Niger J Paediatr 2022; 49 (2):102 –108

ORIGINAL

Abiodun Moses Temidayo
Ikhurionan Paul Ehiabhi

Clinical experience of medical students in Children Emergency Room: A cross-sectional study at a University hospital in Nigeria

DOI:http://dx.doi.org/10.4314/njp.v49i2.2

Accepted: 16th May 2022

Abiodun Moses Temidayo (✉)
Ikhurionan Paul Ehiabhi
Paediatric Emergency Division, Department of Child Health, University of Benin Teaching Hospital, & School of Medicine, University of Benin, Benin City, Nigeria
Email: moses.abiodun@uniben.edu

Abstract: *Background:* The Children Emergency Room (CHER) is a high-volume, fast-paced environment where children present with acute illnesses. With the paradigm shift in educational models towards outcome-based education, teaching and assessment of students must be structured to attain intended learning outcome in every rotation.
Objective: This study assessed the relationship between teaching methods and learners' satisfaction. We also identified challenges to CHER posting and likely solutions.
Methods: This is a descriptive cross-sectional study, using a semi-structured anonymous feedback form to elicit perception of learning objectives and adequacy of teaching methods in CHER. Adequacy of participation in emergency care was assessed on a 4-point Likert scale. Bivariate analysis for possible determinants of adequate CHER posting satisfaction on a visual analogue scale (VAS) was done. P-value < 0.05 was considered significant.
Results: A total 112 medical students participated in this study; 51.8% of them knew their specific learning objectives on the first day in the unit. The participants' grand mean score for learning satisfaction in CHER was adequate (2.65±0.24). Their preferred teaching method was Bedside Teaching/ Clerkship (3.01±0.78) but they were dissatisfied with simulations (2.29±0.91) and participation in emergency care (2.19±0.10). Participants in junior posting were more satisfied than those in senior posting (OR =3.45, 95% CI: 1.46-8.15; p=0.005). A high workload was identified as a challenge.
Conclusion: The overall clinical experience of medical student in CHER is satisfactory. Our study however, shows that there is inadequate simulation-based teaching, case presentation and participation in case management by the medical students. Curriculum reforms may be necessary to address these identified gaps and improve clinical experience of medical students in CHER.

Key words: Children emergency room, medical students, clinical experience, recommendations

Introduction

The Children Emergency Room (CHER) is a high-volume, fast-paced environment with children presenting with acute illnesses or injuries[1]. It is an important field of Paediatrics education for both undergraduate and post -graduate students. The CHER has a wide range of presentations and procedures for students to observe and participate in[2]. During the rotation students have the opportunity to participate in the assessment and management of the ''undifferentiated patient,'' as well as reinforcing their basic life support knowledge[3,4]. While joining in providing acute care, students are also expected to acquire clinical skill application focused on differential diagnosis, management, and disposition of common paediatric complaints[5]. Procedural skills like vascular access, intraosseous access, lumbar puncture, and management of the paediatric airway and associated didactics such as approach to the paediatric examination, neonatal resuscitation, child abuse, antibiotic usage, electrocardiogram reading and paediatric radiology including chest radiograph reporting are also expected to be observed and performed[5].

Although robust in clinical opportunities for learning, the often chaotic and hectic CHER can make it difficult to provide a uniform education to ensure that students have their educational needs met, have their performance properly assessed, and receive effective feedback regarding their performance[1,6]. Similarly, CHER trainers

are often challenged with a high student to teacher ratio in a chaotic clinical setting[7,8]. Most times, trainer have only a few minutes per patient encounter to devote to direct teaching of medical students rotating through the CHER[9]. There is also the challenge with the duration of the CHER posting which is often limited to a few weeks during undergraduate training to allow students rotate through other paediatric specialties on the curriculum. This can lead to inadequate clinical exposure of students undermining their knowledge of paediatric emergency care.

With the paradigm shift in educational models towards outcome-based education, teaching and assessment of the student must be organised to ensure that intended learning occurs by the end of each rotation.[10,11] One motivation for learning for many students include experiences that are tailored toward achieving their learning objectives [3,12]. Previous studies have shown that medical students encountered less patient presentations and procedures than those recommended by training curriculum[12,13]. Similarly, some authors have suggested that traditional medical education may not adequately prepare the student for assessment requirements and post graduate experiences[2,13]. There is therefore, need to adapt training to be more student-oriented in the emergency setting without compromising on quality of care. This is especially needed in resource-limited setting with its high patient to doctor and student to trainer ratio[11].

Consequently, it is needful to identify teaching methods and activities that are most relevant to student knowledge in our setting for optimal achievement of learning objectives on the curriculum. It is also necessary to identify challenges hindering optimal CHER rotation from the learners' viewpoint. Therefore, this study evaluated the relationship between teaching methods and learners' overall satisfaction with CHER posting. We also document challenges and likely solutions from the students' perspective. This can eventually enhance departmental and unit's orientation programs, teaching methods and clinical training of students.

Methods

Study Setting and Participants

This study took place in the Children Emergency Room (*CHER*) of the University of Benin Teaching Hospital (*UBTH*), in southern Nigeria. The paediatrics postings consist of two 8-weeks rotations (junior and senior postings) during the fifth year of medical education. During the posting, students are expected to take rotations in CHER as well as take calls, requiring clerking/ presentation of patients as well as observation/ participation in clinical care and relevant procedures specified in their logbooks. The study participants were medical students undergoing junior and senior postings in CHER during the study period, *June 2018 to March 2019*.

Study Design: This was a descriptive cross-sectional study.

Sample Size: It was a total population study of all consenting medical students rotating through the unit during the nine-month study period. Participants were purposively recruited.

Data Collection: This was done on the last day of CHER posting using a semi-structured anonymous feedback form to elicit perception of learning objectives and adequacy of teaching methods in CHER. Participants' satisfaction with clinical skill acquisition in CHER was assessed on a 4-point Likert scale ranging from 1 ("very dissatisfied") to 4 ("very satisfied"). Satisfaction score for each item was derived from the mean score by the students. A mean score less than 2.5 was rated as dissatisfied and a mean score of 2.5 and over was rated satisfied. Overall adequacy of clinical knowledge/ skill acquisition during CHER posting was assessed on a 100mm uncallibrated visual analogue scale (VAS). The threshold for satisfied experience was placed at 70mm. Perceived challenges to CHER posting and likely solutions were elicited using open-ended questions.

Statistical Analysis: The data were analysed using the IBM Statistical Package for Social Sciences (SPSS) version 26.0 for windows. Categorical variables were presented as frequencies and percentages while continuous data were summarised as means and standard deviations. Factors influencing perceived satisfaction with CHER posting on a 100mm visual analogue scale (VAS) were assessed with bivariate analysis. Specified challenges and participants' recommendations were subjected to thematic analysis. P-value < 0.05 was considered significant.

Ethical consideration: Participation was entirely voluntary; names and identifying numbers were not required. Ethical clearance was obtained from the Ethics and Research Committee of the College of Medical Sciences, University of Benin (*CMS/REC/2022/282*).

Results

Baseline characteristics of participants

A total 112 medical students participated in this study during their 2-week clinical rotation in CHER; 56.3% were in junior posting while 43.8% were in senior posting. Majority (94.6%) of them were regular students while 6(5.4%) of them were repeat students. Most 91 (81.3%) of the students attended departmental orientation at the beginning of their posting and 67(59.8%) partly read their student work book. More than a half (51.8%) of them knew the specific learning objectives of their CHER posting by the end of their first day in the unit, and they were mainly informed by unit registrars (41.4%). The remaining students 54(48.2%) knew the learning objectives much later: twenty six (47.3%) late in the 1st week of the posting and 9(16.4%) never knew the learning objectives throughout the posting as shown below on Table 1.

Table 1: Baseline Information of the Participants (N = 112)

Baseline Information	Frequency, n	Percentage (%)
Type of Posting		
Junior	63	56.3
Senior	49	43.8
Re-sit/ Repeat Student		
Yes	6	5.4
No	106	94.6
Posting objectives known First day		
Yes	58	51.8
No	54	48.2
If Yes, Source of Information		
Fellow students	8	13.8
Registrars	24	41.4
Senior Registrar	14	24.1
Unit Consultants	10	17.2
Undergraduate Coordinator	2	3.4
If No, when known		
Late 1st week	26	47.3
Early 2nd week	6	10.9
Late 2nd week	7	12.7
Never	9	16.4
Others	7	12.7
Attend Departmental Orientation		
Yes	91	81.3
No	21	18.8
General Information at the Orientation		
Yes	72	64.3
No	40	35.7
Read Student Workbook		
Partly	67	59.8
Fully	24	21.4
Others	21	18.8

Departmental orientation messages

The key messages received at departmental orientation meetings focused on clerkship (87.5%), participation in ward rounds/clinics (80.4%), lecture attendance (68.8%) and interactions with consultants (59.8%). The remaining information provided at the orientation is not adapted to specific units of the department involved in the posting as shown on table 2.

Table 2: Key messages received at departmental orientation meetings (N=112)

Key messages*	Frequency, n	Percentage (%)
Punctuality and regularity	29	25.9
Importance of history taking and examination	68	60.7
Have interactions with as many consultants	67	59.8
Take signings of the logbook seriously	21	18.8
Clerking of patients and presentation	98	87.5
Participation in ward round/ clinic	90	80.4
Importance of attending lectures	77	68.8

**multiple responses present*

Satisfaction with Learning in CHER

The students expressed an adequate level of satisfaction with learning in the various sections of the paediatrics emergency division except in the critical care bay with a mean score of 2.40 ±0.63; their grand mean score for satisfaction with learning in CHER was 2.65±0.24 (Table 3).

Table 3: Satisfaction with Learning in the Sections of CHER

CHER Sections	Mean Satisfaction Score (SD)	Interpretations
Casualty	2.65±0.63	Satisfied
CHER ward	2.98±0.55	Satisfied
Critical care bay	2.40±0.68	Dissatisfied
Others*	2.58±0.79	Satisfied
Grand Mean Score	2.65±0.24	Satisfied

*Procedure area, side room

Satisfaction with Clinical Experience based on Teaching Methods

The participants were satisfied with unit ward rounds, procedures and beside teachings, mean scores 32.85±0.70, 2.75±0.75 and 3.10±0.78 respectively. However, they were dissatisfied with simulations and caregivers counseling sessions. Their overall satisfaction with teaching methods CHER was adequate 2.55±0.30 (Table 4)

Table 4: Satisfaction with Learning from Teaching Methods

Teaching Methods	Mean Score (SD)	Interpretations
Unit Ward Rounds	2.85±0.70	Satisfied
Special Patient Reviews/ Procedures	2.75±0.75	Satisfied
Beside Teaching/Clerkship	3.01±0.78	Satisfied
Imaging Reviews	2.43±0.89	Dissatisfied
Simulations	2.29±0.91	Dissatisfied
Caregivers Counseling Sessions	2.28±0.89	Dissatisfied
Others*	2.27±0.80	Dissatisfied
Grand Mean Score	2.55±0.30	Satisfied

*invited subspecialty reviews, disease notification, etc;

Observation/Participation in Emergency care

Table 5 shows the students' rating of their level of satisfaction from observation and participation in the management of major childhood emergencies. They expressed satisfaction with their observation of management of paediatric morbidities including convulsion, shock, severe asthma and severe anaemia; their grand mean score of adequacy of observation was 2.66±0.13. The participants were altogether dissatisfied with their involvement in the management of these emergencies; participation grand mean score was 2.19 ±0.10.

Table 5: Satisfaction with Observation/Participation in Emergency care

Emergency care	Observation Mean Score (SD)	Interpretation	Participation Mean Score (SD)	Interpretation
Shock	2.60±0.82	Satisfied	2.09±0.79	Dissatisfied
Convulsion	2.79±0.74	Satisfied	2.25±0.80	Dissatisfied
Severe Asthma	2.64±0.92	Satisfied	2.18±0.88	Dissatisfied
Severe Anaemia	2.66±0.78	Satisfied	2.28±0.80	Dissatisfied
Coma	2.46±0.89	Dissatisfied	2.28±0.87	Dissatisfied
Others*	2.82±0.80	Satisfied	2.04±0.88	Dissatisfied
Grand Mean Score	2.66±0.13	Satisfied	2.19±0.10	Dissatisfied

*severe dehydration, severe respiratory distress, raised intracranial pressure, etc.

Clerkship during CHER Posting

Table 6 shows that at least 8 out of every 10 participants clerked a minimum of 2 patients during their CHER posting. Also, only 36(32.1%) of the students presented 1 patient to resident doctors while 21(18.8%) presented 2 patients to resident doctors. Forty three (38.4%) of the students presented 1 patient each to a consultant in CHER during the posting but 60(53.6%) of them did not make any presentation to a consultant in CHER throughout the posting.

Table 6: Participants' participation in clerkship during CHER Posting (N=112)

Clerkship during CHER Posting	Participants' participation Frequency, n	Percentage (%)
Patients clerked in CHER		
0	9	8.0
1	6	5.4
2	32	28.6
3	31	27.7
≥4	34	30.5
Presented to Resident Doctor		
0	42	37.5
1	36	32.1
2	21	18.8
3	6	5.4
≥4	7	6.3
Presented to Consultants		
0	60	53.6
1	43	38.4
2	7	6.3
≥3	2	1.8

Determinants of adequate satisfaction with CHER Posting

The overall satisfaction level with CHER posting among the participants was significantly higher than their satisfaction level with their preceding posting in other paediatric units (*59.50± 18.39 vs. 51.47±19.88; t=3.137, p=0.002*). Table 7 shows factors influencing participants' overall satisfaction with CHER posting; those in junior posting were at least 3 times more likely to be satisfied with their posting compared to those in senior posting (*OR=3.45, 95%CI:1.46-8.15; p=0.005*). Other variable were not statistically significant (Table 7 below).

Table 7: Determinants of adequate overall satisfaction with CHER Posting (≥70mm VAS)

Determinants	B (regression co-efficient)	P value	Odds ratio	95% CI for OR Lower	Upper
Type of Posting					
Junior	1.237	0.005**	3.446	1.457	8.147
Senior*	1		1		
Re-sit/ Repeat Student					
Yes	-0.315	0.743	0.730	0.111	4.812
No*	1		1		
Posting objective day 1					
Yes	0.702	0.094	2.018	0.886	4.596
No*	1		1		
Read Student Workbook					
Partly	-0.654	0.237	0.520	0.176	1.537
Fully	-0.552	0.406	0.576	0.157	2.117
Others*	1		1		
Patients Clerked CHER					
<3	0.056	0.899	1.058	0.442	2.534
≥3*	1		1		
Presented to Resident					
<3	.020	0.978	1.020	0.251	4.142
≥3*	1		1		
Presented to Consultants					
<2	-0.128	0.868	.880	0.195	3.976
≥2*	1		1		
Constant	-0.828	0.421	0.437		

R^2 (co-efficient of determination) = 11.3% - 15.1%,
*Reference category
**Statistically significant

Challenges and suggestions for CHER Posting

Table 8a shows participants levels of agreement with possible challenges with CHER posting. Most of the participants agreed that resident doctors were too busy during their posting in CHER (*3.10±0.83*) but they did not consider lack of patients or clinical tools as significant challenges. Table 8b is a list of suggestions to improve clinical posting given by the participants. The leading suggestions were to 'increase availability of consultants and residents to teach students' as well as 'allowing senior posting students to clerk new patients and review with residents' in the emergency setting. Also, nearly a half (49.1%) of the participants suggested that 'ward rounds on patients should be separated from teaching rounds' in CHER.

Table 8a: Participants levels of agreement with possible challenges with CHER Posting

Challenges	Mean Score (SD)	Interpretations
Lack of patients to clerk	1.54±0.76	Disagreed
Resident Doctors too busy	3.10±0.83	Agreed
Consultants signature not available	2.36±0.99	Disagreed
Lack of Clinical tools	1.59±0.77	Disagreed
Grand Mean Score	2.15±0.73	Disagreed

Table 8b: List of Suggestions to improve CHER Posting by the participants

Suggestions to improve CHER Posting	Frequency, n	Percentage (%)
Increased communication of Senior Registrars with students	78	69.6
Patient round should be separated from teaching round which is now obtainable elsewhere	55	49.1
Senior posting students should be allowed to clerk new cases and review with the registrars and carried along with the treatment plan	29	25.9
More registrars should be posted to CHER to ease the workload	98	87.5
Patients compliance should be emphasized	90	80.4
Consultant should be often available to teach students clinical examinations	65	58.0
Resident doctors should pay more attention to students during rounds	69	61.6

Discussion

This study found that most students had satisfactory learning exposure in CHER except in the critical care bay. It is generally believed that CHER offers rich learning opportunities for undergraduate students because of the variety of acute presentations, significant number of patients, and different emergency procedures[2]. The unit is however organized into different specialized settings including casualty, critical care bay, CHER ward and procedure areas. These different clinical settings provide varied experiences for the student[3]. Previous studies have highlighted the need for adequate exposure and education of paediatric critical care to medical students and other health workers to improve outcome of critically ill children[14,15]. The dissatisfaction of the adequacy of learning in this area by medical student may have been because the life-threatening and unpredictable nature of children nursed in the critical care bay makes it difficult to find opportunities for optimal teaching in this section of CHER. Similarly, students might have felt incompetent in making significant contribution to the care of these children and thus avoided these sessions.

Teaching methods that provided satisfactory learning experiences in this study included ward rounds, special patient reviews and procedures and bedside teaching. Case-based teaching during ward rounds and bedside teaching is considered a very effective teaching approach with scientific basis[14]. It is therefore not surprising that participant rated such learning experiences as satisfactory. Also, simulation-based teaching method can promote learning in various sections of CHER including the Critical Care bay even in resource-limited settings[16]. Previous studies suggest that simulation-based medical education afforded student the opportunity to contact clinical scenarios earlier in their training and ensured improved patient safety and care. Zhang *et al* [17] in China found that students trained via simulation-based learning had significantly better exam results than the traditional training approach. However, their findings cannot be generalized to all settings; real-life exposure to patients is pertinent to optimal medical education. In our study, participants rated learning experiences from simulations-based learning as unsatisfactory. The poor rating of simulation-based learning in the current study may be due to insufficient exposure and the fact that not many trainers are accustomed to the teaching approach. Also, there is limited availability of varieties of simulators for clinical scenarios.

One of the opportunities for student education in the CHER includes allowing the students to clerk and present patients during the rounds [3]. Our study showed that although most of the students had clerked at least one patient during their rotation, only six in 10 and less than five in 10 students had presented at least one case to a resident and consultant respectively. Presentation of clerked patient affords trainers the opportunity to provide directed teaching to students. Directed learning with opportunities for one-on-one engagement with trainer is critical to the clinical experience of students[1]. This takes place in all units in Paediatrics. Also, it provides the opportunities for immediate feedback to the student. Formal examinations which usually occur at the end of the posting may not have significant impact in guiding learning and improving competence.

Similarly, competency in the care of acutely-ill and injured patients is one of the fundamental exit goals of most medical schools[4]. Acquiring competency requires that medical students observe and participate in the management of common childhood emergencies. In the present study, medical students rated the clinical experience gained by observation of the management of most emergency clinical presentations as satisfactory except for non-traumatic coma. However, students' rating of their participation in the management of all the emergency conditions assessed was dissatisfactory. Previous studies report that medical students, competency and confidence in providing, emergency care somewhat depended on the extent of their clinical/ emergency posting exposure. Increased exposure to medical emergencies appeared to be the main driver behind medical students' confidence in handling medical emergencies [18,19]. Although observing trainers and residents provide emergency care to children presenting at CHER has its place in improving the competence of medical students, participation and appropriate feedback should be encouraged. More active participation would reinforce learnt skills and improve confidence of the student.

The type of posting significantly affected the rating of overall satisfaction of clinical experience of the CHER posting by the students. Students undergoing junior posting rotation had three times the odd of rating the overall clinical experience as satisfactory compared to those undergoing senior posting rotation. Interestingly, Chen and colleagues in Taiwan observed that paediatric

residents' satisfaction with paediatric emergency training decreased with their increasing seniority in residency program[20]. While the reason for this decline in satisfaction with clinical exposure is not apparent, it is likely that the more senior students had a better understanding of the required goals of the training and thus had more expectations compared to the junior students. Also, more attention may have been inadvertently paid to the training of junior students by trainers considering the fact that they have not had previous exposures to the unit unlike the senior students. It may be necessary to have distinct learning goals for each posting and different teaching approaches to meet the learning goals of the different students postings.

A high workload in CHER was identified as an important challenge to the clinical exposure of medical students in this study. Increasing CHER manpower and improved communication between senior residents and students as well as separating teaching rounds from patient rounds were suggested as means of improving students' clinical exposure. Previous authors have also supported the use of a dedicated teaching shift to protect the teacher and learner from tasks and duties that may distract from an instructional goal [21,22]. This approach is suggested to optimize the time available for teaching in the clinical environment.

The strength of this survey is the assessment of the participants' relative satisfaction levels in the various sections of the CHER. The limitation of this study may include a recall bias of their clinical exposure but the short recall interval following completion of the posting mitigates this challenge. Also, although the lead researcher works in the unit, this could not significantly influence participants' satisfaction levels because they had access to all trainers in the unit during the study.

Conclusion

The overall clinical experience of medical student in the children emergency room is satisfactory but there is inadequate simulation-based teaching, case presentation and participation in case management. Curriculum reforms might focus on adequate hands-on experience, simulation-based teaching and the use of dedicated teaching shifts for medical students. Trainers should outline learning goals for students in the critical care bay and ensure such goals are achieved. Also, students should promptly present cases to trainers and residents for improved overall clinical experience during CHER postings.

Authors' Contribution
Author MTA designed the study, collected the data and interpreted it; author PEI carried out literature searches and wrote the initial draft of the manuscript. Both authors critically reviewed and approved the final manuscript.

Conflict of Interests: None
Funding: None

References

1. Iyer MS, Mullan PB, Santen SA, Sikavitsas A, Christner JG. Deliberate Apprenticeship in the Pediatric Emergency Department improves experience for third-year students; *West J Emerg Med. 2014;15(4):424-9*
2. Shaban S, Cevik, AA, Canakci, ME, Kuas C, El Zubeir M, Abu -Zidan F. Do senior medical students meet recommended emergency medicine curricula requirements? *BMC Med Educ. 2018;18(1):8*
3 Coates WC. An educator's guide to teaching emergency medicine to medical students. *Acad Emerg Med. 2004;11 (3):300–6*
4. Burdick WP, Jouriles NJ, D'Onofrio G, Kass LE, Mahoney JF,Restifo KM. Emergency medicine in undergraduate education. *Acad Emerg Med. 1998;5:1105–9*
5. Pacella CM. Advanced Opportunities for Student Education in Emergency Medicine. *Acad Emerg Med 2004;11 (10):1028.e9-1028.e12*
6. Burnette K, Ramundo M, Stevenson M, Beeson MS. Evaluation of a web-based asynchronous pediatric emergency medicine learning tool for residents and medical students. *Acad Emerg Med. 2009; 16 Suppl. 2:S46-50*
7. Fielder EK, Lemke DS, Doughty CB, Hsu DC, Middleman AB. Development and assessment of a pediatric emergency medicine simulation and skills rotation: meeting the demands of a large paediatric clerkship. *Med Educ Online. 2015; 20:(1): 29618*
8. Mulcare MR, Suh EH, Tews M, Swan-Sein A, Pandit K. Third-year medical student rotations in emergency medicine: a survey of current practices. *Acad Emerg Med. 2011; 18: Suppl 2:S41-7.*
9. Pusic MV, Best R, Black JB, Mutnick A. Exploring Medical Student Learning Needs in the Pediatric Emergency Department: "What Do You Want to Learn Right Now?". *Pediatr Emerg Care. 2016; 32 (4):217-21*
10. Vashe A, Devi V, Rao R, Abraham RR, Pallath V, Umakanth S. Using an integrated teaching approach to facilitate student achievement of the learning outcomes in a preclinical medical curriculum in India. *Adv Physio Educ. 43:522-528.*

11. Gukas ID. Global paradigm shift in medical education: issues of concern for Africa. *Med Teach. 2007; 29(9):887-92.*
12. Avegno J, Leuthauser A, Martinez J, Marinelli M, Osgood G, Satonik R, Ander D. Medical student education in emergency medicine: do students meet the national standards for clinical encounters of selected core conditions? *J Emerg Med. 2014; 47(3):328-332.*
13. Bloomfield L, Harris P, Hughes C. What do students want? The types of learning activities preferred by final year medical students. *Med Educ. 2003; 37 (2):110-8*
14. David A. Wald DO. Teaching Techniques in the Clinical Setting: The Emergency Medicine Perspective. *Acad Emerg Med. 2004; 11(10):1028.e1-e8*
15. Al Ansari M, Al Bshabshe A, Al Otair H, et al. Knowledge and Confidence of Final-Year Medical Students Regarding Critical Care Core-Concepts, a Comparison between Problem-Based Learning and a Traditional Curriculum. *J. med. educ. curric. Dev. 2021;8:1-10*
16. Canarie MF, Shenoi AN. Teaching the Principles of Pediatric Critical Care to Non-Intensivists in Resource Limited Settings: Challenges and Opportunities. Front. *Pediatr. 2018; 6:44*
17. Zhang M, Cheng X, Xu A, Luo L, Yang X. Clinical simulation training improves the clinical performance of Chinese medical students. *Med Educ Online. 2015; 20:28796*
18. Xie JY-Y, Frost R, Meakin R. Not quite a doctor, but should I help? A qualitative exploration of medical students' attitudes towards responding to medical emergencies that occur in the public domain. *BMJ Open. 2019;9:e028035.*
19. Freund Y, Duchateau FX, Baker EC, et al. Self-perception of knowledge and confidence in performing basic life support among medical students. *Eur J Emerg Med. 2013;20:193–6.*
20. Chen W-C, Chaou C-H, Ng C -J, Liu Y-P, Chang Y-C. Assessing the effectiveness of pediatric emergency medicine education in emergency medicine residency training: A national survey. *Hong Kong J Emergency Medicine. June 2020;*
21. Williams KN, Ramani S, Fraser B, et al. Improving bedside teaching: findings from a focus group study of learners. *Acad Med. 2008;83(3):257–64*
22. Natesan S, Bailitz J, King A, et al. Clinical Teaching: An Evidence-based Guide to Best Practices from the Council of Emergency Medicine Residency Directors. *West J Emerg Med. 2020;21(4):985-998.*