	0	1 (12.5)	22 (39.3)	23
	Subtotal	0(0.0)	0(0.0)	0	8 (28.6)	56 (15.3)	64
Simiyu	Bukundi	5 (50.0)	70(22.2)	75	0(0.0)	66 (18.0)	66
Total number of under-fives for all regions		10	316	326	28	367	395

N=Number of under-fives

4.2 Correct assessment of all danger signs

IMCI algorithm requires health care providers to triage sick children in order to identify those who need immediate care and treatment including pre referral treatment and immediate referral to higher level facilities. The under-five case notes were scrutinized to determine if general danger signs were assessed to identify under-fives with febrile illness that required urgent referral.

HCW's ability to identify the general danger signs at first visit for Group One ranged from 45.2% - 63.4% compared with HCW's ability in Group Two that ranged from 3.3%-15.6%, $p < 0.001$. There were no records for Group Three at all selected health facilities.

At last supportive supervision visit HCW, ability to identify general danger signs ranged between 81.6%-93.4% for Group One health facilities, 27.1-52.9% for Group Two health facilities and 0.4%-6.4% for Group Three health facilities, $p < 0.001$ (Table 5).

Table 5: Comparison of health care quality provided by HCW by IMCI training methodology among children aged 2-59 months during the first visit in assessing for danger signs at supervision/mentorship visits.

Health Care Provided:	IMCI Training Method: First visit (N, % and 95% CI)			P values for comparison of;		
	Group One Three day IMCI + 3day QI+SCM	Group Two dIMCI + 3 day QI+SCM	Group Three dIMCI alone	Three day IMCI + 3day QI+SCM vs dIMCI + 3 day QI+SCM	Three day IMCI + 3day QI+SCM vs dIMCI alone	dIMCI + 3 day QI+SCM vs dIMCI alone
First visit						
Weight recorded	59.7 (50.8-68.0)	77.0 (68.7-83.7)	-	0.0034	-	-
Vomiting every thing	54.0 (45.2-62.7)	8.2 (4.4-14.6)	-	<0.001	-	-
Convulsions	54.8 (46.0-63.4)	9.0 (5.0-15.6)	-	<0.001	-	-
Unable to feed	54.0 (45.2-62.7)	6.6 (3.3-12.6)	-	<0.001	-	-
Lethargic	54.0 (45.2-62.7)	8.4 (4.6-15.0)	-	<0.001	-	-
Last Visit						
Weight recorded	98.3 (93.3-99.6)	85.3 (78.0-90.4)	6.6 (3.3-96.7)	0.0003	<0.001	<0.001
Vomiting every thing	88.8 (81.6-93.4)	44.2 (35.8-52.9)	1.6 (0.4-6.4)	<0.001	<0.001	<0.001
Convulsions	89.7 (82.6-95.1)	43.4 (35.1-52.1)	3.3 (1.2-8.5)	<0.001	<0.001	<0.001
Unable to feed	88.8 (81.6-93.4)	34.9 (27.1-43.5)	-	<0.001	-	-

Lethargic	88.8 (81.6-93.4)	34.9 (27.1-43.5)	1.6 (0.4-6.4)	<0.001	<0.001	<0.001
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¹ Average score are presented as mean score with their 95 % confidence interval

N=Number of under-fives

4.3 Correct assessment for presence of all main symptoms (cough, diarrhea, fever, ear problem) and other examination parameters

In managing U5 children, IMCI algorithm requires HCWs to assess for all main symptoms and other important parameters including signs of measles, malnutrition, anemia, HIV infection, malaria and checking vaccination, anti-helminthes and vitamin supplementation.

At the first visit of supportive supervision and mentorship after training, the study findings indicate that 26% and 7% of children in Group One and Two respectively were assessed for all main symptoms ($p < 0.001$) (Table 6). In both Groups One and Two, over 75% of children with fever were tested for malaria (Group One: 79.8% and 92.6% Group Two; $p < 0.001$).

Performance in correctly checking for measles, malnutrition and anemia ranged from 2%-38% for Group One health facilities and 2%-23% for Group Two health facilities ($p < 0.001$). At first visit, in both Group One and Two, all children were poorly assessed for measles, malnutrition, anemia, HIV infection immunization, and vitamin A supplement and deworming. There were no patient's records for Group Three (Table 6).

Table 6: Comparison of quality of health care provided by health care workers in relation to their IMCI training methodology among children aged 2 to 59 months during the first visit in assessing for the main symptoms, measles, malnutrition, pallor, HIV infection, immunization, vitamin A supplementation and deworming.

Health Care Provided	IMCI Training Method: First visit (N, % and 95% CI)			P values for comparison of;		
	Group One Three day IMCI + 3day QI+SCM	Group Two dIMCI + 3 day QI+SCM	Group Three dIMCI alone	Three day IMCI + 3day QI+SCM vs dIMCI + 3 day QI+SCM	Three day IMCI + 3day QI+SCM vs dIMCI alone	dIMCI + 3 day QI+SCM vs dIMCI alone
Assessed for presence of all main symptoms (cough, diarrhea, fever, ear problem)	25.8 (18.8-34.3)	6.6 (3.3-12.6)	-	<0.001	-	-
Test for malaria if the child came with history of fever	79.8 (71.8-86.0)	92.6 (86.4-96.1)	51.4 (39.7-63.0)	0.0037	<0.001	<0.001
Correctly checked for measles	14.5 (9.3-21.9)	5.7 (2.7-11.6)	-	0.0227	-	-
Correctly assessed for malnutrition	13.7 (8.7-21.0)	4.9 (2.2-10.6)	-	0.0179	-	-
Correctly checked for palmar pallor	29.8 (22.4-38.5)	15.6 (10.1-23.2)	-	0.0076	-	-
Correctly assessed for HIV Infection	8.9 (5.0-15.4)	5.7 (2.7-11.6)	-	0.3454	-	-
Correctly checked immunization.	3.2 (1.2-8.3)	4.9 (2.2-10.6)	-	0.5099	-	-

Correctly checked for Vitamin A supplement	0.8 (0.1-5.6)	5.2 (2.3-11.1)	-	0.0565	-	-
Correctly checked for deworming	5.4 (2.4-11.5)	5.4 (2.2-12.4)	2.2 (0.3-14.6)	0.9927	0.3843	0.3944

N=Number of under-fives

At the last supportive supervision and mentorship visit, ability of HCWs to correctly check for measles, malnutrition, pallor, HIV infection, immunization, vitamin A supplementation and deworming ranged from 17%-91% for Group One health facilities, 7%-38% for Group Two and 1%-14% for Group Three health facilities ($p < 0.001$; Table 7).

Table 7: Comparison of HCW performance related to IMCI training methods among children 2-59 months during last visit in assessment

Health Care Provided	IMCI Trained Method: Last visit(N, % and 95% CI)			P values		
	Group One Three day IMCI + 3day QI+SCM	Group Two dIMCI + 3 day QI+SCM	Group Three dIMCI alone	Three day IMCI + 3day QI+SCM vs dIMCI + 3 day QI+SCM	Three day IMCI + 3day QI+SCM vs dIMCI alone	dIMCI + 3 day QI+SCM vs dIMCI alone
Assessed for presence of all main symptoms (<i>cough, diarrhea, fever, ear problem</i>)	77.6 (69.0-84.3)	51.9 (43.3-60.5)	2.5 (0.7-7.4)	<0.001	<0.001	<0.001
Test for malaria if the child came with history of fever	96.6 (91.1-98.7)	93.8 (88.0-96.9)	39.3 (31.0-48.3)	0.3188	<0.001	<0.001
Correctly checked for measles	74.1 (65.3-81.3)	41.1 (32.9-49.8)	-	<0.001	-	-
Correctly assessed for malnutrition	76.7 (68.1-83.6)	24.8 (18.1-33.0)	0.8 (0.1-5.7)	<0.001	<0.001	<0.001
Correctly checked for palmar pallor	85.3 (77.6-90.7)	34.9 (27.1-43.5)	7.4 (3.9-13.6)	<0.001	<0.001	<0.001
Correctly assessed for HIV Infection	84.5 (76.6-90.0)	29.5 (22.2-37.9)	8.2 (0.1-5.7)	<0.001	<0.001	0.0004
Correctly checked immunization.	68.1 (59.0-75.9)	15.5 (10.2-22.9)	-	<0.001	-	-
Correctly checked for Vitamin A supplement	23.9 (16.9-32.7)	9.5 (5.3-16.4)	-	0.0034	-	-
Correctly checked for deworming	34.5 (26.3-43.8)	12.5 (7.4-20.4)	-	0.0001	-	-

N=Number of under-fives

4.4 Correct Classification

After assessing for all main symptoms and other parameters, HCWs need to classify the sick child to identify correct treatment. The study found that only 39% of children were correctly classified at last visit. At first visit following training, 30% of sick children were correctly classified at Group One health facilities and 25% at Group Two and 1 % at Group Three health facilities ($p < 0.001$).

At last supportive supervision/ mentorship visit, 38.8% of sick children were correctly classified at Group One health facilities vis a vis 27.1% and 3.3% at Group Two and Three respectively, $p < 1.001$. (See table 8).

Table 8: Comparison of HCW classification of children 2-59 month by their IMCI training

Health Care Provided	IMCI Trained Method: (% Under-fives, 95% CI)			P values for comparison of;		
	Group One Three day IMCI + 3day QI+SCM	Group Two dIMCI + 3 day QI+SCM	Group Three dIMCI alone	Three day IMCI + 3day QI+SCM vs dIMCI + 3 day QI+SCM	Three day IMCI + 3day QI+SCM vs dIMCI alone	dIMCI + 3 day QI+SCM vs dIMCI alone
FIRST VISIT Correct Classifications	29.8 (22.4-38.5)	25.4 (18.4-33.9)	1.4 (0.2-9.6)	0.4374	<0.001	<0.001
LAST VISIT Correct Classifications	38.8 (30.3-48.0)	27.1 (20.1-35.5)	3.3 (1.2-8.5)	0.0520	<0.001	<0.001

4.5 Correct Management of Severe Cases

The IMCI approach can classify sick children as severe or non-severe cases, and this determines how the children will be treated. At first visit following training Group Two health facilities, 28.6% [95% CI ((5.7-72.6)] of severe case of sick children were correctly managed while 15% [95% CI (3.2-49.2)] in Group One health facilities ($p < 0.482$). There were no records for Group Three at first visit.

At the last supportive supervision 68.8% and 28.6% of severe case were correctly managed by health facilities in Group One and Three respectively ($p = 0.0041$). At first visit, 30.7% and 85.7% of very sick children were referred at health facilities in group 1 and 2 respectively $p < 0.0191$ (see table 9).

Table 9: Comparison of HCW correctly managing severe cases by IMCI training method

Health Care Provided:	IMCI Trained Method (% Under-fives, 95% CI)			P values for comparison of;		
	Group One Three day IMCI + 3day QI+SCM	Group Two dIMCI + 3 day QI+SCM	Group Three dIMCI alone	Three day IMCI + 3day QI+SCM vs dIMCI + 3 day QI+SCM	Three day IMCI + 3day QI+SCM vs dIMCI alone	dIMCI + 3 day QI+SCM vs dIMCI alone
First visit						
Severe cases correctly managed	15.4 (3.2-49.2)	28.6 (5.7-72.6)	-	0.4819	-	-
Severe cases referred	30.7 (10.7-62.2)	85.7 (34.3-98.6)	-	0.0191	-	-
Given first dose of antibiotic before referral.	23.1 (6.7-55.7)	42.9 (11.8-80.8)	-	0.3572	-	-
Given IM quinine/ artisunate before referral	61.5 (31.6-84.7)	85.7 (34.3-98.6)	-	0.2605	-	-
Given diazepam if convulsing now	25.0 (4.5-70.0)	-	-	0.0261	-	-
Last Visit						
Severe cases correctly managed	68.8 (41.3-87.3)	-	28.6 (5.9-71.8)	0.0041	0.0737	0.1546
Severe cases referred	-	50.0 (8.0-92.0)	28.6 (5.6-72.9)	0.0386	0.0053	0.4773

Given first dose of antibiotic before referral.	57.1 (18.8-88.5)	-	83.3 (28.2-98.5)	-	0.3077	-
Given IM quinine/artisunate before referral	85.7 (33.6-98.6)	50.0 (8.0-92.0)	50.0 (13.1-86.9)	0.2008	0.1643	1.0000
Given diazepam if convulsing now	-	-	66.7 (4.0-98.9)	-	-	-

4.6 Correct Management of Non Severe cases

At first visit 30.3%, 36.5% and 17.4% of non-severe cases in group 1, 2 and 3 respectively were correctly managed with no significant difference between group 1 and 2 ($p=0.3221$) while there were significance difference between group 2 and 3 ($p=0.0058$) and between group 1 and 3 ($p=0.0058$).

At last visit, 28.6%, 34.7% and 13.9% of non-severe case were correctly managed in Group One, Group Two and Group Three health facilities respectively $p=0.3221$ between Group One and Two and 0.0002 between Group Two and Three and $p=0.0076$ between Group One and Three (see table 10).

Table 10: Comparison of HCW management of non-severe cases of children 2-59 month by IMCI training method

Health Care Provided:	IMCI Training Method: (% Under-fives, 95% CI)			P values for comparison of;		
	Group One Three day IMCI + 3day QI+SCM	Group Two dIMCI + 3 day QI+SCM	Group Three dIMCI alone	Three day IMCI + 3day QI+SCM vs dIMCI + 3 day QI+SCM	Three day IMCI + 3day QI+SCM vs dIMCI alone	dIMCI + 3 day QI+SCM vs dIMCI alone
First Visit : Non severe cases correctly managed	30.3 (22.3-39.6)	36.5 (28.2-45.8)	17.4 (10.0-28.3)	0.3221	0.0540	0.0058
Last Visit: Non severe cases correctly managed	28.6 (20.7-38.0)	34.7 (26.8-43.5)	13.9 (8.7-21.6)	0.3232	0.0076	0.0002

4.7 Advice on home care, assessing and counseling on feeding

Counseling is one of the key components of under-five care as counseling on feeding may prevent severe malnutrition and severe anemia secondary. Counseling on immediately referral will also increase access to care at health facility when the child's condition worsens. The study assessed if HCWs were providing counseling on giving extra fluids, signs for when a caregiver should return immediately and when to return for follow up visit, assessment of feeding and provision of age appropriate feeding advice as recommended by IMCI guidelines.

At first visit only about 7% (7.3% from Group One and 6% from Group Two) of sick under-fives with fever had caregivers who received advice on home care ($p=0.6917$). The results were similar in other elements such as assess feeding, counsel on feeding and assess mothers own health, averaging at 6%. In Group One sick children assessed for other problems were 14.5% [95% CI (9.3-21.9)] and Group Two, 3.3% [95% CI (1.2-8.5) $p=0.0020$ (see table 11).

Table 11: Comparison of HCWs for counseling and referral on nutrition on 2-59 month children by IMCI training method

Health Care Provided:	IMCI Trained Method: % Under-fives, 95% CI)			P values for comparison of;		
	Group One Three day IMCI + 3day QI+SCM	Group Two dIMCI + 3 day QI+SCM	Group Three dIMCI alone	Three day IMCI + 3day QI+SCM vs dIMCI + 3 day QI+SCM	Three day IMCI + 3day QI+SCM vs dIMCI alone	dIMCI + 3 day QI+SCM vs dIMCI alone
First visit						
Advice on home care Instruct on giving extra fluid, continue feeding and 2 signs for when to return	7.3 (3.8-13.5)	6.0 (2.9-12.2)	-	0.6917	-	-
Assess, Counsel on feeding	8.3 (3.8-17.5)	5.3 (2.0-13.5)	-	0.4702	-	-
Assess feeding	6.1 (2.2-15.2)	5.3 (2.0-13.4)	-	0.8371	-	-
Provide advice appropriate for age and feeding problems	6.0 (2.2-15.0)	5.3 (2.0-13.4)	-	0.8543	-	-
Assess other problems	14.5 (9.3- 21.9)	3.3 (1.2-8.5)	-	0.0020	-	-
Assess mother's own health	0.8 (0.1-5.6)	1.6 (0.4-6.4)	-	0.5518	-	-
Last Visit						
Advice on home care Instruct on giving extra fluid, continue feeding and 2 signs for when to return	42.1 (33.0- 51.7)	12.9 (8.0- 20.1)	0.8 (0.1- 5.8)	<0.001	<0.001	0.0002
Assess, Counsel on feeding	24.7 (16.2- 35.6)	9.9 (5.4-17.5)	2.2 90.5- 8.5)	0.0082	<0.001	0.0277
Assess feeding	14.5 (7.7- 25.8)	10.8 (6.0- 18.5)	-	0.4788	-	-
Provide advice appropriate for age and feeding problems	16.9 (9.8- 27.6)	8.0 (4.0-15.3)	-	0.0743	-	-
Assess other problems	44.6 935.6- 54.0)	10.9 (6.6- 17.7)	20.7 (14.3- 28.9)	<0.001	0.001	0.0349
Assess mother's own health	21.1 (14.5- 29.6)	3.1 (1.2-8.1)	-	<0.001	-	-

4.8 Proportion of under-fives correctly assessed and treated using IMCI algorithm.

A child was considered correctly assessed and treated using IMCI algorithm only if all relevant elements of IMCI were correctly completed.

The difference between the first visit and last visit for supportive supervision and mentorship for Group One ($p < 0.001$) in overall compliance to IMCI guideline was statistically significant. The difference was not statistically significant for Group 2 ($p = 0.949$). It was not possible to compare Group Three as there were no data at the first visit after they received IMCI training as those health facilities were not keeping patient records. Compliance to IMCI guidelines for Group 1 was 0.8% at first visit and 14% at the last visit. For Group Two compliance to IMCI algorithm was 5.9% at first visit and 8.9% at last visit. The average score of compliance to IMCI algorithm for group 3 was 4.0% at first visit and 3.7% at last visit (Table 12).

Table 12: Comparison of HCW compliance to IMCI algorithm of children 2-29 month by IMCI training method

Health Care Provided:	IMCI Trained Method: First visit (% Under-fives, 95% CI)			P values for comparison of;		
	Group 1	Group 2	Group 3	Three day IMCI + 3day QI+SCM vs dIMCI + 3 day QI+SCM	Three day IMCI + 3day QI+SCM vs dIMCI alone	dIMCI + 3 day QI+SCM vs dIMCI alone
First visit						
Assessed correctly	0.8 (0.1-5.9)	1.7 (0.4-6.4)	-	0.5811	-	-
Average score ¹	7.9 (7.2-8.7)	5.9 (5.2-6.5)	-	<0.0001	-	-
Last visit						
Assessed correctly	14.0 (8.7-21.7)	1.6 (0.3-6.1)	-	0.0002	-	-
Average score ¹	15.0 (14.0-15.9)	8.9 (8.0-9.8)	3.7 (3.4-3.9)	<0.001	<0.001	<0.001

¹ Average score are presented as mean score with their 95 % confidence interval, the total score was 22

In addition, data were analyzed to compare level and ownership of health facilities to see whether there were differences in complying with IMCI guidelines. At first visit, the compliance to IMCI algorithm was 0.4% and 2.5% at Health Centers and dispensaries respectively ($p=0.111$), while the compliance to IMCI algorithm was 0.9% and 1.0% at public and private health facilities respectively.

At last visit, compliance to IMCI algorithm was 3% at health centers and 8% at dispensaries, Compliance at health centers improved from 0.4% to 3.1% ($p<0.003$) while compliance at dispensaries improved from 2.5% to 7.7% ($p=0.111$).

Compliance to the IMCI algorithm at first visit was 0.9% and 1.0% at public and private health facilities respectively and at last visit was 5.8% and 2.37% for public and private health facilities respectively. Compliance to IMCI algorithm at public health facilities improved from 1% to 6% at last visit ($p=0.005$) while compliance at private health facilities improved an insignificant amount from 1% to 2%, ($p=0.438$; Table 13).

Table 13: Proportion of under-fives assessed correctly according to IMCI guidelines during the first and last visit by groups, health facility type and ownership

IMCI Training Method and Health facility type	Health Care Provided:						
	1 st visit (N=318)			2 nd visit (N=391)			P value
	Total number assessed	With correct assessment	Row % (95% CI)	Total number assessed	With correct assessment	Row % (95% CI)	
Group 1	120	1	0.8 (0.1-5.8)	130	16	12.3 (7.7-19.2)	<0.001
Group 2	123	2	1.6 (0.4-6.3)	131	2	1.5 (0.4-6.0)	0.949
Group 3	75	0	-	130	0	-	-
Health facility type							
Health center	237	1	0.4 (0.1-3.0)	261	8	3.1 (1.5-6.0)	0.027

Dispensary	81	2	2.5 (0.6-9.5)	130	10	7.7 (4.2-13.8)	0.111
Health facility ownership							
Public	214	2	0.9 (0.2-3.7)	259	15	5.8 (3.5-9.4)	0.005
Private	104	1	1.0 (0.1-6.6)	132	3	2.3 (0.7-6.9)	0.438

Table 14: Proportion of under-fives assessed correctly according to IMCI guidelines during the first and last visit by groups, health facility type and ownership

IMCI Trained Method and Health facility type	Health Care Provided:			
	First visit Mean score (95 % CI)	P values	Last visit Mean score (95 % CI)	P values
Group 1	7.9 (7.2-8.6)		14.2 (13.3-15.1)	
Group 2	5.9 (5.2-6.5)		8.8 (7.9-9.7)	
Group 3	3.9 (3.6-4.2)		3.6 (3.4-3.9)	
Health facility type		<0.0001		0.0024
Health center	5.7 (5.3-6.1)		8.3 (7.6-8.9)	
Dispensary	7.8 (6.6-9.0)		10.2 (9.0-11.4)	
Health facility ownership				0.0557
Public	5.9 (5.3-6.4)		8.5 (7.7-9.3)	
Private	6.9 (6.3-7.3)		9.7 (8.8-10.7)	

4.9 Health facility conditions affecting HCW abilities to manage sick children

HCWs in selected health facilities were asked in FGDs their opinions on quality of care for sick children. HCWs mentioned that availability of equipment, medicines and supplies at the facilities are key in ensuring a child is receiving proper care and treatment. Good health seeking behavior by caretakers was suggested as another factor. One HCW said ***"If a mother rushes her child quickly to the dispensary for treatment within 24 hours of onset of fever, this child will more likely be manageable at this facility and will not result in referring the child to the hospital in contrast to being late when a mother comes with a child already in severe situation"***

The FGDs revealed that good communication facilitates quality care and treatment to children. This is achieved through improving cooperation between patient and caregivers, building trust enabling patients to be addressed treated equally and fairly by HCWs.

Quantitative analysis showed that compliance to IMCI guidelines is still low in most assessed facilities even though all were trained in IMCI. In FGDs, the following limiting factors were noted:

- Some HCWs felt providers do not follow the guideline because of work overload either because of low staffing levels or an influx of patients. In this case they prefer to treat with the aim of reducing the queue rather than providing quality care. One HCW said ***"Following each element of IMCI guideline is time consuming, meaning one will spend a significant portion of time with a single patient, while there is still a long queue of patients still waiting for you"***¹
- Other HCWs felt that this is a result of negligence of the HCWs and talked about ethical practices saying that guidelines need to be followed and it is unethical to mistreat a child just because one wants to clear out the queue. Some discussant observed that there is not enough

staff supervision and those HCWs who don't follow the guidelines are not held accountable by the health facility management or district health managers.

- Trained HCWs said that in some cases staff refused to receive peer training from staff who attended IMCI training. They demand that they too receive training from training partners.
- In health facilities with a busy patient load, it is challenging to find time for briefing other HCWs.
- Other HCWs suggested that not all staff trained on IMCI are capable of transferring the knowledge to others. One FGD participant stated: **"poor teaching from a poor trainer²"** (leaving untrained staff with less knowledge to apply IMCI guideline).
- Another key factor is that some clinicians are not prepared to show weakness or poor knowledge in front of patients by consulting the guideline. This was an issue raised in Ukune HC in Kahama DC, Shinyanga Region.

The FGDs revealed that most HCWs have good knowledge on the advantages of using IMCI guidelines in managing children with fever. Examples shared during the discussions include:

- **"The IMCI guideline reminds one of the steps to follow for treatment i.e. guides one to treat children according to the steps/ processes, preventing misdiagnosis; by following the guidelines, you will be able to reach a diagnosis of the complaints and treat the child accordingly"**³.
- **"If one does not use the guidelines, one won't give correct treatment for one may have forgotten having not studied in a long time"**⁴
- **"Helps the HCW to remember to check all symptoms by asking questions about the child's problems, and not just waiting to hear only from mother's complaints; It allows correct treatment to be given to the child and be given timely, e.g. correct diagnosis of medication/ prescription. In a nutshell following the guidelines allows you to treat a child well"**⁵
- **"To be certain of a child's status from symptoms observed so as to treat accordingly, e.g. knowing a child is dehydrated, vomiting and has diarrhea, and provide ORS and telling the mother to breastfeed. There are many advantages. Following the guidelines mean you will diagnosis and treat even better."**⁶

This summary indicates that HCWs are aware of the importance of using IMCI guidelines even though most are still not using it for reason discussed previously.

4.9 Effects of Supply Chain Management and Quality Improvement training in Improving Compliance to IMCI guideline

4.9.1 Effects of Supply Chain Management

This study sought to know whether including SCM in the training package contributed to improving case management for under-fives with fever. At least two HCWs at each facility in Groups One and Two trained on SCM. The HCWs shared their perceptions of improvement after the training indicating that it was useful in reducing stock-out of medicines and supplies, especially for essential items for children. A staff member from Natta HC said "***we did not know how to properly order medicine. This training helps us to fill R&R properly based on the need of the facility and on the availability at MSD, and to place orders on time. We have also started using CHF when in need after seeking permission from facility health committee. This has helped us not to run out of stock as frequently as it was happening before the training***".

This was repeated by HCWs at Nyabange KMT Dispensary who said training SCM has:

- a) Helped in daily monitoring of essential medicine stocks and supplies
- b) Helped in ensuring proper dispensing of medicines by getting out drugs that were stocked first and subsequently dispensing those which were stocked last (FIFO- First In and First Out) so as not to have medicines expiring

Participants said that before training health facilities experienced stock out of medicines, used medicines until they ran out without noticing their usage and needed to be reminded. However, the introduction of a daily stock out monitoring form after the training has improved monitoring, ordering and purchasing of stocks when funds are available.

A staff member Ibwera Dispensary said "***In this facility the Clinical Officer and one nurse received this training. I think it must have been useful, I am not sure of what my colleagues studied, but I have observed some improvements. For example in the past, Alu (Dawa ya Mseto⁷) supply was low but after the training we are now maintaining good stock. We request medicines on time, every three months through R&R forms, receive reminders to monitor medicines in store and count physically, I think this has made a difference***".

FGDs with HCWs at Ukene and Bukundi HCs showed that facilities in Group Three (trained on dIMCI alone) had some of its staff trained in SCM from other partners. They acknowledged this training was useful. Staff from Bukundi HC said that before training, medicines and supplies arrived late or were delayed due incorrect requests. They claimed they now can record and identify/recognize medicines and supply needs and order timely.

The above discussion indicates the need for supply chain management training of HCWs to reduce unnecessary stock-outs of essential medicines and supplies.

4.9.2 Experience in Quality Improvement Training

THP interventions included training in quality improvement (QI) integrated in IMCI training. In QI training, health facilities had opportunities to identify improvement objectives and performance indicators, discuss areas in the system that were problematic, propose solutions, test changes implemented and measure improvements through generation and evaluation of run charts on a monthly or quarterly basis while documenting gains and challenges.

HCWs were interviewed in FGDs to understand their perspectives on QI initiatives in improving care and treatment of under- fives with fever. At Natta HC, one HCW said he thought the training has contributed to improvement because initially staff worked individually but after Quality Improvement (QI) training health facilities formed Pediatric Quality Improvement Teams (PQIT). They started monthly meetings and advised each other on how to improve services and on team work. He added ***"few staff (2) were trained in QI, these trained others when they came back, we improved our services to reduce waiting time by prioritizing under-fives for care by having a designated room only for under-fives. Also, instead of sending under-fives to laboratory for testing, a mother could come with her child and be attended to by a clinician/nurse and be tested using mRDT in the consultation room and receive results without going to the lab"***.

Similar approaches described above were also implemented at Nyabange KMT Dispensary and Ibwera Dispensary even though there were slight differences. For instance, Nyabange planned for quarterly instead of monthly meetings, they bought a file and kept records of their meetings in the file and assigned roles. Staff from all facilities had a strong feeling that the improvements they have seen were as a result of these changes that they respectively introduced into their operation system. One notable improvement was retention of exercise books at the facility or purchasing of OPD cards to retain patient records at the facility; this helped the HCWs to assess themselves through weekly case reviews and identified areas for improvement.

Moreover, the discussions also indicated that most health facilities were not performing triaging but they stated doing it after receiving QI training.

4.10 Effects of supportive supervision and mentorship in improving care for U5s with fever for trained HCWs

One key intervention was strengthening supportive supervision and mentorship visits to health facilities. These were planned and implemented collaboratively. Focus groups discussed the merit of such interventions in improving care and treatment. They were first asked to share their understanding of the term "supportive supervision" and how it differed from other supervision. All focus groups mentioned that supportive supervision is more friendly and more of learning-by-doing rather than a one-way instruction process. The HCWs said they were more comfortable learning on-the-job and were not afraid of asking for clarifications⁸.

In Natta HC, one staff said ***"Supportive Supervision and Mentorship (SS&M) meetings provide feedback to improve changes in treating children so that the PQIT can address them and make changes and remind one another of what to do. These regular SS&M visits have contributed to not only change in behavior of HCWs but also the performance of the health facility as well"***. She added that during SS&M, HCWs are evaluated and given feedback. Third party feedback has a strong impact as most found it difficult to identify their own team's problems. These SS&M visits helped to keep HCWs up to date and motivated them to follow the guidelines. Those initially reluctant to changes their approach changed over time due to fear of embarrassment for not doing their work properly even after receiving feedback several times.

Other HCWs said mentorship (being shown how diagnosis and treatment can be improved) was more effective in changing HCWs' behaviors. One staff at Nyabange KMT said ***"SS&M builds one's ability, how to perform mRDT testing versus BS, reminds a HCW of what he/she was***

trained on and helps him/ her in their work. This causes the HCW to prepare ahead and since it is done in a friendly way it creates openness in explaining things". In addition, a PQIT member from Ibwera Dispensary said **"SS&M visits helped us to become aware of following up with patients after treatment, provide counseling; we have separate files for patients (i.e. adults and children); currently under-fives patients files/ exercise books are retained in the health facility (this was not done in the past); retaining files helps follow up on records e.g. patient's history, avoids potential loss of patients records; prevents misuse of patient information".**

Kashozi HC staff also suggested that SS&M visits have been very helpful in improving care and treatment of under-fives with fever. They explained that before THP started supportive supervision and mentorship, their facility had their patient cards only with information on main complaints and examinations. They were not looking at other things such as neck stiffness, dehydration, yellow palms, etc. But after the SS&M visits started, HCWs started to look at a patient (together with a mentor), received support from supervisors visiting the team and instructing them on correct assessment and documentation following IMCI guidelines. The facility had never had a diarrhea treatment corner nor an emergency tray, but through supportive supervision they were facilitated to establish them. These innovations had a positive impact on improving care and treatment to under-fives.

FDGs with HCWs from facilities that were not supported by THP (Ukune HC in Kahama DC and Bukundi HC in Meatu DC) said they did not receive any supportive supervision for improving care and treatment of under-fives. They received supervision on HIV care and treatment from another partner and mentioned it was similar to the THP training model with mentorship provided at their respective Care and Treatment Centers (CTCs). They were asked by a facilitator why innovations at CTCs were not transferred to other routine care services. A staff member Ukune HC responded **"One believes it is due to poor infrastructure which does not allow such; patients refuse to leave their files at the facility especially if they bought them themselves with their own money".** A respondent from Bukundi HC said, **"This is a good idea, we will sit in our team and see how we can improve under-fives care"**

Health facilities that did not receiving supportive supervision and mentorship visits had either no patient records or very poor patient data. During field work for this assessment, additional facilities had to be visited to get sufficient records for the assessment. However, there were no records as shown in table 15 below.

Table 15: Health facilities visited for assessment

S/ N		Facility name	Ownership	Intervention/ Control	Number of records Planned	Number of records reviewed	Comment
1	Mara Region	Nata H/C	Public	Intervention	80	88	Done
2		Nyakitono Dispensary	Public	Intervention	40	41	Done
3		KMT Nyabange	Private	Intervention	40	45	Done
4		Kiabakari HC	Private	Intervention	80	86	Done
5	Shinyanga Region	Kagongwa Dispensary	Public	Control	40	41	Done
6		Ukune HC	Public	Control	80	23	No enough records
7		Mpera HC	Private	Control	80	0	No one trained
8		Mbulu Disp	Private	Control	40	0	No one trained

9	Kagera Region	Kanazi HC	Public	Intervention	80	93	Done
10		Ibwera Dispensary	Public	Intervention	40	47	Done
11		Kashozi HC	Private	Intervention	80	76	Done
12		Rwamulumba Disp	Private	Intervention	40	0	Facility owned by Military (Tanzania Prison)
1	Shinyanga Region	Zongomela Disp	Public	Control	40	0	No records
2		Sangilwa Dispensary	Public	Control	40	0	No records
3		Mwime Dispensary	Public	Control	40	0	No records
4		Nyambula Dispensary	Public	Control	40	0	No records
5		Lowa HC	Private		40	0	No one trained
6		Kagera salient Dispensary	Private	Intervention	40	40	
7	Simiyu Region	Mwandoya HC	Public	Control	80	0	No records
8		Isengwa Disp	Private	Control	40	0	No records
9		Mwamanongu Disp	Public	Control	40	0	No records
10		Bukundi HC	Public	Control	80	141	Oversampled to cover missing values

5. DISCUSSION

The study assessed the effectiveness of three IMCI training methods, two used by THP and the third one widely used by the MoHSW to improve case management to reduce deaths in children under five. The study looked at the performance of trained HCWs by reviewing case notes of children under five to determine if compliance to IMCI guidelines was achieved. This study has a variety of strengths. First, it considered the use of a relatively large sample of records of under-fives from three study groups which led to increased power of the study. Second, the use of experienced clinicians made it possible to assess performance of health care providers in the diagnosis, classification and treatment of under-fives with fever objectively.

The male to female ratio of study children was 1:1 and most children were infants up to 12 month. Only 5% of records were of children aged 0 to 2 months. Records of neonates were difficult to find because neonate information is kept in mother's health facility records. The MoHSW needs to set a policy on how this problem could be handled to ease monitoring of the newborn health problems during follow up clinics. This is most important now that Tanzania is embarking on reducing neonatal mortality which contribute significantly to infant and under five mortality according to the recent Tanzania demographic health survey ¹.

The third training option was assessed in Shinyanga and Simiyu regions where the MoHSW dIMCI training was conducted in collaboration with AGPAHI (Group Three). Most health facilities visited in these regions had no patient records. Records were missing even at the level of health center where patients are admitted. Therefore, nine trained health facilities were visited (instead of sampled four health facilities) to get the required sample for the assessment. This is an area which also requires a policy change in order to make it easy to monitor the quality of treatment provided by HCWs by keeping patient information records/files at respective healthy facilities.

Although IMCI implementation improved the quality of care provided by health care workers (HCWs), was cost effective and lowered under-five mortality by 13% observed in the multicounty evaluation², follow up studies of HCWs after training showed that compliance to guidelines was not satisfactory^{3,4,5,6,7}. This study made a similar observation but noted improvement following regular supportive supervision in Group One and Two health facilities.

Earlier studies recommend looking for shorter alternative course options due to the impracticability of implementation the 11 day standard courses .^{8 9 10 11} Although Rowe et al¹¹ found health care workers trained on a standard 11 day course performing better than shorter courses in a systematic review, other studies found no significant difference between the two groups ^{8,9,10}.

At the start of THP in the Lake Zone, Tanzania had not adopted any shorter IMCI training approach. IMCI had not been fully scaled up. Therefore, THP used a six day training approach utilizing the 11 day course materials for 3 day IMCI training combining it with 3days of QI and SCM. QI and SCM trainings were included to enable QITs to respond to health system strengthening issues that affect case management. These two approaches were strengthened by regular monthly supportive supervision and mentorship visits to targeted health facilities. This innovative approach has been shown to be effective in this study where Group One Health facilities performed better than the other groups partly because of having more supportive supervision visits. HCWs seemed to have understood the 11days training materials very well although they were introduced to them for only 3 days. In a systematic review by Leung et al reported better performance in HCWs who reported greater supervision¹⁶. In the absence of supportive supervision absolute level of health care performance was often found to be poor, less than 50% in Uganda (Pariyo) ¹⁴ and 16% in Peru (Huicho)⁹. Goga et al recommended linking

follow up after Integrated Case Management Training with routine Primary Health Care supervision¹⁷

Following the MoHSW approval and availing of dIMCI guidelines, the 11 day training materials were replaced by the dIMCI guidelines. THP strengthened these two approaches by including monthly supportive supervision and mentorship visits to target health facilities. In this study these two approaches were compared individually and with the MOHSW approach which does not provide QI and SCM training. The good practices of keeping patients records spread to the non THP health facilities making it possible to find some records at the last visit in Group Three health facilities. The study observed that regardless of the duration of training and the available IMCI training materials (11 day standard materials vis a vis dIMCI materials), trained HCWs were found not to have changed appreciably the case management practices when visited at 4-6 weeks following classroom training. The results of this study emphasizes the importance of early follow up supportive supervision after classroom training.

In order to assess HCWs performance earlier studies used direct observation method (observing the trained HCW manage a sick child). The MoHSW is using this approach as well. However THP attempted to use this approach at the start of the Program but abandoned it because at 4-6 weeks follow up after training, THP could only find 50% or less HCWs at the working station and oftentimes with fewer or no patients available for assessment. Therefore THP chose to improve record keeping and started to use case reviews from patient records. In this study, case reviews could not be applied in Group Three health facilities at the beginning because patient's records were not kept at health facilities and therefore performance of HCW trained with the third option was not available for comparison with the other training options. In this regard case reviews offer an alternative health care performance assessment method as far as case management is concerned where and when health care workers/patients are not available for assessment by direct observation methods.

The study made observations on health care workers performance to compliance on various steps of the IMCI algorithm:

5.1 Assessing for General Danger Signs

The HCWs in Group One assessed for the general danger signs better than HCWs in Group Two and Three at first visit following training and at last visit of supportive supervision. Both Group One and Two significantly improved from their respective first visits of SS&M but findings showing that Group One was significantly better (averaging 89% of correct assessment) in the last SS&M visit as compared to Group Two (averaging 40% of correct assessment). This might be due to health facilities in Group One receiving a consistent number of monthly SS&M visits for over two years while health facilities in Group Two received monthly SS&M visits for eight months by the time of the last visit. MoHSW provides quarterly supportive supervision which is often irregular and this might contribute to poor performance observed in Group Three healthy facilities. Poor performance in this area often leads to inadequate referral of severely sick children. Although baseline status was not available, the study showed that at first visit less than 50% of the severely sick children were actually referred. This level improved with subsequent supportive supervision

5.2 Assessing for 4 Main Symptoms

Children were not generally assessed for all main symptoms before and immediately following training. However, at first visit, health facilities in Group One were significantly better than Group Two in assessing for presence of all main symptoms (cough, diarrhea, fever, ear problem). Better performance consistently observed in Group One health facilities implies that health care workers understood very well the 11 day IMCI training materials offered during the three day training.

Significant improvement was consistently observed following subsequent supportive supervision/mentorship visits with Group One having 77.6%, Group Two, 51.9% and Group Three, 2.5% of under-five assessed for the main symptoms respectively. Diffusion of best practices i.e. keeping patient records, appear to have diffused to some health facilities in Group Three making patient records available for assessment at last supervision/mentorship visit.

5.3 Assessing for *measles*, *malnutrition*, *anemia*, HIV infection immunization, vitamin A supplement and deworming

At first visit, in both Group One and Two, all children were poorly assessed for *measles*, *malnutrition*, *anemia*, HIV infection, immunization, vitamin A supplementation and deworming. There was no statistically significant difference between Group One and Two in assessment for HIV infection, immunization, vitamin A supplementation and deworming both at first and last visit. This indicates that more work is needed in this area. In FGDs HCWs said the algorithm is too long to get through especially when confronted by a large patients volume.

Health facilities from the third group that received dIMCI alone (with small numbers of records) lagged behind in almost all analyzed parameters. This is still the case even when compared with Group Two who received almost similar training method except that this group also received QI+SCM in addition to SS&M visits at least six times. This shows clearly that HCWs training in classroom alone is not effective in improving case management at the facility level as previously observed by Pariyo et al in Uganda.¹³ Children under five with fever were more likely to receive correct assessment for presence of all main symptoms from health facilities whose health care providers received a significant number of supportive supervision and mentorship visits.

5.4 Correct Classification

Classification of patient's illnesses was not correctly done in all the groups, however Group One performed best. All the groups performed better at the last supportive supervision/mentorship visit. Poor performance in this area often leads to incorrect treatment and it is due to incomplete assessment through the whole algorithm.

5.5 Correct Management of Severe and Non Severe cases

Only 15% and 28% of Group One and Two patients respectively were correctly managed at first supervision visit and this improved to 68% of children (Group 1) at the last supervision visit demonstrating the importance of supportive supervision and mentorship. There was no statistically significant difference in managing severe cases between the facilities from group 1 and 2 just after training ($p=0.3221$). This implies that health care workers in the 2 groups acquired as much knowledge and skills at the end of training regardless of the different training materials used. However at last visit Group One with more supervision/mentorship visit was better than the other two groups as indicated in table 9 below. The statistically observed difference in management of cases observed between Group Two and Three who were trained with dIMCI materials could be a result of inadequate supportive supervision visits in Group three health facilities ($p= 0.322$).

5.6 Advice on home care and assessing and counselling on feeding

At first visit about 7% (7.3% from group 1 and 6% from Group Two; $p = 0.692$) of sick under-fives with fever had caregivers who received advice on home care. Similar findings were observed in other elements such as assessing feeding, counselling on feeding and assessing mothers own health, averaging at 6% with no statistical significant difference between the training approaches. However, more children were assessed for other problems in Group One at 14.5% [95% CI (9.3-21.9)] as compared to Group Two at 3.3% [95% CI (1.2-8.5)] and $p=0.0020$. Classroom training alone in all the approaches did not seem to influence performance which was subsequently

observed following supportive supervision and mentorship visits. Whereas Group One improved six times Group Two only doubled the improvement between the first and last visit respectively which further demonstrates the importance of having regular supportive supervision.

5.7 Proportion of under-fives correctly assessed and treated using IMCI algorithm.

In this study a child was considered correctly assessed and treated using IMCI algorithm only if all relevant steps of IMCI were correctly completed. Group One which showed best compliance to IMCI compared to other two groups had an average of 14% [95% CI (8.7-21.7)] of under-fives with fever correctly managed according to IMCI guideline in the last visit, with Group 2 and 3 averaging at 1.6% and 0% respectively in the last visit. Initially, Group One and Two were averaging at 1% respectively at the first visit after IMCI training with Group Three remaining unchanged at 0%. HCWs do not sufficiently comply to IMCI guidelines even after undergoing training regardless of training method for several reasons, and this have been observed in previous studies in counties implementing IMCI which emphasizes the importance of supportive and mentorship visit following training.^{3,4,5,6,7}

From qualitative analysis, factors affecting IMCI compliance were similar to what was observed in earlier studies (demotivated HCWs, weak health systems; lack of medicines and supplies; inadequate supportive supervision; weak leadership and management insufficient HCWs; and inappropriate transfer of trained HCWs). Focusing on retention of trained HCWs, promoting job satisfaction, developing policies that encouraged knowledge sharing and skills with other health care workers, provision of easy to use job aids with sources of information accessible to cell phones might be affordable ways of addressing this problem. Mitchel et al demonstrated that applying IMCI on a mobile phone worked better for HCWs than paper based IMCI algorithm and improved compliance¹⁹. Funding was not available for THP to implement mobile phone technology.

This study also observed that IMCI algorithm compliance was better at dispensaries than health centers, 2.5% (Dispensaries) to 0.4% (Health Centers) in the first visit. Sick children were twice as likely to receive management according to IMCI guidelines at dispensaries as at health centers. Similarly, public health facilities complied with IMCI guidelines better than private health facilities ($p < 0.0557$). Health facilities with more trained professionals were the worst-performing health facilities. This has also been observed by Cabana¹⁴ and Zurovac et al. in Kenya²². Trained professionals seem to think IMCI is oversimplifying the case management process and therefore likely to mismanage or under look coexisting non IMCI conditions. In this study during qualitative analysis, trained professionals were reluctant to consult guidelines while managing children thinking they will be is taken by Care takers as not to be knowledgeable of what they are doing.

5.8 Health facility conditions affecting health care worker abilities to manage sick children

The study observed the FGDs and in-depth interviews factors that have been reported in earlier studies. In order to address factors affecting compliance to case management, the MoHSW should focus on retention of trained HCWs, promoting job satisfaction, developing policies that encourage easily sharing of knowledge and skills with other health care workers, provision of easy to use job aids with sources of information accessible to cell phones.

5.9 Effects of Supply Chain Management

Most HCWs interviewed or participating in FGDs from Group One and Two health facilities said their training was useful in reducing stock-out of medicines and supplies especially for essential items for children. Moreover, the introduction of a daily stock out monitoring form after the training has been of great help, reminding staff to monitor and order or purchase stocks when money was available.

5.10 Impact of Quality Improvement Training

Following QI training health facilities had the opportunity to identify improvement objectives and performance indicators, discuss areas in the system that are problematic, propose solutions, taste changes implemented and measure improvements using run charts monthly or quarterly while documenting gains and challenges.

HCWs interviewed said they observed a number of process reorganizations as part of health system strengthening following formation of PQITs. They attributed improvements observed to the QI training and skills building received during the monthly supportive supervision and mentorship visits.

5.11 Effects of supportive supervision and mentorship in improving care for U5s with fever for trained HCWs

In all FGDs, HCWs mentioned that supportive supervision was friendlier and was more of learning by doing rather than one-way instructions to HCWs that was commonly practiced before THP. They considered SS&M visits to be keeping HCWs up to date knowing they will be visited and will be assessed. This motivated them to follow the guidelines. Even those who were reluctant to change, over time started changing as they felt embarrassed for not doing their work properly even after receiving feedback several times. They admitted to have seen innovations that had a positive impact on improving care and treatment to under-fives.

Health facilities not receiving supportive supervision and mentorship visits had either no patient records or very poor patient data. During field work for this assessment, more facilities had to be visited to get sufficient records for the assessment but there were no records.

6. CONCLUSION AND RECOMMENDATION

This study has shown clearly that HCWs training in classroom alone was not effective in bringing improvement in case management at the facility level. Under-fives with fever were more likely to receive correct assessment for presence of all main symptoms from health facilities whose health care providers received a significant number of supportive supervision and mentorship visits regardless of the training method and duration. Providing QI and SCM training to HCWs helps reorganize the health facility structures and improve availability of medicines and supplies that contributes to health system strengthening.

Focusing on retention of trained HCWs, promoting job satisfaction, developing policies that encourage sharing of knowledge and skills with other health care workers, provision of easy-to-use job aids with sources of information accessible to cell phones might be affordable ways of addressing poor compliance to case management guidelines.

Availability of patients' records at health facility will help follow up patients' clinical condition and make it possible to track HCW performance targeting quality care.

There is a need to have separate newborn health care information from maternal records to be able to track newborn care more easily.

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