


**Research Article**

## Evaluation of two Distance Learning Integrated Management of Childhood Illnesses (IMCI) Training Models: Implementation Research in Uganda

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### Abstract

**Background:** Uganda adopted the Integrated Management of Childhood Illness (IMCI) Strategy in 1995 as one of the key strategies for reducing mortality and morbidity in children less than five years of age, however, IMCI faced various challenges including high costs. To address the challenges, the Ministry of Health of Uganda undertook a decision to explore two alternative IMCI distance learning models between 2017 and 2018. To assess the process, outcomes and cost of two alternative IMCI distance-learning models i.e., the WHO generic Distance Learning (DL) and Short, Interrupted Course (SIC), an evaluation was undertaken in order to guide the roll out of IMCI training. This paper describes the results of the evaluation of the implementation research.

**Methods:** We used multiple approaches: (i) Desk Review (ii) Key Informant Interviews and Focus Group Discussions (iii) Observation of case management and health facility support for both DL and SIC models. We conducted a desk review which included extracting data on cost of training, as well as data on health care provider knowledge before, during and at the end of the course and 18 months later. Direct observations of health care providers (HCPs) managing sick children were conducted 18 months after the courses to determine knowledge retention. We compared performance of HCP trained using these alternative approaches with the performance of HCP using the standard 11-day IMCI course in Tanzania.

**Results:** Both DL and SIC were implemented in 2 districts each and had high and similar skills retention 18 months later. The average skills score changed from 74% to 71% ( $p=0.6545$ ) in DL and from 72% to 73% ( $p=0.8841$ ) in SIC at 18 months after initial training. After adjusting for gender and professional cadre, participants in SIC had a 0.44 %: 95% CI (-8.0,8.9) higher score compared to DL participants, but this was not statistically significant. The programmatic and government cost of training per HCP was cheaper by 40% for DL compared to SIC across all levels of health care delivery.

**Conclusion:** DL and SIC were successfully used to build skills and knowledge of HCPs at the end of the course and participants showed significant knowledge retention 18 months later. These two models could be harnessed in scaling up IMCI training for all cadres of HCPs in the country.

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## What is already known

- IMCI has been shown to contribute to reductions in child mortality in countries.
- IMCI is based on 11-day skills-based training course which has been found to be too expensive for countries to scale up.
- Countries have been looking for alternative feasible and less costly training models.

## What this study added

- Distance learning approaches of IMCI training improved knowledge immediately after the course and skills 18 retained months after the course.
- Both models of IMCI approaches had high acceptance by HCPs and their managers.
- Both approaches have the potential for building capacity and sustaining clinical performance of HCPs, however, DL has the potential for sustainability because of its lower cost, less disruption of service provision.

## Background

The Integrated Management of Childhood Illnesses (IMCI) is a strategy that was developed by the World Health Organization (WHO) and UNICEF in 1995 with the aim of reducing mortality and morbidity associated with the common causes of childhood illnesses [1-3]. IMCI has 3 components: improving HCP skills, the health system and community practice [1-3]. IMCI has been shown to contribute to reductions in child mortality as shown by a Cochrane review which found the strategy to be associated with a 15% reduction in child mortality when activities were implemented in health facilities and communities [4]. IMCI has been implemented in more than 100 Low and Middle Income Countries (LMIC) [3].

Uganda is a LMIC located in eastern Africa. Uganda has a population of 45 million (2020 estimate) with an under-five mortality rate of 43 per 1000 livebirths and an infant mortality rate of 33 per 1000 livebirths [5-6]. Uganda adopted IMCI in 1995 as one of the key strategies for reducing mortality in children less than five years of age. The initial impact of this strategy was impressive as Uganda realized a reduction in childhood mortality [5-6]. However, implementation of IMCI has been facing challenges. One of the main challenges of IMCI implementation has been high cost and long duration associated with in-service training. Uganda implemented the 11-day IMCI course from 1995 to 2002 and from 2002 onwards, it implemented the 6-day IMCI course. Even with the latter change, the course was found long and expensive. Long duration of training resulted in prolonged absence of HCPs from their duty stations (causing critical shortage at

health facilities) resulting in negative health consequences [7-8]. Additionally, there was inadequate follow-up after training and supervision of HCP trained, limiting the impact of the training on overall quality of care [9].

To address these challenges, the Ministry of Health of Uganda (MOH) with support from partners initiated a series of consultations with stakeholders through the national IMCI technical working group and conducted a rapid needs assessment in the four districts targeted for implementation. Several options of delivering IMCI training were discussed among which included 6-day abridged course, the WHO generic distance learning (DL) and a slightly adapted and shortened version of DL called the Short-Interrupted Course (SIC). Although the national IMCI Technical Working Group (TWG) had learnt from the successful experience of implementing DL in Tanzania which is a neighboring country with similar socioeconomic status and health system [10-11], the TWG decided to evaluate both DL and SIC in Ugandan settings in 4 districts in 2017 and 2018.

While the standard IMCI is a face-to-face training over a period of 11 consecutive days and a 6-day abridged face to face course introduced since 2002, the two alternative training models to be evaluated were:

- DL: Three 1-day face-to-face facilitator- led learning sessions; with 4 and 6 weeks of self-study in between the face-to-face sessions and
- SIC: Two face-to-face facilitator- led sessions; first: 2.5 days, second 1.5 days; 2 weeks of self-study in between the face-to-face sessions, as illustrated in Figure 1.

This paper describes the results of the evaluation of the two alternative IMCI distance-learning models to guide scaling up of IMCI training in Uganda.

## Methods

### Study settings

#### Implementation of DL and SIC training models

Four districts were purposefully selected: 2 in the east central and 2 in southwestern region of Uganda to represent the country geographically. One district in each region (Kaliro in the eastern region and Sheema in the southwest Region) was purposefully assigned to the DL model while the other districts (Luuka in eastern region and Ntungamo in the southwest region) were assigned to the SIC model. Health facilities at all levels (i.e. health centre II, health centre III, health centre IV and the district hospital), both public health facilities and private not for profit facilities were included. There are 4 levels of health centre in Uganda: Level 1 represents the Village Health Team, level II has outpatient care, antenatal care, immunization and outreach services, level III has , in addition, inpatient care and environmental

health while level IV also has surgery and blood transfusion.

District master trainers who underwent a 6-day basic IMCI training followed by a 4- day IMCI facilitation skills course were selected to facilitate the courses as well as mentor the trained HCPs. At each of the health facility, HCPs involved in the clinical management of children under five in outpatient clinics were selected for the training. The first cohort of Trainees were purposively selected to include health facility managers, who in addition to getting the clinical IMCI training, also received orientation on their roles in facilitating service delivery for under-five children. Trainings of HCPs were scheduled to achieve rapid scale-up while minimizing service disruption. A series of consecutive face-to-face sessions were conducted over a two-week period in each district. Each session had only one HCP from any health facility and a maximum of 24 HCPs so that the clinical services were not compromised.

Whereas in the DL model learning using reading self-learning modules and clinical practice was the focus, in the SIC model the self-study period had no modules to study, but the participants mainly focused on learning knowledge and skills acquired during the face-to-face sessions.

The support that the participants received in both models was through a variety of means including WhatsApp groups with peers from other health facilities and with trainers, as well as with mentors by district trainers. The WhatsApp groups were administered by the District MCH focal person and were used by the trainers to send reminder messages to HCPs as well as share pictures and videos of common cases of childhood illnesses.

The self-study period in both models was augmented with onsite support and mentorship. District mentors visited each health facility for a day once during the self-study period. During the visit to each health facility, the district mentors reviewed progress made by the HCPs on the learning materials, assessed case management skills through observation of HCPs while managing child patients, reviewed records, and used review and assessment findings to provide targeted support for the individual HCP and the health facility.

### Study design

Both quantitative and qualitative data analysis was conducted. We describe the quantitative methods first.

### Quantitative methods

We conducted multiple methods evaluation: a pre-post training course evaluation of knowledge; direct clinical observation of skills, and cost analysis. A pre-post training survey was done using standard WHO tools for each training course [12] and reported by the course directors; these data

were extracted from Ministry Reports. An assessment of skills was conducted at the end of the training course and at follow-up 18 months after the course as well as the costs incurred for each training course [SUPPLEMENT file 1]. The quantitative findings of the extracted data were used to compare the DL with the SIC models.

Direct clinical observation of cases was done using experienced national IMCI trainers/facilitators using Ugandan adapted IMCI observation checklist (SUPPLEMENT File 1), which is based on the WHO Health Facility Survey (HFS) tool [13]. Comparison of DL model with SIC model was done using these indicators. However, comparison of these indicators for DL and SIC models against the standard 11-day IMCI was not done because there was no data in Uganda, instead, we compared them with a similar data from Tanzania that used the same WHO HFS method [11]. Tanzania is the immediate neighboring country of Uganda with similar population, socio-economic status and health system.

### Sample selection

All 4 districts were purposefully selected mostly based on ensuring geographic representation of the country. Districts were randomly assigned either to DL or SIC. Within each district, the selection of health facilities involved generating a list of all health facilities with HCPs trained in either DL or SIC. According to the WHO HFS tool, the minimum number of facilities that can be visited in each sampling area is between 25 and 35 [13]. We decided to include at least 25 health facilities but as many HCPs trained as possible for the evaluation.

At the selected health facilities, HCPs who had previously been trained in IMCI using either DL or SIC were identified and asked to assess and manage sick children or sick young infants. All HCPs who were available on the day of the assessment were observed while managing the children. In order to avoid creating undue pressure on the HCPs while being observed, a briefing about the process was explained to each of them before the observation and feedback was given at the end.

### Data analysis

Analysis of scores of standardized tests on knowledge before the course (pre-course), in the middle of the course (mid-course) and at the end of the course (post-course) as well as assessment of skills at the end of the course and at follow-up 18 months after the course was performed using Stata version 14.0 (Stata Corp; College Station, TX, USA), comparing DL with SIC groups. We presented categorical variables describing study participants as proportions and compared them using the chi squared or Fischer's exact tests as appropriate. We described continuous variables as means with their standard deviations (SD) and compared them using

the student t-tests or Mann-Whitney U tests as appropriate. In addition, we used Cohen's D, and knowledge difference to assess the change in knowledge by the different training methods at bivariable analysis.

### Cost analysis

To estimate the cost of training for each HCP trained in DL and SIC, the following data sources were used: MOH and partners direct activity costs (Monthly voucher review of all individual program expenditures), monthly time tracking sheet submitted by each member of the child health team with detailed activity descriptions, salary estimates using Ministry of Public Service FY2018-19 public salary schedule, including pension.

### Qualitative methods

We conducted key informant interviews and focus group discussions. Key informant interviews included policymakers at Ministry Of Health (MOH) headquarters, partners, and national IMCI trainers. Key informant interviews were also carried out with district facilitators and national facilitators, with officials at the regional level involving those planning child health / IMCI, district health officers, health facility in-charges, national IMCI trainers /facilitators, district / regional IMCI mentors and key partners involved in IMCI implementation in the districts as well as IMCI-trained HCPs from each district.

Focus group discussions were carried out in the four districts where HCPs trained using DL and SIC models were engaged. Trained HCP were brought together and had FGD facilitated by a medical anthropologist (AS) using a probing questionnaire list (Supplement File 3). The same activity was repeated in each district.

The qualitative data was analyzed using thematic content analysis. The anthropologist (AS) listened to the recorded tape of the Focused Group Discussions (FGD) as well as key informant interviews (KII) and got the records transcribed. AS read the transcribed text repeatedly and identified interesting and useful themes that emerged from both the FGD and the KIIs. The data was analyzed using Atlas Ti 8. Themes generated and described included facilitating factors that helped HCPs learn better and barriers that needed to be improved in subsequent courses for both DL and SIC. More information is available in SUPPLEMENT file 2.

### Ethical consideration

The study was nested within the activities of the Ministry of Health which planned and steered the implementation of the piloting of the two models of IMCI training. Data on cost, pre-, mid—and post-course knowledge scores of participants were obtained from the Ministry of health as this was part of the MOH program activities. For all qualitative interviews

written consent was obtained from the participants. For the clinical observations of HCP, informed verbal consent was obtained from parents or legal guardians. The evaluation was approved by MOH (approval letter no ADM 143/01/2022).

### Patient and Public Involvement statement

This was implementation research. There were no minors involved. For all qualitative interviews written consent was obtained from the participants. For the clinical observations of HCP, verbal consent was obtained from parents or legal guardians.

## Results

### Quantitative data

DL was implemented in 2 districts, in 53 health facilities (out of 65 health facilities) and 235 HCPs were trained and mentored (out of 369 eligible participants). SIC was implemented in 2 districts, in 78 health facilities (out of 86), and 172 HCPs were trained and mentored (out of 484 eligible participants). A total of 211/235 (90%) DL and 163/172 (95%) SIC participants successfully completed the training. The 18-month follow-up skills assessment as part of the evaluation was conducted in all 4 districts, in 53 health facilities, and involving 115 HCPs. Detailed district, health facility and participants characteristics are presented in Table 1.

### Knowledge and skills acquisition

There was substantial gain in knowledge by the participants as measured by the difference in scores at pre-course and post-course in both DL (33.2%) and in SIC (33.0%) but there was no statistically significant difference between the two models. Skills gained by participants trained by DL was similar to that gained by those trained by SIC model at the end of the courses (Table 2).

### Retention of knowledge and skills at 18 months

Both DL and SIC had high and similar skills retention 18 months later. HCPs in SIC and DL were compared for IMCI indicators i.e., correct assessment, correct treatment, and counselling of a caregiver. Similar indicators were taken from data on the standard IMCI (11-day face-to face-training) from Tanzania and comparison was made as shown in Table 3. The proportion of participants who assessed a sick child correctly was 85% in DL, 78% in SIC and 81% in standard IMCI. The proportion of participants who treated a sick child correctly was 94% in DL, 76% in SIC and 67% in standard IMCI. The proportion of correct counselling was lower i.e., 54% for DL, 68% for SIC and 70% for standard IMCI. None of the differences in the proportions were statistically significant (Table 3).

Comparison to trend from end of course to 18 months

**Table 1:** Characteristics of sample for knowledge testing.

	Pre-course Evaluation		Post-course Evaluation		18 month-follow-up	
	DL	SIC N=173	DL	SIC	DL	SIC
	N=235		N=211	N=163	N=57	N=58
Gender						
Male	83 (35.3)	57 (33.0)	76 (36.0)	50 (30.7)	16 (28.1)	23 (39.7)
Female	152 (64.7)	116 (67.0)	135 (64.0)	113 (69.3)	32 (56.8)	35 (60.3)
Completion rate			0.9	0.94		
Years in service						
<1	8 (3.7)	3 (3.1)	8 (3.8)	3 (1.8)	-	-
1-<5	100 (46.7)	37 (38.5)	88 (41.7)	32 (19.6)	-	-
5-<10	48 (22.4)	23 (24.0)	44 (20.9)	23 (14.1)	-	-
>=10	58 (27.1)	33 (34.4)	53 (25.1)	32 (19.6)	-	-
Health facility						
HC II	100 (42.6)	90 (52.0)	94 (44.6)	86 (52.8)	26 (45.6)	19 (32.8)
HC III	80 (34.0)	61 (35.3)	78 (37.0)	59 (36.2)	12 (21.1)	33 (56.9)
HC IV	32 (13.6)	18 (10.4)	24 (11.4)	14 (8.6)	12 (21.1)	5 (8.6)
Hospital	23 (9.8)	4 (2.3)	15 (7.1)	4 (2.5)	5 (8.8)	0 (0.0)
Cadres						
Nursing assistant	19 (8.1)	47 (27.2)	19 (9.0)	44 (27.0)	10 (17.5)	11 (19.0)
Nurse	133 (56.6)	93 (53.8)	117 (55.5)	89 (54.6)	33 (57.9)	28 (48.3)
Midwife	37 (15.7)	17 (9.8)	33 (15.6)	15 (9.2)	1 (1.8)	4 (6.9)
Clinical Officer	43 (18.3)	16 (9.3)	41 (19.4)	15 (9.2)	9 (15.8)	14 (24.1)
Medical Officer	3 (1.3)	0 (0.0)	1 (0.47)	0 (0.0)	1 (1.8)	0 (0.0)

**Table 2:** Knowledge and skills gain pre- and post-course in DL and SIC.

	DL			SIC			P value
	Pre-course	Post-course	difference	Pre-course	Post-course	Difference	
<b>Knowledge</b>							
Mean	46.2	79.3	33.2	40.7	73.8	33	0.9303
Cohen's d	2.8: 95%CI 2.5-3.0			2.5: 95%CI 2.2-3.0			
<b>Skills</b>							
Mean	72.3: 95% CI 71.0-73.5			70.0: 95% CI 68.1-71.8			0.034

**Table 3:** Performance of Health Care Providers 18 months after the course in selected set of skills (IMCI indicators).

IMCI indicators	DL (N=55)	SIC (N=59)	Standard IMCI (N=70) *
Proportion who assessed the sick child correctly	47(85%)	46(78%)	56(81%)
Proportion who treated the sick child correctly	53(94%)	45(76%)	47(67%)
Proportion who counselled the caregiver correctly	31(54%)	40(68%)	49 (70%)

\*Data from a standard 11-day face-to-face IMCI course in Tanzania [11]

later showed that the average skills score changed from 74% to 71% (P=0.6545) in DL and from 72% to 73% (P=0.8841) in SIC 18 months after completion of initial training. Upon adjusting for gender and professional cadre, participants in

SIC had a 0.44 %: 95%CI (-8.0,8.9) higher score compared to DL participants, although this was not statistically significant (Table 4).

**Table 4:** Retention of skills 18 months after the course in DL and SIC.

	Skills assessment at end of course		Skills assessment 18 months after the course	
	Mean diff (95%CI)	P value	Mean diff (95%CI)	P value
Model				
DL	0 (reference)		0 (reference)	
SIC	2.5 (-0.02,4.9)	0.052	0.44 (-8.0,8.9)	0.919
Gender				
Male	0		0	
Female	0.14 (-2.3,2.5)	0.911	2.5 (-5.9,11.0)	0.557
Years in service				
<1	0		-	
1-<5	-2.8 (-8.1,2.5)	0.306	-	-
5-<10	-3.2 (-8.6,2.3)	0.26	-	-
>=10	-4.7 (-9.7,0.29)	0.065	-	-
Cadre				
Nursing assistant	0		0	
Nurse	8.7 (4.7, 12.7)	<0.001	3.7 (-5.8, 13.2)	0.444
Midwife	9.1 (4.5,13.6)	<0.001	-4.2 (-12.5,4.1)	0.321
Clinical Officer	12.5 (7.7,17.3)	<0.001	5.0 (-4.4,14.5)	0.297
Medical Officer	-	-	-	-

### Cost findings

Overall, the programmatic and government cost per HCP trained with the DL model was cheaper by about 41-61% than with the SIC model across all levels of health care delivery. The increased cost of SIC was mainly attributed to the extra funds for lodging, meals, and incidental costs. The details of the costs are shown in Table 5. (One USD=3,700 Ugandan Shillings during 2017-2018).

### Results from qualitative data

Based on FGDs and KIIs, the following themes were generated and described: 1) facilitating factors that helped HCPs learn better were use of the phased approach, availability of demonstration materials, and the combination of both theoretical and practical trainings. 2) barriers that needed to be improved in subsequent courses for both DL and SIC were communications between them, congestion of topics and the English language being too difficult for some of them as described in detail below.

### Facilitating Factors and advantages of DL and SIC models

Participants in both DL and SIC appreciated the phased learning which gave them time to grasp the concepts. Facilitators of DL noted that more HCPs could be enrolled and that less time was spent away from the health facilities. Facilitators of SIC noted that SIC allowed for more supervised clinical practice, early identification of slow learners and shorter time duration than DL.

There were demonstration materials during training in both DL and SIC models, for instance, they would bring drugs on display and participants would see them physically and even watch videos of how drugs are prepared and administered.

*“The modules were fine, easy to understand and like you were classifying the child they separated 2 months up to 5 years, whereby if you are dealing with a child of below 2 months you open the appropriate pages. If the child is having cough, it was easy for the HCP to classify the child.”* FGD trained HCP.

DL had both classroom and practical sessions whereby the participants would go to the health facility and practice what they had learnt in class. Also, there was the skills session whereby the participants had to practice in front of the facilitators. DL promoted hands-on practice.

*“Yes, it was on case management practice because we would do it practically on face to face. We would get clients with their children, and someone does it practically as they are being observed so the content was really driven to the point. It was practical.”* FGD HCP observed.

### Barriers encountered in the implementation of DL and SIC models

HCPs in DL found studying alone challenging especially among lower cadres. They felt that the face-to-face sessions were too short, and that sharing materials was difficult. SIC participants felt that the two-week study period was

inadequate.

In both DL and SIC the HCPs who did not know how to read English very well had issues with internalizing the content in the training manuals.

In DL most facilities were very far, and this was a one-day training whereby the HCPs were starting the course on time. There was also too much to be covered in one day, on that single day in DL. HCPs had to learn, watch video, do a skills station, and go for practical in the ward and finally present. So, there was even no time to break off for lunch. Some HCPs older than 40 years, especially struggled because they would doze off, get exhausted and be hungry.

There was also poor communication whereby they were only sending messages on mobile phones when the training would be the next day, so if the phone was off you could only see the message when you switched it on, and this hindered participation.

*“Now with DL or SIC models, when the mother comes and a baby is coughing, they think of ACT, so when a HCP tests the baby and is negative and the baby has diarrhoea only and give Zinc and ORS, the mother is not contented with the treatment. So, this is a challenge.”* DL trained HCP.

## Discussion

Our study showed that both DL and SIC distance learning approaches improved knowledge immediately after the course and skills 18 months after the course. Both training models used blended methods by combining face-to-face training with self-study, supportive skills reinforcement, on-site visits, and use of *WhatsApp* groups. Our findings are similar to the systematic review findings of a secondary analysis of data on improving performance of HCPs trained in IMCI showing better effectiveness [14,15] As far as we know, this is the first prospectively collected data to evaluate the effectiveness of IMCI with training models that combine blended methods.

Studies have documented inadequate HCP performance in low/middle-income countries (LMICs) [16], contributing to the low quality of care and the high under-five mortality rates in these countries [17]. In Uganda, A Service Provision Survey (Uganda SPA) in 2007 assessed availability of items (child health card, treatment guidelines, visual aids) and showed that all items for supporting quality of care were available only in 10% of the 481 sick children evaluated [18]. It has been shown that training models that are cost-effective could contribute to improvement in quality of care and health outcome [19]. Our study assessed the cost of training and based on cost; DL was found to be the preferred choice as it is cheaper by 41% - 61% compared to SIC. In a retrospectively collected data analysis of the performance of HCP in

Tanzania, it was shown that a significant proportion of HCP who were trained using the standard IMCI training could assess, treat, and counsel a sick child correctly in around 70% of the cases [11]. Our study showed similar results 18 months after the training.

One of the major challenges with distance learning was the high dropout rate [20]. Our evaluation revealed that the completion rate was very high for both models (approximately 90%) demonstrating that with careful planning and proactive measures, a high completion rate can be achieved [20-21]. Another challenge that was anticipated from the distance learning models was that they could be difficult to learn for the low-level cadre. The qualitative study showed that DL could be challenging for some participants as they need to study alone. However, there was no statistically significant difference in knowledge gain among participants of different cadres trained in DL and SIC.

HCPs continued to learn even after the training courses were completed because of mentorship and the use of innovative methods such as *WhatsApp* and short message service (SMS) communications which kept the HCPs linked to each other and the HCPs with their facilitators and the district managers. Good performance by HCPs in DL and SIC addressed concerns around HCP motivation to complete the course, and ability to cope with the learning materials.

The qualitative data showed the high acceptability of both models. Both the HCPs and their managers appreciated the fact that they did not have to leave their duty stations for a prolonged time. They also appreciated the engagement and proactive nature of the course with follow-up provided by the mentors. Participants highlighted that the *WhatsApp* groups created during the training generated a learning platform with mentors that continued after the training. One commendable observation during the 18-month follow-up was the availability of job aides such as IMCI chart booklets and recording forms in all health facilities. The finding that participants performed well 18 months after the course is unique since knowledge often reduces with time [22]. However, while DL and SIC participants performed well in the evaluation, one cannot ignore the fact that the 4- or 3-times mentorship conducted as part of the training probably contributed to the success.

Both DL and SIC have the potential for building capacity and sustaining clinical performance of HCPs in management of sick children. DL has the potential for sustainability because of its low cost, less disruption of service provision and scale up by running sequential courses for several cohorts with same facilitator team. Mentorship 3 or 4 times for each training, use of innovative learning methods such as the “*WhatsApp* group”, and peer group learning were drivers for the good performance for both DL and SIC. *WhatsApp*

group was useful for learning and decision making but it is important to emphasize that it is needed to be coordinated by a central person at the district or regional level.

While SIC is restricted to the original 6-day IMCI content, DL has the potential to add any new health problem, as may be required. For example, a new module on basic newborn care, management of neonatal sepsis (using the WHO PSBI training), on temperature control (again using the WHO Kangaroo Mother Care training) and any emerging pandemic such as covid-19 could be added on an ongoing DL course [23-24].

### Limitations

One major limitation of our study was that we did not assess all health care workers during the 18-month follow-up. This would have provided more information and reduced the possible effect of selection bias that could have occurred if the HCPs with low skills had a higher likelihood of not being selected for the follow-up or avoided being observed as part of the evaluation. We also were not able to include implementation of the 11-day IMCI in two neighboring districts within Uganda as pilots for comparison rather than use data from Tanzania.

### Conclusion

In conclusion, both DL and SIC have shown skills improvement sustainably as evaluated 18 months after the course. DL seemed to be a better choice because of its low cost, less disruption of service provision (only 3 days) and because many more modules could be added onto it.

### Ethical approval and consent to participate

Written consent was obtained for the focussed group discussions (FGD) and the key informant interviews (KII). Verbal consent was obtained from caregivers for the clinical observation. The study was approved by MOH (approval letter no ADM 143/01).

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### Competing interest

The author(s) declare that they have no competing interests.

### Authors contributions

LMM contributed to study design, data interpretation and writing manuscript. DM contributed to the statistical analysis of the data. AS contributed to the qualitative data collection and analysis of the qualitative data. BB, JNS, SN, RW, NV, TDW, WMW conceived the study, contributed to the study design and writing of the manuscript. All authors read and approved the final draft of the manuscript.

**Supplementary file link:** [Click Here!](#)

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