Medical Education

Comparing two different schedules of online learning for updated cardiopulmonary resuscitation guidelines in Covid-19 patients: A randomized study

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ABSTRACT

Background. Coronavirus disease 2019 (Covid-19) is an evolving disease with newly generated evidence related to the clinical management of Covid-19 patients. We aimed to compare two online learning schedules for disseminating new cardiopulmonary resuscitation (CPR) guidelines in terms of knowledge gain and acceptability among nurses.

Methods. In a prospective randomized controlled study, 61 nurses trained in comprehensive cardiopulmonary life support (CCLS) were randomized to synchronous ($n=31$) and asynchronous learning groups ($n=30$). The enhanced training module on CPR (ETMCPR) prepared by a team of experts was used to impart training to the nurses. Baseline data and pre-intervention knowledge of participants were collected using a structured demographic sheet and knowledge questionnaire (25 items) in a google form. Nurses in the synchronous group were provided training using ETMCPR through a licensed Zoom platform, while the nurses in the asynchronous group had access to the uploaded ETMCPR module in the e-learning platform. At the end of the intervention, the knowledge of the nurses was assessed along with their acceptability to the online learning schedule.

Results. Both schedules of online learning were effective in improving the knowledge scores of the nurses (11.93 [3.26] *v.* 21.15 [1.90], p=0.01 and 11.71 [3.12] *v.* 20.32 [1.71], p=0.01). The mean acceptability scores of nurses in the asynchronous group were statistically lower than in the synchronous group (38.93 [2.50] *v.* 42.5 [3.08], p=0.007).

Conclusion. Both synchronous and asynchronous schedules of online learning were effective in disseminating updated CPR guidelines; however, nurses in the synchronous group were more satisfied with the learning schedule.

INTRODUCTION

Evidence regarding clinical management of patients with Covid-19 with cardiac arrest is evolving.[1] The vulnerable population includes individuals with underlying comorbid conditions who present with pneumonia, severe acute respiratory syndrome and multi-organ failure. These patients may have a cardiac arrest and require immediate cardiopulmonary resuscitation (CPR).[2,3] Giving CPR to such patients is challenging for healthcare workers due to the risk of viral contamination.[4–6] Newer CPR guidelines specific to Covid-19 are related to the use of personal protective equipment, prevention from aerosol-generating procedures, oxygen therapy and transport of patients.[6]

The nurses' role as a member of the healthcare team is crucial during CPR. Considering the impact of Covid-19 on the delivery of CPR, we felt a need to update the comprehensive CPR (comprehensive cardiopulmonary life support [CCLS])-trained nurses to ensure an optimal outcome for these patients. CPR is a skill training programme but in view of the restriction to physical gatherings due to the pandemic, regular conventional classroom learning was not feasible.[7] We decided to train nurses through an online mode. A literature review identified two different techniques of online learning, namely synchronous and asynchronous. Both are well-tested techniques of online learning, but no comparative study has been done to identify which is better for adult learners for CPR training. Therefore, our study compared the two online learning techniques for disseminating new CPR guidelines in terms of knowledge gain and acceptability by the nurses.

METHODS

This prospective randomized controlled study was approved by the ethics committee (IEC/NP- 542/2020) and registered with CTRI (2020/08/026977). We identified from the records, 160 nurses trained in CCLS and invited them via email to participate in the study. Informed consent was obtained through email. Confidentiality and anonymity of the participants were ensured. A total of 108 nurses responded and were screened for eligibility through an online eligibility proforma having 20 multiple-choice questions (MCQs) related to pre-Covid-19 CPR guidelines. Nurses who scored 80% or above ($n=80$) were allowed for registration. A total of 61 nurses completed the registration formalities and were randomized to synchronous ($n=31$) and

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                              │   160 Nurses     │
                              └──────────────────┘
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┌──────────────┐              ┌──────────────────┐   │ Excluded (n=52)                  │
│  Enrolment   │              │ Assessed for     │──▶│ Denied participation (n=10)      │
└──────────────┘              │ eligibility n=108│   │ Left the job (n=22)              │
                              └──────────────────┘   │ Did not respond to mail (n=20)   │
                                       │              └─────────────────────────────────┘
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                                       │              │ Excluded (n=47)                  │
                                       │──────────────▶│ Scored less than 85% (n=28)     │
                                       │              │ Did not complete registration    │
                                       │              │ formalities (19)                 │
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                              │ Completed registration          │
                              │ formalities (n=61)              │
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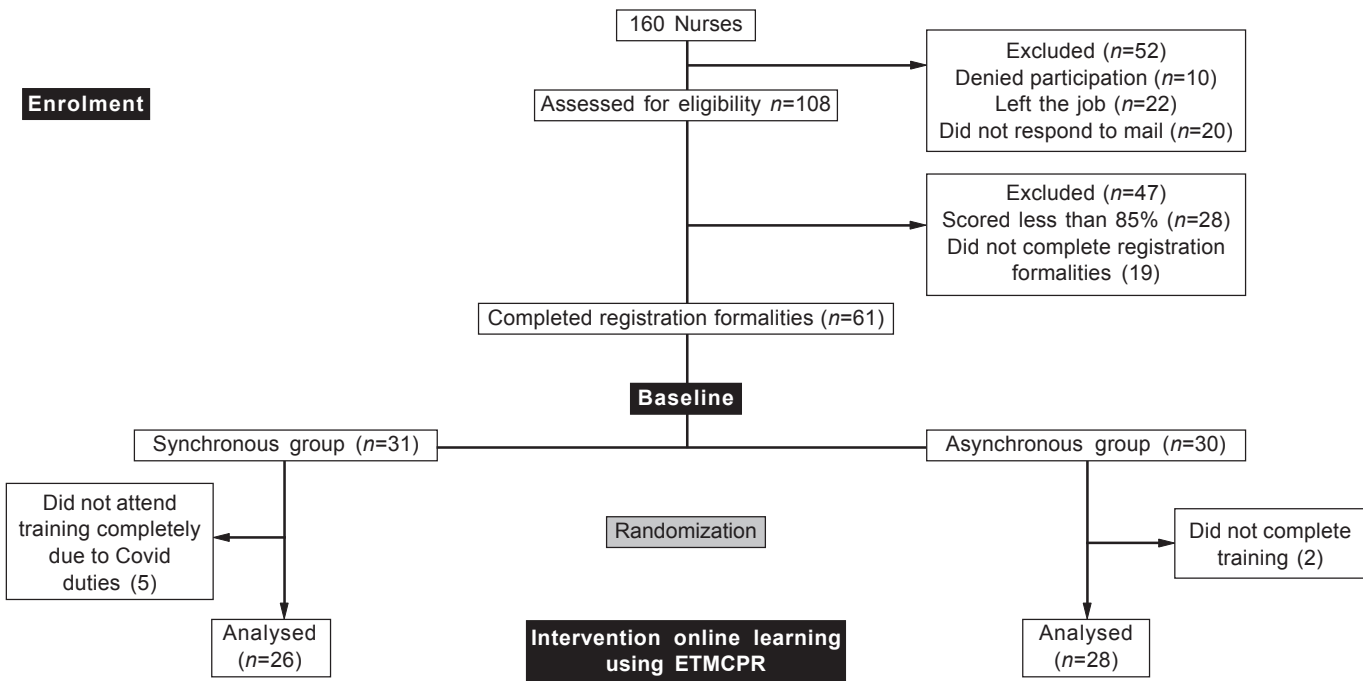
FIG 1. Consort diagram showing the study flow

asynchronous learning groups (n=30) using a computer-generated random sequence (Fig. 1).

Intervention

The enhanced training module on cardiopulmonary resuscitation (ETMCPR) was prepared by a team of five certified master CPR trainers, based on CCLS guidelines for Covid-19 patients, provided by the Indian Resuscitation Council.[6] The ETMCPR contained 14 sub-modules namely (i) introduction to CPR in Covid-19 patients; (ii) hand hygiene; (iii) donning and doffing; (iv) checking response, activating Covid-19 code blue and checking rhythm/pulse and breathing; (v) chest compression; (vi) ventilation; (vii) defibrillation; (viii) airway management; (ix) closed suctioning system; (x) drugs used during CPR; (xi) running a mega-code; (xii) post-cardiac arrest care; (xiii) transport of Covid-19 patients; and (xiv) disinfection, sterilization and clinical waste management. Recording of the teaching material was done in a webinar format with embedded videos, which were independently validated by the experts.

Nurses in the synchronous group were provided training using ETMCPR through a licensed online meeting platform at a fixed time (4–5 p.m.) daily for a week. The meeting ID and password (PW) for the online meetings were shared with the participants via WhatsApp. Every day, two modules were covered followed by a discussion initiated by one of the CPR experts. Two MCQs as part of the pre- and post-session quiz were asked everyday during the meeting. During the same period, nurses in the asynchronous group had access to the uploaded ETMCPR module on an e-learning platform by using individual login identity (ID) and PW. Two interactive online meetings, moderated by the experts, were held: one at the beginning and another at the end, to orient the participants about the programme and to clear their queries, respectively. The learning resource material was shared via email with both the groups.

Tools for data collection

Baseline data and pre-intervention knowledge of participants were collected using a structured demographic sheet and knowledge questionnaire (25 items) in a Google form. A score of 1 was given for a correct response and 0 for an incorrect response, with a maximum possible score of 25. At the end of the intervention, knowledge of the nurses was assessed again using the same tool. As part of a secondary outcome, acceptability of online learning was assessed using a semi-structured tool containing 10 structured items on a 5-point Likert scale (strongly agree 5 to strongly disagree 1; maximum score: 50) related to the content and the methodology used for imparting training and a survey containing two open-ended questions. The survey invited participants to make comments relating to the content and its usability and accessibility and schedules of online learning.

Statistical analysis

In the absence of a similar study, a formal sample size calculation was not feasible. The data were obtained in an Excel sheet and analysed using SPSS 22.0. Frequency, percentage, mean, median and standard deviation were computed to analyse the descriptive data. For drawing the inference, paired t-test and independent t-test were used to compare the knowledge scores within and between the groups. As a secondary outcome, the acceptability of different schedules of online learning was assessed and compared using the Mann–Whitney U-test. A value of p<0.05 was considered to be statistically significant.

RESULTS

Of the 61 nursing officers, the final sample size in the synchronous and asynchronous group was 26 and 28, respectively (Fig. 1). At baseline, both groups were comparable in terms of age, sex, professional qualification, total and current experience in the present area of work, the number of witnessed and managed

Table I. Demographic profile of nurses in synchronous and asynchronous groups of online learning

Variable	Synchronous group (n=31)	Asynchronous group (n=30)	p value
Mean (SD) age (years)	34.3 (6.9)	34.5 (6.8)	0.93
Gender (men:women)	14:17	10:18	0.59
Professional qualification (GNM:BSc Nursing:MSc Nursing)	06:14:11	07:13:8	0.53
Present area of work (medical ICU:surgical ICU:HDU)	14:06:10	12:07:09	0.57
Mean (SD) total experience (years)	11.1 (6.7)	12.6 (5.7)	0.53
Mean (SD) experience in the present area (years)	7.6 (5.1)	7.8 (4.5)	0.89
Covid-19 training (yes:no)	11:20	10:18	0.81
Mean (SD) baseline knowledge scores	11.87 (3.22)	11.71 (3.25)	0.99

GNM general nursing and midwifery   BSc Bachelor of Science   MSc Master of Science   ICU intensive care unit
HDU high-dependency unit

Table II. Knowledge scores of nurses and acceptability of synchronous and asynchronous online learning

Knowledge score	Synchronous group (n=26)	Asynchronous group (n=28)	95% CI of mean difference	p value
Pre-interventional	11.93 (3.26)	11.71 (3.12)	1.44–1.82	0.815
Post-interventional	21.15 (1.9) (8.12–10.91)	20.32 (1.7) (7.31–9.90)	0.17–1.83	0.1
p value	0.01*	0.01*		
Acceptability	42.5 (3.08)	38.93 (2.50)		0.007

Data as mean (SD) (95% CI)   SD standard deviation

cardiac arrest in Covid-19 patients and pre-assessment knowledge scores (p>0.05; Table I). Both schedules of online learning were effective in improving the knowledge scores of the nurses (11.93 [3.26] *v.* 21.15 [1.90], p=0.01, and 11.71 [3.12] *v.* 20.32 [1.71], p=0.01). Post-assessment knowledge scores of the nurses were comparable in both the groups (21.15 [1.90] *v.* 20.32 [1.71], p=0.1; Table II). The mean acceptability scores in the asynchronous group were statistically lower than in the synchronous group (38.93 [2.50] *v.* 42.5 [3.08], p=0.007). All nurses in the synchronous group and a few from the asynchronous group (n=5) recommended a synchronous schedule of online learning. They found the training programme highly informative, interactive, innovative and relevant, and suggested providing intimation about such workshops in advance to the participants and administration.

DISCUSSION

Our study revealed that both synchronous and asynchronous schedules of online learning were effective in disseminating CPR guidelines for Covid-19 in terms of improvement in the knowledge scores. The acceptability by nurses in the synchronous group was higher than by those in the asynchronous group.

Online learning is a valuable tool in medical education and, if used appropriately, can facilitate the learning of many psychomotor skills, which are otherwise best learned through performance.[8–13] All the participants in our study were habituated to the traditional facilitator and classroom models of learning. This online learning was a novel experience for them. In the synchronous group, there was provision for a small group live interactive discussion with 'camera-on' meetings, which provided a classroom-like environment to the participants. It promoted active engagement of the participants by adding human elements in a virtual classroom with the provision of immediate feedback. However, the degree of social interaction and peer group learning was not measured. In contrast, online learning in an asynchronous group can be equated with computer-based, self-motivated and self-paced distance learning.

Our study has some limitations. It was a single-centre, open-label study, where nurses were recruited from a single tertiary care facility. The possibility of the Hawthorne effect among the participants of the synchronous group cannot be ignored. The immediate gain in the knowledge scores can be attributed to the spill-over effect. Therefore, the long-term effect of the intervention remains to be explored. Because CPR is a skill training programme, all the nurses at the end of the training were requested to go to the nearest training centre for practising the newer guidelines. The hybrid method of online learning with classroom hands-on practice is an acceptable mode of imparting training to nurses.[9] Therefore, the present online learning cannot be recommended for nurses who have no prior exposure to CCLS training.

Conclusion

Both synchronous and asynchronous schedules of online learning were effective in disseminating the updated CPR guidelines. Nurses in the synchronous group were more satisfied with online learning as compared to nurses in the asynchronous group.

Conflicts of interest. None declared

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