Foundation Course Skills Development - Impact of Basic Life Support Training on Knowledge, Confidence, Skill and Perception of First Year Indian Medical Students

Ayan Kumar Pati[1], Leelavati Thakur[2], Sachin Damke[3]

[1]Department of Pharmacology, Shri Ramkrishna Institute of Medical Sciences & Sanaka Hospital, Durgapur, West Bengal, India. [2]Department of Critical Care Medicine, Bengal Faith Medical Hospital, Burdwan, West Bengal, India. [3]Department of Paediatrics, Jawaharlal Nehru Medical College, DMIMS University, Wardha, Maharashtra, India.

ABSTRACT

BACKGROUND

Basic life support (BLS) although a lifesaving skill, is seldom taught in the first year of traditional Indian undergraduate medical curriculum resulting in lack of competence and confidence. Medical Council of India's new competency based undergraduate curriculum stresses on early skill acquisition. Basic life support hands-on workshop can be a simple yet effective educational intervention in achieving the goal. The aim of the study is to determine the effectiveness of introduction of BLS training workshop to first year MBBS curriculum as a part of foundation course skills development.

METHODS

An interventional study in the form of BLS workshop consisting of lecture, demonstration and hands on practice on mannequins was conducted on first MBBS students. Assessment was done by standardized pre- and post-test questionnaire and direct observation of procedural skills (DOPS). Student's perception was qualitatively explored by conducting focus group discussions (FGD) followed by thematic analysis.

RESULTS

Analysis of median pre- and post-test scores using Wilcoxon test matched pairs signed rank test revealed highly significant gain in knowledge and confidence (P value = 0.000). Thirty three percent students could perform all the seven steps of cardiopulmonary resuscitation (CPR) correctly, meeting all six quality indicators indicating satisfactory skill acquisition. Six overarching themes emerged from the focus group responses viz. importance of clinical skill acquisition in first year, suggested methods to improve skill training, effectiveness of BLS workshop, usefulness of learning BLS skill, readiness to perform CPR in real life scenario and need for curriculum reformation.

CONCLUSIONS

Simulation-based hands-on workshop can serve as an effective teaching learning strategy for foundation course BLS skills development under new competency-based first MBBS curriculum by Medical Council of India (MCI).

KEYWORDS

Basic Life Support, Cardiopulmonary Resuscitation, MBBS, Curriculum, Competency, Qualitative Analysis, Medical Education

Corresponding Author:
Dr. Ayan Kumar Pati,
Shibtala, Babuganj,
P.O + Dt: Hooghly – 712103,
West Bengal, India.
E-mail: ayanpati@gmail.com

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BACKGROUND

Very recently, Medical Council of India (MCI) has implemented a curriculum reformation of undergraduate medical students in the form of Competency Based Medical Education (CBME) with the goal of delivering Indian Medical Graduate (IMG) at the end of MBBS course.[1] Among others, Skill acquisition has been identified as one of the crucial strategies in CBME and have been emphasised in recently published Graduate Medical Education Regulation (GMER) 2019.[2]

Basic life support (BLS) is a must to know skillset for the 'doctors of first contact'. Early recognition of cardiac arrest or foreign body airway obstruction and prompt action in initiating the 'chain of survival' increases the patient's survival likelihood significantly.[3] The existing medical curriculum for the first year MBBS, emphasize heavily on the knowledge domain of learning and assessment rather than psychomotor and affective components. Due to lack of proper exposure, the newly entrant medical students don't feel enough confidence in handling medical emergencies. On the other hand, the society already starts to expect some amount of professional competence from them as doctors from the very beginning of their training. Therefore, BLS and first aid skills have been incorporated under CBME, into the one-month 'Foundation course' for the first year MBBS students of 2019-20 batch by MCI.[4]

In this present scenario, we wanted to quantify the impact of a BLS training workshop on the knowledge, skill and confidence in first year medical students as well as explore their perception regarding the same.

METHODS

Study Particulars

The study was designed as longitudinal interventional study comparing a single sample before and after intervention conducted at the Medical Education Unit (MEU) Hall & Skills Lab of IQ City Medical College, Durgapur, West Bengal, India from October'18 to March'19. Qualitative research methodology was adopted to explore the perception and consolidated criteria for reporting qualitative research (COREQ) guideline was followed.[5]

Intervention

In our study, we exposed the study participants to a one-day workshop on basic life support which had two sessions. First session was on theoretical aspects of BLS including lecture and video demonstration of basic anatomy, physiology of cardio-respiratory functions related to BLS. Second session consists of demonstration and hands-on training of students on mannequins (four adults and one baby) (Koken, Japan) by three American Heart Association (AHA) certified instructors and two experienced providers in five small groups of ten students each, over three consecutive days. The students were trained until they reach the 'show how' level of Miller's Pyramid.[6]

Study Population, Sample Size & Sampling Technique

The study population was 150 first year MBBS students of 2018-19 batch and all of them were selected using complete enumeration method.

Eligibility Criteria

We included 145 first year MBBS students of 2018-19 batch who were present (five absentees) and willing to participate in the workshop via filling of informed consent form. Our exclusion criteria were having any formal / informal previous training in BLS.

Study Tools, Techniques and Data Collection Procedures

The tools were prepared and standardized in consultation with Department of Critical Care Medicine and other AHA certified instructors.

Quantitative Data

Questionnaires

The questionnaire consisted of four parts; namely participant identification section, knowledge section, confidence section and attitude section. The questions were assembled from multiple previous published studies.[7,8] The keys and distractors were modified using latest AHA guidelines.[3] It was predesigned, pretested and self-administered by the participants. The identical sets of pre-test and post-test questionnaires were filled up by participants before and after the BLS workshop respectively and collected by the facilitators.

DOPS Checklist

The cardiopulmonary resuscitation (CPR) skillset was divided into three sections; sequence of CPR (seven steps), quality of CPR (six criteria) and maintenance of the order of CPR (Yes / No). Assessment of individual skill of performing BLS was done by randomly assigning the participants to mannequins (three adults and one baby) with four independent observers. Data was collected by ticking the DOPS checklist by the observers.

Qualitative Data

Focus Group Discussion Guide

A semi-structured interview guide was prepared based on literature review and expert opinion with questions addressing the perception of training BLS skills. The guide was pilot tested in a focus group of BLS participants, who were excluded from final focus group discussion guides (FGDs).

Focus Group Discussion Data Collection

Three FGDs were conducted among BLS workshop participants in the library room of Department of Pharmacology utilizing theoretical framework of grounded theory. The principal investigator served as the focus group facilitator. Total 24 participants, eight in each FGD were selected beforehand using purposive sampling

method and approached face to face for recruitment and informed consent. Out of them, one participant was unable to participate in FGD due to health issue. Data was captured simultaneously by audio recording and taking field notes by the note taker. FGDs continued till data saturation (duration ranges from 45 min to one hour). Audio recording was transcribed verbatim by principal investigator in Microsoft Office Words (2016) and corroborated with the handwritten field note from the note taker in the debriefing session.

Ethical Clearance & Confidentiality

Permissions were obtained from both institutional ethics committee (Ref. No. IQMC/IEC/LTR/20/05/20(15) and the principal of IQ City Medical College to conduct the study and written informed consent was collected from each participant. For protection of privacy of the participants, anonymity was maintained throughout the study.

Statistical Analysis

Quantitative data was compiled in Microsoft office Excel 2016 and analysed by SPSS software (version 23). Categorical data was expressed as proportions while continuous data was expressed as median and interquartile range as per skewed distribution by Kolmogorov–Smirnov test. Differences between median pre and post multiple-choice questions (MCQ) scores were analysed using Wilcoxon Matched Pair Signed Rank Test while difference in proportions were applied using McNemar's chi square Test. P-value less than 0.005 was taken as statistically significant.

Qualitative data was analysed using thematic analysis method. Personal identifiable information was removed from the final FGD transcript to maintain confidentiality. Data was iteratively analysed for pattern identification; key statements were highlighted, codes were created and labelled, memos were added and finally categorized into themes by the principal investigator.

RESULTS

Out of the 145 participants, 53.1 % (n = 77) were male and 46.9 % (n = 68) were female.

Assessment of Knowledge of BLS

There was a highly significant knowledge gain of the students reflected by the comparison of median pre and post-test score of knowledge-based questions given in table 1. The comparison of pre and post-test percentages of correct responses of individual questions are summarized in table 2.

Assessment of Confidence of Performing BLS

The post-test self-evaluated confidence of performing effective CPR on cardiac arrest and foreign body airway obstruction in adults were significantly higher ($p < 0.0001$) than pre-test scores (matched pairs = 113; test statistics Z = - 8.378 and - 7.166 respectively). Similarly, findings were noted for children victims (matched pairs = 113; test statistics Z = - 8.144 and - 6.967 respectively) as depicted in figure 1.

Statistically significant improvement ($p < 0.0001$) of median confidence from baseline was also found regarding readiness to perform BLS (matched pairs = 111; test statistics Z = - 7.342), ability to teach BLS (matched pairs = 114; test statistics Z = - 7.887), ability to perform an unsupervised CPR on family members (matched pairs = 112; test statistics Z = - 5.974).

Keeping up with the raise in confidence levels, the fear of performing CPR on real patient also showed decremental trend from pre to post intervention when rated in a visual analogue scale (Figure 2).

Assessment of Attitude

93.8 % and 96.2 % of students were certain that BLS is a must to know skill for a doctor in pre and post intervention respectively. After the workshop, 93.9 % of them, as opposed to 87.6 % in pre-test, were certainly in favour of inclusion of BLS in the first MBBS curriculum.

Assessment of Skill of Performing BLS

Total 130 participants appeared for DOPS assessment. The post-intervention DOPS score ranges from 0 to 13 with median and interquartile range of 12 ± 3. Overall, 33.10 % of students scored 13 and 3.20 % scored less than or equal to 6 out of 13.

For the purpose of objectivity, the CPR process was divided into seven sequential steps. 50.77 % of participants followed all the seven steps of CPR sequentially in order, while the rest failed to do so. Percentages of participants correctly eliciting each of the seven steps of effective CPR are shown in figure 3. Six quality indicators of CPR were also identified and the proportions of participants satisfying each of those were expressed in figure 4.

Assessment of Perception

23 out of 145 BLS workshop participants (16 %) enrolled in three focus group discussions consisting of ten females and 13 males. Two FGDs had eight participants and one FGD had seven participants. Six broad overarching themes emerged from the responses.

Importance of Clinical Skill Acquisition in First Year

Focus group participants strongly agreed regarding the importance of mastering basic clinical skills from early preclinical year. One student told: "According to me, in the course of medicine we should develop our skills more than concentrating on our theoretical knowledge".

Subtheme 1 - Theory and Practice Complement Each Other

Students felt the need of applying their theoretical knowledge in a practical scenario for better understanding

of the concepts. One student expressed: "If we could accompany a senior doctor or professor into patient's bedside and were able to simultaneously see and relate our theoretical knowledge of pallor or icterus etc. that would be easier".

Subtheme 2 - Professional Confidence
Participants opined that the newly entrant medical students start off their professional journey with high hopes and ambition of achieving the prestigious 'Doctor' title. Application of the professional competence during the MBBS course as expressed by someone as "the Doctor tag actually coming into the play", could be a real booster for gaining confidence later on.

Subtheme 3 - Meeting the Expectations and Helping Family, Friends and Relatives
A sense of frustration was observed among the students that they felt unable to help their nearer and dearer without any clinical knowledge. A number of participants reflected back on their personal experiences. One student shared: "The other day, my father wanted to confirm something related to his diabetes that his doctor told him. I had to google it to find the answer." On the contrary, one student was really happy to be of use to her father: "As we already had x-ray classes, when my father showed me his knee joint radiograph, I explained it to him and gladly surprised to find out that similar things were told by his doctor also".

Suggested Methods to Improve Skill Training in First Year
Students jointly suggested some changes to bring about desired skill training in first year.

- Dedicated period for teaching clinical skills
- Regular practice
- More hands-on workshops
- More exposure to real patients rather than normal volunteer

One area of concern was practicing repeatedly only on normal subjects like peer volunteers is boring and unauthentic as it does not simulate real life situation, as expressed by "As nothing is pathological, so there is no thrill".

Effectiveness of BLS Workshop
Overall, focus group participants find the BLS workshop to be extremely useful. They identified several factors contributing to it.

Subtheme 1 - Learning by Doing
The students indicated that the application of theoretical knowledge in a clinical scenario was the best part of the BLS course. One expressed: "Hands on experience on the mannequins was one thing really nice because only theoretical knowledge is not enough for BLS".

Subtheme 2 - Strategic Use of Various Teaching-Learning Methods
Reinforcement of information by utilizing various modes of teaching was well appreciated by the participants as illustrated by one: "Another positive was the repeated drilling of the theoretical knowledge, which was given to us, we were given lecture, videos were shown to us…if that was not enough, there was a simulation".

Subtheme 3 - Correlation between Theory and Practice
The rationale behind every manoeuvre of CPR helped them to correlate much better to the theoretical aspects of the procedure as told by a student: "Whatever we were doing we were finding a reason".

Subtheme 4 - Exposure to Professionalism, Teamwork and Communication Skills
Many students indicated that BLS workshop offered some other benefits like teamwork and rapport building in group activities. One explained: "Just some days before, one of our very close batchmate blacked out. I myself was very proud how everyone handled the situation. Two students rushed to emergency to get a wheelchair, myself and other people were making sure that she don't lose consciousness like splashing water on her face, hold her tight so that she don't fall, somebody was actually measuring her pulse…I remember someone of us was tapping her several times …like we were taught in BLS…the 'tap and shout' thing…".

Usefulness of Learning BLS Skill
Participants felt that learning BLS skills made them more competent as health care professionals. Some advantages were pointed out by the students:

- Competence in Lifesaving Skill Before Receiving MBBS Degree - "At that time, I felt like yes, I can save a life without fully becoming a doctor and do justice to the profession".
- No Sophisticated Equipment Required - "Can be performed by anyone, anywhere, anytime with minimal accessories".
- Very Useful in Out of the Hospital Emergencies - "Because these things come in handy outside hospital".
- Can spread the Awareness and Teach BLS Skills to Others - "Now we have become the emissaries…we can teach others…family, friends… maybe we can teach this skill to our juniors next year."

Readiness to Perform CPR in Real Life Scenario
There was mixed opinion when the participants were asked what they would do if they encountered a victim requiring CPR. Some students were confident enough to perform CPR in real life without hesitation. One participant told: "Earlier, I might have asked for help, now instead of rather being just a passer-by or calling an ambulance and waiting for it, I will ask another person to ask for help while myself doing the CPR". Contrarily, some students are hesitant and "don't want anything bad to happen due to my wrong procedure" as explained by another student. The major determining factor behind readiness to perform BLS in actual victim seems to be regular practice of the skill.

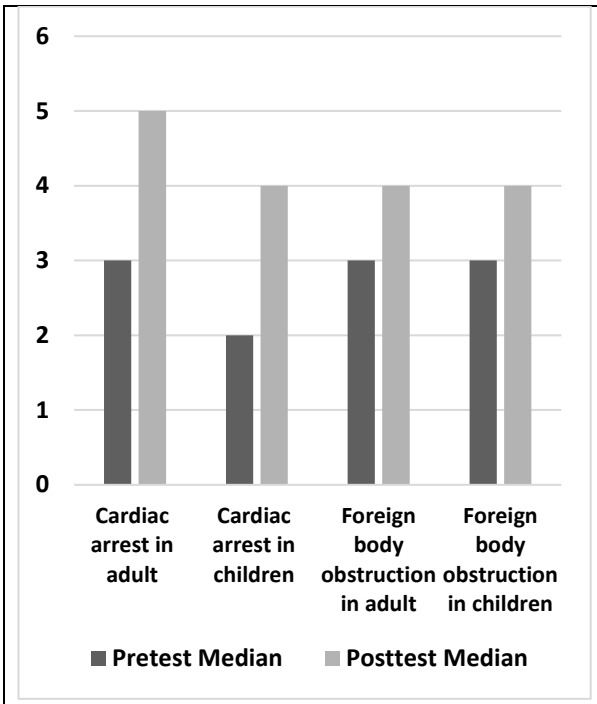

Figure 1. Difference in Confidence Levels to Perform CPR for Various Scenarios on a 5-Point Likert's Scale before and after BLS Training

* P value <0.05 for all four case scenarios

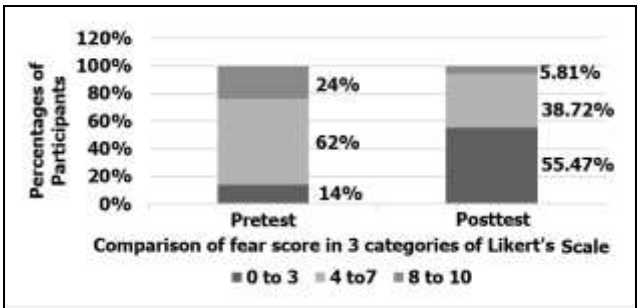

Figure 2. Overall Reduction of Fear of Performing CPR across the Three Categories of Rating Scale before and after BLS Workshop

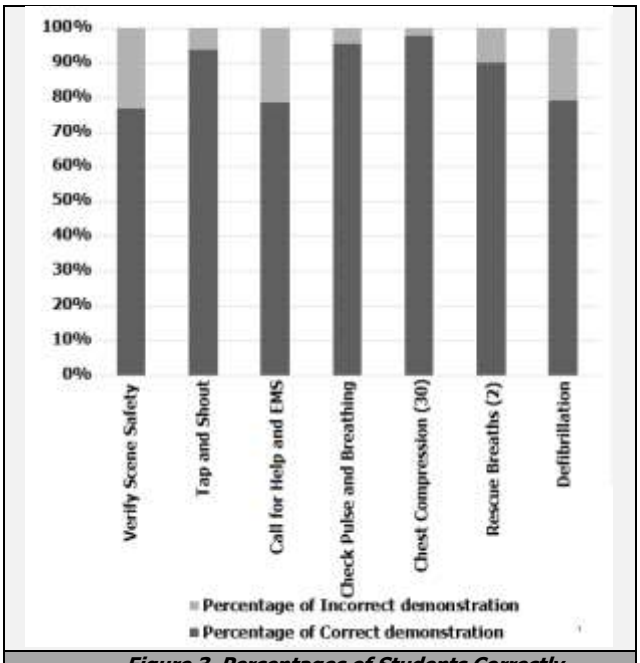

Figure 3. Percentages of Students Correctly Demonstrating Each of the Seven Steps of CPR

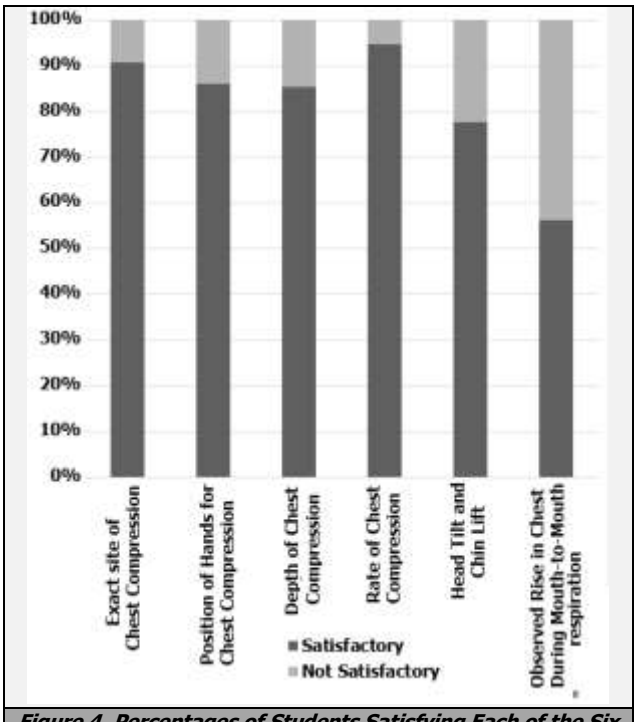

Figure 4. Percentages of Students Satisfying Each of the Six Quality Indicators of Effective CPR

MCQ Scores	Range	Median	Inter Quartile Range	Test of Significance (Wilcoxon Matched Pair Signed Rank Test)
Pre-test (n = 129)	3-14	7.00	3	Z = -9.165, P value = 0.000
Post-test (n = 131)	6-17	14.00	3	(n = 115 matched pairs)

Table 1. Summary Statistics and Difference in MCQ Scores before and after BLS Training

Knowledge Question Items	Pre-Test Correct Responses			Post-Test Correct Responses			Test of Significance (McNemar's Chi square Test)	
	n	Frequency	%	n	Frequency	%	n (Matched pairs)	P Value (2-sided)
Q1*	129	128	99.2	131	131	100	...	...
Q2*	126	60	47.6	131	131	100	...	...
Q3	126	39	31	131	33	25.2	113	0.888
Q4	129	39	30.2	130	83	63.8	114	0.000
Q5	127	51	40.2	129	101	78.3	113	0.000
Q6	128	52	40.6	129	83	64.3	113	0.001
Q7	127	49	38.6	131	121	92.4	114	0,000
Q8	128	21	16.4	131	89	67.9	114	0.000
Q9	128	37	28.9	131	42	32.1	114	1.000
Q10	127	41	32.3	129	60	46.5	113	0.085
Q11*	127	53	41.7	130	129	99.2	...	...
Q12*	127	35	27.6	130	126	96.9	...	...
Q13	124	31	25	129	121	93.8	108	0.000
Q14	127	56	44.1	130	110	84.6	113	0.000
Q15*	129	123	95.3	131	128	97.7	...	...
Q16	129	30	23.3	131	108	82.4	115	0.000
Q17	129	96	74.4	131	125	95.4	115	0.000
Q18	129	20	13.3	130	59	45.4	114	0.000

Table 2. Differences in for Item-Wise Correct Responses before and after BLS Training

* McNemar's test could not be applied as the frequencies in the cells of the contingency table are less than 5

Need for Curriculum Reformation

A felt need of the students was observed in the focus group regarding the way they are trained in first year. Lack of

clinical exposure was emphasized by all the FGD participants.

Subtheme 1 - Monotony of Theory-Based 1st Year Subjects
Students perceived the BLS workshop as a welcome change from the boredom of regular lectures. One explained: "It was a very useful break from the monotonous theoretical schedule of ours. It was good, we needed that change also… that shift in the frame of mind is very important".

Subtheme 2 - Lack of Clinical Exposure
Most of the first-year students found themselves totally detached from patients and unaccustomed with hospital environment. Participant seemed to favour simple clinical orientation as a welcome move. "In first year, we have enough dose of knowledge but don't get minimum practical skill on how to even approach a real patient".

DISCUSSION

Medical Council of India implemented competency based medical education from 2019-20 batch.[2] BLS skillset was incorporated in the initial one-month Foundation Course under skills module 2B.[4] This particular skill is also included as core competency under physiology discipline to be vertically integrated with General Medicine and Anaesthesiology & as 'Certifiable Procedural Skills' in the Graduate Medical Regulation 2019 document.[1,2] Our study assessed the effect of BLS workshop on all the three domains of learning in the students to determine the effectiveness of such intervention.

The results clearly demonstrated that there is statistically significant knowledge gain, improved self-perceived confidence of performing CPR as first responder and overall satisfactory development of BLS skill in the participants. Additionally, a vast majority of the students felt that basic life support skill is an absolute requirement for a doctor and thus should be included in their curriculum. This was also reflected in their open-ended comments.

Our work showed that the improvement in median MCQ score after the intervention is highly significant (P value < 0.0001) similar to past studies.[8,9] On further analysis, it was found out that almost all the students were already aware of the commonly used acronyms like BLS or emergency medical service (EMS) without having any formal training in BLS. After the intervention, 100 % of the participants were aware of the importance of verifying scene safety before engaging in CPR and more than 95 % students knew the exact rate of chest compression and chest compression ventilation ratio in an adult. Interestingly, students keep skipping the step of asking for help in a hypothetical case of non-responding victim. There is statistically significant improvement of confidence levels (P value < 0.0001) in teaching BLS skill to others and dealing with cardiac arrest, foreign body airway obstruction victims, both adult and children. In agreement with increment in confidence levels, there is overall reduction in fear of performing CPR on cardiac arrest in hypothetical situation. The student's DOPS assessment median score was 12 out of maximum score of 13 implying significant attainment of psychomotor skill. The competency of CPR was divided into seven sequential steps and highest number of participants correctly demonstrated the steps of checking pulse and breathing and delivering chest compression. One area of concern is only 43 % of the students followed all the steps sequentially. This may be due to lack of understanding the rationale of each step or lack of enough practice. We identified six quality indicators of effective CPR and found that the students were most satisfactory in maintaining the rate of chest compression and least satisfactory in chest rise during mouth to mouth ventilation.

We employed focus group discussion method to explore the perception of the participants. Qualitative analysis showed that like similar studies,[10] the first-year medical students found the BLS training to be very helpful for correlating with theoretical knowledge, exposure to clinical case scenarios, teamwork, professionalism and communication skill. It was also considered to be a 'handy' skill in case of medical emergencies. Advantage of mastering a lifesaving skill even before getting MBBS degree seemed to boost their confidence in performing unsupervised CPR and professional competence. Also, there was a widespread concern observed regarding monotony of theory based first year subjects and lack of thrill in examining normal subjects. Some of the suggested improvement measures were regular practice in simulated environment, immediate feedback after assessment, dedicated class on teaching clinical skills and frequent hands-on workshop. Multiple previous studies have reported a lack of awareness regarding BLS among different healthcare professionals and students.[7,11,12] In contrast, the majority participants of the current study acknowledge BLS as a must to know skill for a doctor.

A workshop-based teaching learning method has shown to be very effective for BLS skill.[13] Use of simulated CPR mannequins also enhanced the skill in recognizing and handling emergencies.[11,14] In our study, the participants also favoured hands-on sessions with open-ended comments emphasizing on the fact that repeated reinforcement using varied teaching learning methods helps to clear their doubt.

BLS skill should be taught to every layperson in the community. The students in our study felt confident to teach BLS to their friends, family and neighbours. To teach BLS in the preclinical year itself, even as early as high school, can be synergistically beneficial as they get enough practice and simultaneously, they can spread and propagate the knowledge, skill and awareness in the community at large.[8,15,16]

The study suffers from the fact that the retention of knowledge, skill and confidence was not re-assessed after an interval but has been planned after 12 months in the second profession year. Several earlier studies demonstrated the need for periodical reinforcement to attain and maintain the competency of effective CPR skill.[17-19] In addition to regular revision, re-certification is also important to keep up to date with current guideline recommendations.

CONCLUSIONS

Our study, which served as a pilot project prior to countrywide implementation of CBME, showed that BLS workshop promoted an all-around learning gain for first MBBS students and thus draws the conclusion that incorporation of BLS skill into the foundation course of undergraduate curriculum by MCI is a justified necessity.

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