



Evaluation of the Knowledge Enhancement and Impact of Tele Mentoring on Liver Care, Using ECHO Platform on Nursing Professionals in India

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Authors' contributions

This work was carried out in collaboration among all authors. Author AB conceived and planned the study. Authors AB, VK and AK carried out the study. Authors SS, AR and PK worked out almost all of the technical details, and performed the numerical calculations for the data collected. Authors AR, PK and SS, contributed to the interpretation of the results. Author SS took the lead in writing the manuscript. All authors provided critical feedback and helped to shape the research, analysis and manuscript. All authors PK, AK, VK, SS, AR and AB contributed to the final version of the manuscript. AB supervised the implementation of overall project.

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ABSTRACT

Aims: The objective of the study was to assess the effectiveness of the one-day training program on liver care among nursing professionals using online training platform of ECHO (Extension for Community Healthcare Outcomes). The study also aimed to assess the impact of one-day training program on liver care on their attitude and practice at least after four months.

Study Design: Pre-post design

Place and Duration of Study: Institute of Liver and Biliary Sciences New Delhi and 26th March 2019 till 22nd February 2020.

Methodology: A one-day training program titled "Approach to patients with liver diseases" on

management of liver infections for nursing professionals was conducted. An online link for KAP and Pre-post knowledge assessment questionnaire consisting 32 (KAP) questions was shared with all registered participants. Same Knowledge questionnaire consisting 19 questions was shared with the participants after training. Four months after training impact assessment was conducted by sharing the online link with the participants of the conducted program. The data was extracted in MS excel. The continuous variable was presented as mean and standard deviation (SD) or median and Inter quartile range (IQR) as appropriate. The categorical variable was presented as frequency and percentages. Paired t-test was used to assess the difference in pre and post knowledge assessment. For performing the requisite analysis, knowledge score was divided as poor-to-moderate (<66.67%) and Good (≥66.67%). The analysis was performed in IBM-SPSS version 22.

Results: A total of 5974 nursing professionals were trained in 17 one day trainings and data for KAP and pre-post assessment data was available for 4647 and 3456 participants respectively, out of which 295 participants were analysed for impact assessment. Correlation coefficient between knowledge, attitude and practice score stated Pre-knowledge score was significantly correlated with attitude ($r=0.19$, $p<0.05$) and practice ($r=0.20$, $p<0.05$) whereas attitude and practice were also found to be significantly correlated ($r=0.32$, $p<0.05$) with each other.

Conclusion: The results from this study support the use of ILBS-ECHO model in tele mentoring the health care professionals by providing education and training in assessment and management of liver diseases. The technology used in ILBS-ECHO has demonstrated its utility in educating clinicians through co-managed care of underserved patients.

Keywords: Healthcare workers; ECHO ILBS; Tele mentoring; Liver Infections.

1. INTRODUCTION

Liver diseases expressly chronic liver diseases are recognised as major cause of morbidity and mortality globally [1]. Burden of liver diseases in India is enormous with 22.2 deaths/100,000 population attributed to cirrhosis by the Global Health Observatory data from the World Health Organization [2]. Across India prevalence of Hepatitis C varies from 0.3 – 2% [3] (with an average of 1% in general population). India has an intermediate prevalence of Hepatitis B of approximately 4% [4].

Liver diseases owing to multiple associated complications require skilled management that encompasses early diagnosis followed by appropriate treatment, ensuring the necessary clinical standards of practice. Thus, prevalence of liver diseases across the country and the contrasting discrepancies in terms of skilled health care workforce to deliver equitable liver care, a comprehensively designed training program is required to build the treatment capacities of healthcare workers in terms of liver diseases. To overcome this challenge ILBS-ECHO (Institute of Liver and Biliary Sciences, Extension for Community Healthcare Outcomes) project was established [5].

Institute of Liver and Biliary Sciences (ILBS), through this tele mentoring project, aimed to

build capacity and skill of medical fraternity to address the constraints of geographic distance and resources. This study therefore aimed to evaluate the knowledge enhancement and impact of delivering education and training using the Project ECHO model on nurses' in liver care.

2. METHODOLOGY

ILBS-ECHO utilizes tele – audio – video learning principles to deliver trainings to the targeted groups through available Information Technology (IT) infrastructure, supported by ILBS team in rendering technical support to the participating institutes and individuals registered under this program. Institute of Liver and Biliary Sciences is a super speciality autonomous institute under National Capital Territory of Delhi which provides treatment and management of liver and biliary diseases and is actively involved in capacity building of healthcare professionals for liver diseases, served as the host institute while the training beneficiaries were present at their own institute.

Under the umbrella of ILBS-ECHO, different courses were drawn for doctors, nurses and paramedics after due deliberations with the in-house faculty and experts at ILBS and is currently delivered through interactive lectures and case presentations, followed by discussions so that faculty's participatory deliberations,

clinical difficulties of the course enrolled participating doctors get to solved to the ultimate advantage of the patients. A duly designed objective format for capturing the clinical details of a patient was prepared by experts at ILBS and is being used to capture the required details. A provision of certificate of participation to successful participants at the end of course was also in place. The training program was conducted in following manner:

2.1 Preparation of Training Program

At the commencement of the program a scientific agenda was finalised and speakers were identified based on their area of expertise. The speakers were faculty members from nursing college, ILBS or topic experts from other departments. Interaction between project team and speakers were conducted on finalising the objectives and topics of the session. These discussions were organised and presentations were updated on a regular basis as per the new updates and advancements related to the topics of agenda. Based on the session objectives and important key points, a Knowledge Attitude and Practice (KAP) questionnaire was developed and was shared with session experts for content validation. The KAP questionnaire was revised based on the comments received by the experts. After finalisation of the KAP and Pre-Post Questionnaires were prepared to understand the existing parameters and the subsequent changes in the same following the training program.

The brochure and link to register was shared with the nodal officers of the medical institutes for registration of participants. Following the registration, KAP questionnaire link was circulated with the participants for assessing their present knowledge status. A 32-item questionnaire with 19 knowledge questions, 6 questions in attitude and 7 questions to assess the practices of the participants was conducted during the program. In knowledge section, each question was of 1 mark, making the total score of the section to be 32. Knowledge section was further divided into 4 major domains: (i) General awareness of Hepatitis (ii) Treatment of Hepatitis (iii) Transmission of Hepatitis; (iv) Prevention and Infection Control. In attitude section C, there were 6 questions related to attitude of HCWs. The attitude questions were based on 5 point-Likert scale for participants to choose from how much they agree or disagree with a particular statement. For positive questions 'strongly agreed' was coded as 5; 'agreed' as 4; 'neutral'

as 3, 'disagree' as 2 and 'strongly disagree' as 1. For negative questions coding was opposite of positive questions 'strongly disagreed' as 5 to 'Strongly Agreed' as 1. The total score of the attitude questions ranged from 0 – 30. Practice section consisted of 7 practice questions based on Yes, No and May be scale for participants to choose from 3 options in a statement (Yes was coded as 2, No as 0 and May be as 1). The score of the practice question ranged from 0–14. The online pre-test link was prepared using SurveyMonkey platform.

2.2 Training Program

The online one-day training programs were conducted from 26th March 2019 till 22nd February 2020, on regular basis with an aim to impart scientific knowledge to nursing professionals in management of complication of common liver diseases, viral hepatitis and on safe medical practices while caring for liver disease patients.

The training on scientific topics related to prevention and management of liver infections were imparted by the subject-expert through tele communication using state of the art technology. The training program comprises of scientific topics from the domains of safe practices, complications of liver diseases and viral hepatitis with session duration ranging from 30 minutes to one hour. Training program were divided into four major domains including general awareness of hepatitis, treatment and transmission of hepatitis, transmission and infection prevention and control.

The information about these topics was enhanced through imparting an amalgam of theoretical knowledge as well as through interaction with participants. Following the end of the session, session-experts addressed the queries of the participants. The content delivered through presentations were regularly updated as per the new advancements.

2.3 Post Test and Feedback of the Training

Following the end of the scientific sessions, link of Post-test questionnaire was sent to all participants via SMS on their registered mobile number. The online post-test link consisted of 19 questions related to knowledge about liver infections, same as pre-test in KAP questionnaire. In addition to this, an online

feedback form was collected from participants at the end of the session to assess the quality of the lectures. The feedback form consisted of five segments: 1. Clarity and content of the course. 2. Time and frequency of the sessions based on the component of the course 3. IT support from the project team 5. Overall perception about the course. For these, a rating scale of 1 to 5 was used where poor was coded as 0, Average as 1, Good as 2, Very Good as 3 and Excellent as 4. Thus, each individual parameter was rated out of 5.

2.4 Impact Assessment

In addition to pre-post, an impact assessment survey was conducted among participants after a period of at least 4 months from the completion of training. The impact assessment also aimed at assessing the change in the attitude and practice with respect to routine/clinical practice on liver infections. The impact assessment survey questionnaire was sent to the eligible participants via email and SMS. The questionnaire aimed to analyse the changes adopted by these health care professionals in their clinical practice after attending the training program. The survey questionnaire intended to assess the improvement in adhering to universal precautions, use of personal protective equipment, injection safety protocols while attending to the patients of liver infections. A total of 5% response was expected to be collected through impact assessment survey.

2.5 Stastical Analysis

The data was extracted in MS excel. The continuous variable was presented as mean and standard deviation (SD) or median and Inter quartile range (IQR) as appropriate. The categorical variable was presented as frequency and percentages. Paired t-test was used to assess the difference in pre and post knowledge assessment. For performing the requisite analysis, knowledge score was divided as poor-to-moderate (<66.67%) and Good ($\geq 66.67\%$) [6]. The analysis was performed in IBM-SPSS version 22.

3. RESULT

A total of 17 one-day training programs on approach to patient with liver diseases were organised for nursing professionals at Institute of Liver & Biliary Sciences from 26th March, 2019 to

22nd February 2020. A total of 5974 nursing professionals from 23 institutions across 5 states i.e. Delhi, Haryana, Rajasthan, Uttar Pradesh and Uttarakhand, of India have attended the training program. The training programs were conducted institute wise using tele mentoring intervention. A total of 4647 responses were received through online survey before commencement of the training program. However, the pre-post data was available only for 3456 participants, hence pre-post analysis was performed for only 3456 individuals.

3.1 Demographic Details of the Participants

Mean age of participants was 21.51 ± 4.28 years. The proportion of female participants (76.2%) who attended the training was higher than male participants (23.8%). Approximately 53.8 % of the total participants were working in institutions based in the state of Uttar Pradesh, most of the participant possessed B.Sc. Nursing degree (61.3%) with least participation (3.1%) from healthcare workers qualifies with post basic. (Table 1).

3.2 Pre- post Test Analysis

The KAP was available for 4647 individuals. Approximately 70.4% of participants were having poor-to-moderate knowledge. Responses of Knowledge, attitude and practice are summarized in the supplementary 1.

A total of 3456 participants were considered for analysis of assessment of pre-post score. The pre-post analysis of knowledge questions indicated improvement in knowledge of the participants following the training program. The mean improvement in knowledge score was 10.83 ± 3.56 in pre-test to 14.87 ± 3.32 in the post-test. This difference in the knowledge scores were found to be significant (p-value <0.001). With respect to domain wise score, maximum score was found in Prevention and Infection Control and minimum score in Transmission of Hepatitis in pre-knowledge assessment. Domain wise improvement in knowledge is presented in Table 2.

Pre-knowledge score was significantly correlated with attitude ($r=0.19$, $p<0.05$) and practice ($r=0.20$, $p<0.05$) whereas attitude and practice were also found to be significantly correlated ($r=0.32$, $p<0.05$) with each other.

Table 1. Baseline demographic characteristics of clinicians in KAP (N=4647) and Pre-post assessment (N=3456)

Demographic Characteristics	KAP n (%)	Pre-post n (%)
Mean Age (SD)*	21.53 (4.42)	21.51 (4.28)
Gender		
Male	1105 (23.8)	709 (20.5)
Female	3542 (76.2)	2747 (79.5)
Qualification		
Diploma	1324 (28.5)	990 (28.6)
Post Basic	143 (3.1)	114 (3.3)
B.Sc. Nursing	2835 (61.0)	2098 (60.7)
M.Sc. Nursing	345 (7.4)	254 (7.3)
Location		
Delhi	921 (19.8)	610 (17.7)
Haryana	464 (10.0)	324 (9.4)
Rajasthan	383 (8.2)	165 (4.8)
Uttar Pradesh	2499 (53.8)	1998 (57.8)
Uttarakhand	380 (8.2)	359 (10.4)
Marital Status		
Unmarried	461 (9.9)	337 (9.8)
Married	4186 (90.1)	3119 (90.2)

* SD: Standard deviation

Table 2. Total and domain wise Pre-post knowledge assessment (N=3456)

Domain Name (Total score)	Pre- assessment score Mean ±SD*	Post assessment score Mean± SD*	p-value
General Awareness of Hepatitis (4) K1, K8, K18, K19)	2.33 (1.16)	2.88 (0.79)	<0.001
Treatment of Hepatitis (4) (K2, K7, K11, K13)	2.16 (1.11)	3.18 (0.99)	<0.001
Transmission of Hepatitis (4) (K3, K4, K9, K12)	2.13 (0.98)	3.02 (0.99)	<0.001
Prevention and Infection Control (7) (K5, K6, K10, K14, K15, K16, K17)	4.22 (1.66)	5.79 (1.49)	<0.001
Overall Knowledge Score	10.83 (3.56)	14.87 (3.32)	<0.001

*SD: Standard deviation

3.3 Feedback

A total of 2844 anonymous entries were obtained for feedback. The overall mean score of the training feedback was found to be 16.36±3.35 out of 20. The feedback related to relevance of the program was found to be highest among all parameters (4.31± 0.73). The mean feedback pertaining to clarity, content and delivery of the training course was calculated to be (4.25±0.77) while the timing and frequency of the sessions

were rated at 4.02±0.85. The feedback for information technology support was found to be (4.25±0.77). Each individual parameter was rated out of 5.

3.4 Impact Assessment

A total of 295 responses were included in the analysis after removing the duplicate and incomplete entry. The response rate of impact assessment was 8.5%. The impact assessment

indicated that 82.70% of the participants (n-239) started following universal precautions on regular basis, post attending training; whereas 14.19% participants (n-55) initiated the use of PPE sometimes only. It was found that the most 90.72% (n-264) participants started following the injection safety protocols on regular basis, whereas 7.56 % (n-22) participants were following the mentioned protocol occasionally, post training. In addition, 71.43% (n-205) participants started advising high risk individuals and their family members regarding screening of hepatitis B and C viruses whereas remaining 24.74% HCWs (n-71) advise it several times only. Approximately, 75% (n-219) participants have also started advising high risk patients and relatives about HBV vaccination as a regular practice whereas nearly 21% (n-61) started doing the advocacy for the same sometimes only (Table 3).

4. DISCUSSION

The knowledge gap among health care professionals can potentially impact the overall outcome. This lacunae in knowledge and eventually practice and attitudes can be addressed through tele mentoring programs, dedicated to provide relevant and updated information in liver care. With this purpose, ILBS initiated ILBS-ECHO project with the aim to move the specialised liver care knowledge to healthcare professionals placed at comparatively remote geographical areas.

The tele mentoring system of training depicted a change in knowledge as established from the post-evaluation scores of the participants. Similar anticipated results i.e. knowledge enhancement using the ECHO model, have been realised

earlier through comparable studies [7,8]. An Indian study reported an increase in average knowledge level score of 14.4 from the baseline score of 6.3, after the ECHO training 6 months post the initial 3-day in-person training on oral, breast, and cervical cancer screening of HCPs in the tribal primary healthcare centre of Gumballi [9]. Likewise another study reported a significant increase both in the mean number of correct answers on the 26-item hypertension knowledge test (from 13.11 to 17.44, $p < .01$) and on the 7-item hypertension management self-efficacy scale (from 4.68 to 5.41, $p < .01$) among the primary care practitioners in the intervention group in Chicago's south side [10]. The positive outcome in the current study could be attributed to both the informative didactics delivered by experts in the concerned fields, and practical, evidence-based learning through the medium of case presentations by the participants [11]. Apart from this, the time designated during each session for questions and interaction among the participants and the experts facilitated further knowledge enhancement. [11]

Poland et al. [11], Ciullo et al. [12], and Panait et al. [13] compared in-person training and tele mentoring of medical students in different medical procedures like the focused assessment with sonography for trauma (FAST) examination, mechanical ventilation, and laparoscopy respectively, and reported almost similar efficacy of both and found the benefit of both the training methodologies comparable. Moreover, a recent study from a developing county stated, 65.41% healthcare workers used e-learning platforms for upgrading their knowledge during COVID-19, suggesting increased preference towards online training as it saves travel during pandemic without compromising learning [14].

Table 3. Responses on Impact of attending training program (N=295)

Survey Questions	Never n (%)	Sometimes n (%)	Always n (%)
Started following universal precautions	9 (3.11)	41 (14.19)	239 (82.70)
Started using Personal Protective Equipment's (PPE)	8 (2.78)	55 (19.10)	225 (78.13)
Started following injection safety protocols	5 (1.72)	22 (7.56)	264 (90.72)
Started reporting Needle Stick Injuries (NSI)	16 (5.48)	38 (13.01)	238 (81.51)
Started advising high risk patients and relatives about Hepatitis B and C testing	11 (3.83)	71 (24.74)	205 (71.43)
Started advising high risk patients and relatives about Hepatitis B vaccination	11 (3.78)	61 (20.96)	219 (75.26)
Started advising pregnant females for HbsAg testing	27 (9.28)	46 (15.81)	218(9.91)

The results from this study support the use of ILBS-ECHO model in tele mentoring the health care professionals by providing education and training in assessment and management of liver diseases. The technology used in ILBS-ECHO has demonstrated its utility in educating clinicians through co-managed care of underserved patients [5]. The geographic isolation of many communities in India precludes [15] ongoing on-site professional education or consultation. Linking of technology based mentorship like ECHO for health care workers, that connect a specialist with primary health care providers, ensures favourable healthcare outcome [16].

A study [17] evaluating the effectiveness of ECHO model of online training to improve primary care for autism in Uruguay resulted in favourable outcomes in improving clinical knowledge and confidence of primary care providers.

The study could have also suffered a response-shift bias because of its pre-post design. In addition to this, the design by default is exposed to intrinsic bias; this is because participants are already exposed to the questions in the pre-test and this might have influenced the post-test responses. Moreover, responses received in impact assessment may have been influenced by socially desirable responses and may not be true representation of change due to training. However, to some extent knowing about the correct practices help in engaging in correct practices as well.

Despite these inherent limitations, to the best of our knowledge, use of ILBS-ECHO model in tele mentoring has been efficient in training the health care professionals by providing education and training in assessment and management of liver diseases through online mode. The technology used in ILBS-ECHO has demonstrated its utility in educating clinicians through co-managed care of underserved patients [5]. The geographic isolation of many communities in India precludes [15] ongoing on-site professional education or consultation. Linking of technology based mentorship like ECHO for health care workers, that connect a specialist with primary health care providers, ensures favourable healthcare outcome [16]. Thus, learning should be promoted among healthcare workers using the online modes.

5. CONCLUSION

The study was able to assess the effect of one-day online training program using state of art tele mentoring system of ECHO regarding approach to patient with liver diseases on knowledge level of the nursing professionals. Overall, study observed significant improvement of knowledge among nursing professional following one-day training program and also improvement in attitude and practices of the trainees while managing the patients with liver diseases. The ECHO model can be further utilized to increase accessibility towards quality health care among underserved population, requiring management of multiple complex conditions .However, more studies are required to study the feasibility, impact and factors associated with learning and training through online medium among health care workers.

6. SUPPLEMENTARY MATARIALS

Supplementary materials is available in this fooling link:

Available:<https://www.journalajmah.com/index.php/AJMAH/libraryFiles/downloadPublic/9>

CONSENT

As per international standard or university standard guideline participant's consent has been collected and preserved by the authors.

ETHICAL APPROVAL

The present activity was undertaken as a part of outreach activity, however ethical clearance was obtained with No. F.37/(1)/9/ILBS/DOA/2020/20217/79 from the Institutional Ethics Committee.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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