

Evaluation the effectiveness of Abridged IMNCI (7-Day) Course v standard (11-Day) Course in Pakistan

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Research Article

Keywords: IMNCI, Neonatal Health, Child Health, Abridged course

Posted Date: October 27th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-97148/v1>

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Version of Record: A version of this preprint was published at Maternal and Child Health Journal on October 20th, 2021. See the published version at <https://doi.org/10.1007/s10995-021-03276-3>.

Abstract

Background: The conventional IMCI training for healthcare providers is delivered in 11 days, which can be expensive and disruptive to the normal clinical routines of the providers. An equally effective, shorter training course may address these difficulties.

Methods: This was a quasi-experimental study that was conducted in two provinces (Sindh and Punjab) of Pakistan. 104 healthcare providers were conveniently selected to receive either the abridged (7-day) or the standard (11-day) training. Knowledge and clinical skills of the participants were assessed before, immediately on conclusion of, and six months after the training.

Results: The improvement in mean knowledge scores of the 7-day and 11-day training groups was 31.6 (95% CI: 24.3, 38.8) and 29.4 (95% CI: 23.9, 34.9) respectively, $p = 0.630$ while the improvement in mean clinical skills scores of the 7-day and 11-day training groups was 23.8 (95% CI: 19.3, 28.2) and 23.0 (95% CI: 18.9, 27.0) respectively, $p = 0.784$. The decline in mean knowledge scores six months after the training was -12.4 (95% CI -18.5, -6.4) and -6.4 (95% CI: -10.5, -2.3) in the 7-day and 11-day groups respectively, $p = 0.094$. The decline in mean clinical skills scores six months after the training was -6.3 (95% CI -11.3, -1.3) in the 7-day training group and -9.1 (95% CI -11.5, -6.6) in the 11-day group, $p = 0.308$.

Conclusion: An abridged IMNCl training is equally effective as the standard training. However, training for certain illnesses may be better delivered by the standard course.

Introduction

The global under-five and neonatal mortality rates in 2018 were 39 and 18 per 1000 live births respectively. This translates to an average of 15,000 under-five and 7000 neonatal deaths per day. Approximately half of these deaths occurred in only five countries: India, Nigeria, Ethiopia, the Democratic Republic of Congo and Pakistan, displaying the vast disparities that exist between regions (1). Pakistan's under-five mortality rate was 74 deaths per 1000 live births in 2017-18, much higher than the international average (2).

Since 1990, the global neonatal mortality rate has decreased by 52%, and the under-five mortality has dropped by 59% (1). A substantial amount of this decline was brought about by addressing the preventable causes of these deaths. From 2000-2015, 47.5% of all averted child deaths were related to diarrheal diseases and pneumonia (3). Despite this, the two illnesses were amongst the most frequent contributors to mortality in children aged 1-59 months in 2015 (4).

To address this global burden, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) developed a strategy called the Integrated Management of Childhood Illness (IMCI) in the early 1990s. This encompassed a consolidated approach for managing the five most common causes of

death in children under the age of 5 years at that time; pneumonia, diarrhea, measles, malaria and malnutrition (5). Care for newborns younger than 7 days was added to the program in 2003 and the strategy came to be known as IMNCI in many countries (6). IMCI was first introduced at country-level in 1996 by Tanzania and Uganda, and in the next nine years over 100 countries adopted the strategy (7). Pakistan's Ministry of Health formally endorsed IMCI in 1998 and it was implemented in the country in 2000 to address the high infant and child mortality rates (8).

The effectiveness of IMCI in improving health care workers' ability to assess and manage the sick child has been well documented in literature (9, 10). A 2016 Cochrane review reported that IMCI training and implementation may also cause a reduction in child and infant mortality (11). Regardless of the demonstrated advantages of the strategy, its implementation has been met with several challenges ranging from a shortage of trained medical staff, essential drugs, and equipment to weak health systems and budget allocations (12-14).

In low-middle income countries, the expense associated with the 11-day IMCI case-management training (ICMT) is a significant problem for scaling up the strategy (15). Additionally, the absence of participating healthcare workers from their clinical obligations leads to disruptions, scarcity of medical staff, and compromised care for the patients. An abridged ICMT has been identified as one method to overcome these high costs and operational difficulties (16). A survey of the global implementation of the IMCI strategy reported that at least 39 countries use a shorter training instead of the standard 11-day course (17). However, the effectiveness of an abridged training course needs to be established before shortening the training. Therefore, we carried out a scientific comparative evaluation of abridged 7-day training with the standard 11-day IMNCI training.

Objective

To compare the effectiveness of the 7-day with the standard 11-day IMNCI training by evaluating health care providers' ability to assess and classify the illness and take appropriate action according to the IMNCI protocol.

Methodology

Study design and setting

This was a quasi-experimental study that was carried out by the Department of Pediatrics of the Aga Khan University from April 2009 to Oct 2009 in two provinces of Pakistan. Participants from the province of Sindh belonged to district headquarter hospitals of Sukkur and Khairpur, and participants from Punjab came from civil hospitals of district Rawalpindi and Islamabad. Two IMNCI training sessions were conducted in each province; a standard WHO 11-day training and an abridged 7-day training that was adapted from the standard course.

Study population

Healthcare providers were nominated by the District Health Officers from the public sector facilities. The providers were conveniently divided into two groups to receive either an abridged 7-day training or the standard 11-day training. The two groups were comparable in terms of healthcare worker cadre (physicians or other healthcare providers), the level of health facility they worked at (secondary or tertiary level), the health sector they worked in (public or private), and the years of experience they had in managing infants and children. Physicians that participated in the training had 3 to 4 years of experience in providing clinical care to newborns and children. The other providers included registered nurses (RNs), lady health visitors (LHVs), midwives, and health technicians (HTs).

A total of 104 providers participated in the training. Of these, 57 were from Khairpur/Sukkur (35 and 22 in the 7 and 11-day groups respectively) and 47 were from Rawalpindi/Islamabad (23 and 24 in 7 and 11-day groups respectively). The training was facilitated by faculty members of the Department of Pediatrics, Aga Khan University, who were WHO certified IMNCI master trainers. To ensure uniformity and reduce environmental bias, the training sessions were led by the same team of facilitators for both groups.

IMNCI case-management training

The training sessions were held at two public sector tertiary care hospitals: the Pakistan Institute of Medical Sciences (PIMS) Hospital, Islamabad for the Islamabad and Rawalpindi participants, and the Civil Hospital, Sukkur for the Khairpur and Sukkur participants. The training courses consisted of eight modules that were delivered via classroom activities and hands-on clinical practice sessions as recommended by WHO. The clinical practice sessions were conducted in the outpatient clinics and inpatient wards of the two hospitals. The participants observed and practiced the assessment, classification, and treatment of sick children according to the IMNCI protocol. They were also provided with the IMNCI recording forms to fill their patients' information.

The same teaching materials, tools, curriculum, and training methodologies were used for both groups. The course was only redesigned and shortened in terms of the time allocated to each classroom activity and clinical practice session.

Pre and post-training assessment

All participants' knowledge and clinical skills were assessed at the beginning and immediately upon the conclusion of the training. The level of knowledge was measured by administering a written test comprising 25 MCQs. Each correct answer was given a score of two and incorrect answers were marked zero. The questions tested the providers' knowledge on seven common childhood ailments: possible bacterial infection (PBI), acute respiratory infection (ARI), diarrhea, malaria, ear infection, malnutrition, and anemia, along with breastfeeding problems and counseling.

The clinical skills were assessed in two ways. First, the providers were directly observed in the hospital outpatient and inpatient departments by the facilitators and were evaluated according to the IMNCI

standard skills observation checklist. Second, the providers were shown 12 video case studies and asked questions pertaining to the clinical scenarios presented in the videos for a maximum score of 33. These scenarios covered the conditions mentioned above. Participants were expected to appreciate IMNCI signs (for example, sub-costal recessions, stridor, and nasal flaring in respiratory distress, sunken eyes, lethargy, and a slow return to normal after skin pinch in dehydration, edema in malnutrition, and purulent discharge and mastoid swelling in ear infection), count respiratory rate, classify the level of dehydration, nutritional status, ear problem, and respiratory symptoms, and recognize proper attachment and suckling during breastfeeding.

Six months following the IMNCI training, a re-assessment of both the 7-day and 11-day groups was carried out to evaluate and compare the difference in the retention of knowledge and clinical skills between the two groups. This re-assessment was done with the same MCQs and video-based tools that were used at the beginning and conclusion of the training. The facilitators also directly observed the participants' case-management abilities and their clinical skills.

Data analysis

Data were analyzed using SPSS version 15. Only the scores of the participants who were re-assessed at 6 months were used for the analysis. The scores were reported as mean percentages with standard deviations. The differences in the scores between the standard and the short training groups were evaluated for statistical significance by unpaired t-tests. A $p < 0.05$ was considered statistically significant.

Cost estimation

The total expenses of the training were calculated by including the travel and accommodation costs of the facilitators and the participants, the facilitation fees, the cost of refreshments, stationery, and teaching materials. Because all training sessions were conducted in public sector hospitals, there were no additional expenses for logistic arrangements.

Ethical considerations

The study was approved by the Ethics Review Committee of the Aga Khan University. Verbal informed consent for partaking in the study was obtained from all participants.

Results

Baseline characteristics

There were 104 healthcare providers who participated in the study. 46 (44.2%) providers received the 11-day training and 58 (55.8%) received the 7-day training. Their baseline socio-demographic characteristics are shown in Table 1.

Table 1. Baseline characteristics of training participants

	7-day, n (%)	11-day, n (%)	Total, n (%)
Gender			
Male	36 (62.1)	29 (63.0)	65 (62.5)
Female	22 (37.9)	17 (37.0)	39 (37.5)
Cadre			
Doctors	46 (79.3)	37 (80.4)	83 (79.8)
Other providers	12 (20.7)	9 (19.6)	21 (20.2)
Other providers			
RN	4 (6.9)	0 (0.0)	4 (3.8)
LHV	3 (5.2)	1 (2.2)	4 (3.8)
Dispenser	4 (6.9)	4 (8.7)	8 (7.7)
HT	1 (1.7)	3 (6.5)	4 (3.8)
Midwife	0 (0.0)	1 (2.2)	1 (0.9)
Sector			
Public Sector	50 (86.2)	41 (89.1)	91 (87.5)
Private Sector	8 (13.8)	5 (10.8)	13 (12.5)
District			
Rawalpindi/Islamabad	23 (39.7)	24 (52.2)	47 (45.2)
Khairpur/Sukkur	35 (60.3)	22 (47.8)	57 (54.8)
Total	58 (100)	46 (100)	104 (100)

RN; registered nurse, LHV; lady health visitor, HT; health technician

Of these participants, 61 were re-assessed 6 months after the initial training, 32 (52.4%) from the 11-day and 29 (47.5%) from the 7-day training groups. The two groups that were re-assessed had a similar proportion of healthcare providers in terms of gender and cadre. Males made up 68.8% (n = 22) and 65.5% (n = 19) of the participants in the standard and abridged training groups respectively. There were 75% (n = 24) physicians in the 11-day group, and 75.9% (n = 22) physicians in the 7-day group. The 11-day group comprised an equal number of participants from both provinces, while the 7-day group had 13 (44.8%) participants from Rawalpindi/Islamabad and 16 (55.2%) from Khairpur/Sukkur.

Knowledge and clinical skills assessment

The 11-day training group had comparatively higher scores for knowledge and clinical skills in the pre-training and post-training assessments. In the re-assessment 6 months post-training, the 11-day group performed better in the knowledge domain, but there were no differences in the translation of knowledge to clinical skills, and the scores recorded between the two groups for clinical skills performance were statistically similar (Table 2).

Table 2. Comparison of knowledge and clinical skills scores between the standard and abridged training groups

	7-day, mean (SD)	11-day, mean (SD)	<i>P</i> value
Knowledge			
Pre-training	49.2 (20.1)	60.7 (15.0)	0.019
Post-training	80.7 (11.8)	90.1 (6.9)	0.001
Re-assessment	68.3 (19.7)	83.7 (9.0)	0.001
Clinical skills			
Pre-training	44.8 (9.9)	51.3 (10.4)	0.018
Post-training	68.5 (7.7)	74.3 (6.6)	0.004
Re-assessment	62.2 (11.3)	65.2 (5.8)	0.236

In the knowledge assessment of general health, possible bacterial infection, eye infection, counseling, and otitis media, there were no statistically significant differences in the mean post-training and re-assessment scores between the two groups. Conversely, for diarrhea, malaria, ARI, and meningitis, the 11-day group had significantly higher scores in both tests. For mastoiditis and sore throat, the 11-day training group only performed better in the re-assessment and post-training tests respectively (Table 3).

In the clinical skills assessment, the groups had similar scores for PBI and ARI in the two evaluations. However, the 11-day group had significantly higher scores for questions on malnutrition in both post-training and re-assessment at 6 months. For diarrhea and otitis media, the 11-day group had higher scores in the re-assessment only, while for malaria, the 11-day group performed better in the immediate post-training assessment only (Table 3).

Table 3. Comparison of knowledge scores and clinical skills by health conditions between the standard 11 days and abridged 7 days training groups

Assessment domain	Post-training scores, mean (SD)		Re-assessment scores, mean (SD)	
	7-day, n=27	11-day, n=30	7-day, n=27	11-day, n=30
Knowledge				
General health	81.5 (21.4)	74.4 (16.8)	72.8 (24.5)	82.8 (22.5)
Possible bacterial infection (PBI)	92.6 (26.7)	100 (0)	92.6 (26.7)	100 (0)
Diarrhea	86.7 (15.7)¥	98 (8.1)¥	77 (24)¥	94 (10.7)¥
Malaria	74.1 (25.5)*	96.7 (12.7)*	59.3 (36.8)¥	86.7 (22.5)¥
Eye infection	88.9 (32)	96.7 (18.3)	48.1 (50.9)	63.3 (49)
ARI	77.8 (16.7)¥	87.5 (12.5)¥	64.8 (24.2)¥	77.2 (15.5)¥
Meningitis	77.8 (42.4)¥	96.7 (18.3)¥	63 (49.2)¥	96.7 (18.3)¥
Mastoiditis	81.5 (39.6)	96.7 (18.3)	63 (49.2)¥	96.7 (18.3)¥
Sore throat	81.5 (39.6)¥	100 (0)¥	77.8 (42.4)	83.3 (37.9)
Counseling	70.4 (46.5)	86.7 (34.6)	81.5 (39.6)	90 (30.5)
Otitis media	75.9 (29)	71.7 (25.2)	44.4 (16)	55 (24)
Clinical skills	7-day, n=26	11-day, n=31	7-day, n=26	11-day, n=31
Possible bacterial infection (PBI)	68.6 (15.1)	70.4 (15.3)	59.6 (15.8)	56.5 (13.4)
ARI	60.6 (16.9)	71.2 (11.8)	51.9 (17.4)	50.5 (12.7)
Diarrhea	85.9 (10.7)	82.1 (8.9)	82.9 (11)¥	91 (10.5)¥
Malaria	42.3 (27.2)¥	61.3 (33.4)¥	34.6 (30.9)	33.9 (23.8)
Otitis media	96.2 (19.6)	96.8 (18)	80.8 (40.2)¥	100 (0)¥
Malnutrition	56.4 (24.5)¥	72 (17.4)¥	59 (19.6)¥	73.1 (15.9)¥

¥ $p < 0.05$

* $p < 0.001$

ARI; acute respiratory infection

Effectiveness of the standard and abridged training

To measure and compare the effectiveness of the standard and abridged training, we calculated the improvement and retention of the knowledge and clinical skills in the two groups (Table 4). Improvement was defined as the difference between the means of the pre-training and immediate post-training assessment scores. Retention was defined as the difference between the means of the post-training and re-assessment scores.

Table 4. Improvement and retention of knowledge and clinical skills in the standard 11 days and 7 days abridged training groups

	7-day			11-day			P value
	n	Mean (SD)	95% CI	n	Mean (SD)	95% CI	
Improvement							
Knowledge	27	31.6 (18.4)	24.3 - 38.8	30	29.4 (14.8)	23.9 - 34.9	0.630
Clinical skills	26	23.8 (11.0)	19.3 - 28.2	31	23 (11.0)	18.9 -27.0	0.784
Retention							
Knowledge	27	-12.4 (15.2)	-18.5 - -6.4	30	-6.4 (10.9)	-10.5 - -2.3	0.094
Clinical skills	26	-6.3 (12.4)	-11.3 - -1.3	31	-9.1 (6.7)	-11.5 - -6.6	0.308

Costs

The average cost of training was approximately US \$75.00 per participant per day. This means that a total of US \$825.00 was required for each participant to receive the standard 11-day IMNCI training. This figure decreases to US \$525.00 for the 7-day training, approximately two-thirds the cost of the standard training.

Discussion

This study's main purpose was to evaluate the effectiveness of an abridged IMNCI case-management training in a resource-limited country and to compare it with the standard 11-day training. The results of the study showed that the two groups differed at baseline in their level of knowledge and their clinical skills proficiency. While the standard duration training group performed better in the knowledge assessment six months after the initial training, this did not translate into improved clinical skills, and the mean clinical skills scores for the two groups were similar at re-assessment. Furthermore, there were no statistically significant differences in the improvement and retention of knowledge and skills between the two groups. This was in contrast to the findings of Rowe et al, who in their systematic review, concluded that the standard IMCI training was more effective than its shorter versions, though the extent of this difference may be small (18). Additionally, the lack of first-tier study designs directly comparing short and

standard courses in literature was found to be a major limitation to definitively declaring the standard training as the superior option.

However, since then, other studies have shown the shorter courses to be of similar effectiveness as the standard course. Mayhew et al reported that healthcare workers in Afghanistan receiving a 7-day training performed equally well as workers that received the 11-day training (19). Harerimana et al. concluded that nurses trained for 6 days in Rwanda had lower odds of incorrectly classifying fever and treating pneumonia than nurses trained for 11 days (20). India, from the onset, implemented a revised 8-days version of the WHO recommended 11-day course (21). In 2012, a cluster-randomized trial demonstrated a decline in the infant mortality rate and the neonatal mortality rate for children born at home after the execution of the country's 8-day version of the IMCI strategy (22). Moreover, two studies in India compared the outcomes of a further shortened interrupted 5-day training with the country's standard 8-day ICMT in primary healthcare workers. They demonstrated that the increase in assessment scores after training and the subsequent decline 3 years later were not statistically different between the two groups, a finding very similar to our study (23, 24).

We also found that the two groups did not perform consistently when the scores were evaluated for each health condition. In the knowledge scores for general health, PBI, eye infection, otitis media, and counseling, and clinical skills scores for PBI and ARI, the two groups did not statistically differ from one another in the post-training and re-assessment evaluations, signifying that the two training sessions were equally efficacious for these conditions. For knowledge regarding sore throat, the 11-day group had a higher score in the post-training assessment only, indicating that in the long-term, the 11-day training was not superior to the shorter one. However, the knowledge scores for diarrhea, malaria, ARI, and meningitis were higher in the 11-day training group in the post-training and re-assessment evaluations. Likewise, in the clinical skills assessment, the 11-day training group performed better in the subjects of malnutrition, diarrhea, and otitis media at re-assessment. This may suggest that building healthcare providers' competency in the IMNCl approach for certain diseases may require the additional time spent in the 11-day training. Therefore, any measures for shortening the training should take this factor into consideration.

The standard training was considerably more costly, representing a 57.1 percent increase in expenses over the abridged training. The surplus funds can be reallocated and utilized to train more providers or be availed for supervisory visits for previously trained providers, which can further improve the quality of care and sustain the quality of skills (25, 26). Additionally, the lack of long term supervision has been identified as an important obstacle to the proper implementation of IMCI (27).

The findings of the current study add to the existing literature where few studies have directly compared two training sessions of different lengths. To our knowledge, this is the first study in Pakistan that has developed, administered, and evaluated the effectiveness of an abridged IMNCl training module. The study also re-assesses the participants at 6 months to provide a more comprehensive picture of the effectiveness of the two training courses.

The study however had some limitations. First, it was carried out in 3 districts of Pakistan, so the sample may not be generalized. Second, the two groups participating in the study were not randomized. Nonetheless, a conscious effort was made to match the participants as much as possible.

Conclusion

The improvement and retention of knowledge and clinical skills of healthcare providers receiving an abridged 7-day training are equivalent to providers receiving the standard 11-day training. However, knowledge and clinical skills for some health conditions may be better delivered by the standard training. Additionally, the abridged training incurs fewer upfront costs than the standard training. Our study provides further information about the feasibility and effectiveness of scaling up an abridged training program across Pakistan and identifies the potential areas of weaknesses that may result from the reduced time spent in training.

Declarations

Competing interests:

The authors declare that they have no competing interests.

Acknowledgements:

We thank all the providers who participated in the training and the facilitators who led the sessions. We also thank the Pakistan Institute of Medical Sciences (PIMS) Hospital and the Civil Hospital, Sukkur for providing logistic arrangements for the training.

Funding:

This study was funded by John Snow Inc, via a grant from by the US Agency for International Development (USAID; Award Number: 36098-01, cooperative agreement number 391-A-00-05-01037-00).

Consent for publication:

Yes

Availability of data and materials

The datasets used for the article and the study is available from the corresponding author on request.

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