Enhanced learning strategies of undergraduate medical students with a structured case presentation format

Sarabmeet Singh Lehl, Monica Gupta, Sanjay D'Cruz

Abstract:

BACKGROUND: Improvement of the learning in undergraduate bedside teaching needs to be promoted through innovative interventions. Changes in the structured format (SF) for bedside case discussion may help students improve their learning experience and gain insights into collaborative self-directed learning. The aim of the present study was to encourage collaborative and self-directed learning strategies by MBBS undergraduate students through a new case presentation format structured for this purpose.

MATERIALS AND METHODS: This was an interventional study carried out in the year 2010–2011. A new SF for bedside cases presentation was developed. A comparison with the traditional format was done by holding one session in each format. Uniformity of topic and teaching style was ensured by having the sessions on pulmonary medicine cases with the same teacher. The student perspective of the educational process was analyzed using evaluation pro forma, Likert scale, and narratives.

RESULTS: Ninety final year and prefinal year MBBS students participated in this study. There was significantly higher participation in history taking (50.7%) and clinical examination (60%) in the SF. A higher statistically significant number of clinical possibilities were considered in the SF (85.3% vs. 66.6%). Similarly, significantly higher number of students indulged in self-directed learning and referred to learning resources in the SF. The SF provided students an active role (96.9%), encouraged access to resources (93.9%), and control of learning (75.7%). The additional interactive session was productive (90.9%), discussions were streamlined (66.6%), and the role of a teacher was considered important (75.7%).

CONCLUSION: The SF generated higher participation in the aspects of history taking, clinical examination, and consideration of differential diagnoses. It led to a perceived improvement in self-directed and collaborative learning among students.

Keywords:

Bedside learning, innovation, medical students, problem-based learning, self-directed learning, structured formats

Department of General Medicine, Government Medical College and Hospital, Chandigarh, India

Address for correspondence:
Dr. Monica Gupta, Department of General Medicine, Level 4 D Block, Government Medical College and Hospital, Sector 32, Chandigarh - 160 030, India.
E-mail: drmg1156@gmail.com

Introduction

Bedside teaching is an essential component of undergraduate medical training. This learning environment is considered better than didactic teaching in the development of essential skills in doctor–patient communication, elicitation of history, clinical examination, and engendering reasoning and professionalism in students.

It lies at the heart of medical education and practice as its focus is on the problem of the authentic patient.[1,2]

Failure to utilize the full potential of this methodology represents a missed opportunity due to a variety of factors including lack of teaching and facilitation skills, time constraints, diverse administrative demands on teachers; noncooperation and rapid turnover of patients; overdependence

on diagnostic technologies; and a failure on the part of students to accept autonomy over their learning. This leads to opportunistic teaching without active involvement of all the students or a time for reflection and discussion to meet their diverse learning needs.[1-4]

The learning process, based on psychological and sociological approaches, is a blend of individualistic and social constructivist philosophy. This includes activation of prior knowledge and acquisition of new knowledge from perceptions arising from interaction in a social environment. In the clinical setting, it occurs through team cohesion, social bonding, and learning by the whole group.[4-6]

In case-based teaching, preceptors set the stage for experiential learning by anchoring instruction into cases, actively involving students, modeling professionalism, providing direction, feedback, and creating a collaborative learning environment.[4] Learning in the clinical environment is influenced by many factors some of which are outside the teacher's control. Increasing student admissions in medical institutes places a higher demand for expert teachers to supervise them with the aim of developing a competent health professional workforce which can adapt, transfer, and apply knowledge in an effective and timely manner.[7,8]

Problem-based learning (PBL) model in preclinical teaching has much in common with student learning during clinical attachments, but it has been underutilized in this phase of medical education.[9] Application of PBL principles in clinical encounters with real patients has a positive influence on student learning.[10]

The aim of the present study was to encourage collaborative and self-directed learning strategies by MBBS undergraduate students through a new case presentation format structured for this purpose.

Materials and Methods

Study design and setting
This interventional educational research was conducted in the Department of General Medicine at a Government Medical College in India during the MBBS clinical rotation of 4-week duration in the year 2010–2011.

Study participants and sampling
All successive final and prefinal year MBBS students who came for bedside clinical rotations in small groups eight–ten students participated in the study. A total of ninety students participated in this study.

Data collection tool and technique
A written and informed consent of all the student participants was taken. The student perspective of the educational process was analyzed using evaluation pro forma (EVP), Likert scale, and narratives. The data were evaluated using descriptive statistics and Chi-square test.

Ethical consideration
The study was approved by the Research and Ethics Committees of the Medical College vide No. GMC/TA-I (19D)/53206 Dated September 23, 2010.

Methodology
To ensure uniformity of subject content and teaching style, the cases used in the discussion were from pulmonary medicine and one faculty member conducted the sessions being evaluated. This faculty member had one clinical session per week with each group of students. The traditional case presentation form for clinical case presentation was reviewed by taking inputs from faculty members and students. This was called traditional format (TF) for the purpose of the study. Then, the new structured format (SF) for the intervention was developed by the faculty based on a SF used in an earlier study.[10] The aim was to introduce elements for collaboration, self-learning, and revisiting the problem. Both formats are shown in Table 1 (the additional activity in the SF is shown in italics). This format also had an additional tutorial of 1 h duration after a 2-day interval.

The first clinical bedside session (Week 1) was conducted using the TF of bedside teaching, i.e. one student prepared the case using the TF which was discussed with the whole group. Before the fourth clinical bedside session (Week 4), the participants were introduced to the SF. They were required to prepare the case using the instructions in the SF [Table 1].

The evaluation was done through two pro formas. The first pro forma was a Self-Assessment Questionnaire (SAQ) [Table 2] consisting of Yes/No and open-ended questions to identify the learning activities undertaken by the individual participants. This was completed by the students immediately before the first case presentation (Week 1) as SAQ-TF and before the fourth session (Week 4) as SAQ-SF. At the end of the clinical rotation in General Medicine, participants were asked to complete an EVP which had ten predesigned statements to be rated on a 5-point Likert scale. In addition, comments from the participating students were also invited [Table 3]. All questionnaires and pro forma were strictly anonymous, and students were required to submit them in a box for evaluation.

Results

Ninety students of the MBBS prefinal and final professional participated in this study. Completed responses were received from 60% in the TF and 83.3%

Table 1: Outline of the traditional and structured case presentation format

Format	TF	SF
Case presentation		
Patient information, demographic details		
Case presentation sub-headings		
Presenting complaint/s history of present illness, history of past illness, medication history, personal history, family history, socioeconomic history		All students
		Discuss what clinical possibilities can be considered from the chief complaint and complete history
		What more questions or information need to be asked?
GPE		
Systemic examination (pulmonary) inspection, palpation, percussion, auscultation		All students
		Interpret and discuss the clinical findings?
Systemic examination: other systems (in brief)		Develop a consensus in systemic examination
Clinical diagnosis		All students
		Discuss the different clinical possibilities
Investigations		All students
		Discuss the possible investigations in order of priority, which will help you confirm the diagnosis
Management		All students
		Discuss the possible treatment of the condition
	Traditional format ends with case discussion with the tutor by the presenting student in the small group	Structured format case discussion with the tutor by the presenting student in the small group
		Self directed learning interval
		Instructions: The students will do further self-study based on the discussion
Second session after self-directed learning interval in structured format only		Review: The case is discussed again after 2 days with the faculty without the patient

All items are similar but the structured format has additional instructions for students. GPE=General physical examination, TF=Traditional format, SF=Structured format

Table 2: Questionnaire to identify prior self-directed and collaboration by students

Are you presenting the case: Yes/no

If, No, did you actively participate in the case work-up allotted yesterday: Yes/no

If you did participate, please list how you participated: (e.g. Provided inputs on history, examination, diagnosis, any other)

List the diagnostic possibilities you considered in the case which is going to be discussed today

What textbooks/other learning tools have you referred to during the work-up of this case

in the new format (SF), respectively. The response to the SAQ is shown in Table 4.

The participation in case history taking and clinical examination was significantly higher with SF. The student interaction on discussion of differential diagnosis was poor in both groups, however statistically better with the new format. A larger percentage of students considered at least two appropriate diagnostic possibilities in the SF as compared to TF, and this difference was also statistically significant. Majority of the students in both groups accessed at least two or more educational resources, but again there was marked improvement in their ability and keenness in accessing the resources in the SF.

The commonly prescribed textbooks of clinical methods, that is, MacLeod's Clinical Examination and Hutchison's Clinical Methods were accessed by the majority of students, whereas standard textbooks of General Medicine such as Harrison's Principles of Internal Medicine and Davidson's Principles and Practice of Medicine were less frequently consulted for clinical bedside cases.

The EVP was completed by 66 students (73.3%). The responses were clubbed into two main groups, i.e., agreed – strongly agreed and disagreed – strongly disagreed, while the undecided responses were excluded. This is shown in Figure 1. The majority of students perceived that the two formats were inherently dissimilar, TF was not better and it did not provide more opportunities for self-expression nor did it increase student interest. On the other hand, students perceived that, in SF, they had a more active role, accessed more resources, and had more control on learning. The majority did not consider the additional session in SF to be a waste of time or that the discussions did not occur in a streamlined manner. Importantly, the majority of students indicated that the teacher had an active role to play in any bedside teaching.

A summary of the free responses of students' experience of the two processes was that the SF promoted group activity by involving active participation of all students (*n* = 44, 66.6%); 16 responses (24.2%) that

Table 3: Format for evaluation of postrotation experience of students with traditional and structured format

Rate the statements below on a Likert Scale of 1-5 as indicated 1: Strongly agree, 2: Agree, 3: Not sure, 4: Disagree, 5: Strongly disagree	1 Strongly agree	2 Agree	3 Not sure	4 Disagree	5 Strongly disagree
There is no difference between the two methods of teaching clinical cases					
The traditional method of case presentation is not as good as the structured method					
I had more opportunities to express my point of view in the traditional format					
I was more actively participating in the structured format					
The structured format enabled me to access more sources of information					
My interest was higher in the traditional format					
The extra time spent in the structured format is a waste					
The discussion in the structured format was not smooth or streamlined					
The active role of the teacher is the most important component in a bedside case study					
The structured format gave me a feeling of control on my learning needs					

Instructions: You have experienced two formats of bedside case presentations. Express your views on these formats in a few sentences

Table 4: Analysis of students' participation and learning activity

Learning Activity	Traditional format respondents, *n* (%)	Structured format respondents, *n* (%)	*P*
Total students (*n*=90)	54 (60)	75 (83.3)	0.0005 (S)*
Group participation/collaboration			
Case history	16 (29.6)	38 (50.7)	0.0169 (S)*
Clinical examination	22 (40.7)	45 (60)	0.0308 (S)*
Discussion	12 (22.2)	29 (38.7)	0.0478 (S)*
Individual student learning activity			
Considered at least 2 clinical possibilities	36 (66.6)	64 (85.3)	0.0122 (S)*
Referred to educational material			
Two or more resources	30 (55.6)	55 (73.3)	0.0356 (S)*
Specific resources/textbooks referred			
MacLeod's	46 (85.2)	65 (86.7)	0.8107 (NS)*
Hutchison's	30 (55.6)	47 (62.7)	0.4166 (NS)*
Harrison's	14 (25.9)	18 (24)	0.8027 (NS)*
Davidson's	20 (37.03)	38 (50.7)	0.1247 (NS)*

*Chi-square test, *P*<0.05=Significant. S=Significant NS=Not significant

SF was a better, organized, and step-wise approach. Responses directed toward the content varied from 8 (12.1%) indicating that SF increased understanding and learning and 22 (33.3%) that it increased the diagnostic and analytical capabilities. The learning environment in SF was described in various terms as interesting, effective, better, friendly, comfortable, less fearful, student oriented, encouraged expression and discussion, resolved doubts, promoted thinking process, self-learning, and curiosity. Two responses indicated that the teacher needed to be experienced in effectively using a new format of learning.

Discussion

In addition to the paucity of information on conducting effective bedside teaching in textbooks of medical education, a literature review observed that the utilization of this modality was declining due to many factors including an increased reliance on technology and simulation.[3] However, while determining competence for practice, replacement of the long case by objective structured clinical examination (OSCE) with the promise of a more reliable assessment has been challenged by the higher reliability of 0.84–0.88 for the long case versus 0.73 for OSCE.[11] Therefore, there is a need to retain and improvise the long case in bedside clinical examination for assessment of clinical bedside skills and competence.

Utilization of a structured musculoskeletal examination by trainees across a range of postgraduate specialties indicated that 90% perceived that it led to more confidence in the examination of this system.[12] A structured PBL tutorial for teaching nervous system increased the comfort, accountability, preparedness, and participation by students in addition to efficient utilization of time. However, some participants considered the SF resulted in an increase of workload, lack of flexibility, restricting the free flow of ideas, and conversion of an effective discussion into a series of presentations.[13] A similar viewpoint emerged in a model of PBL for clinical attachments where students identified a need for complementary clinical skills teaching, loss of flexibility, and potential conflict with informal
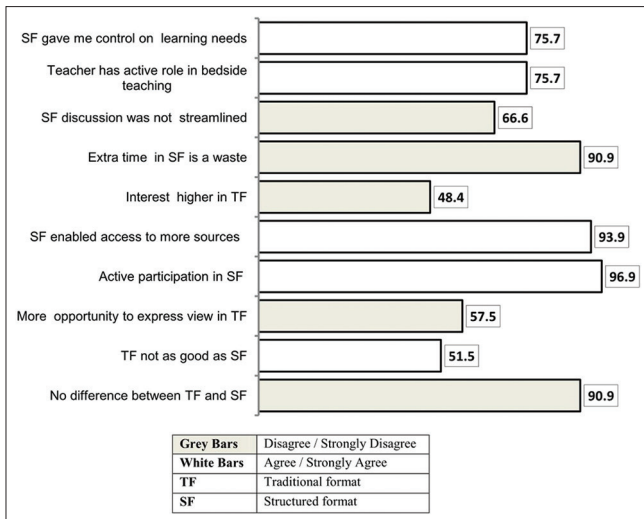
Figure 1: Analysis of responses to the end-of-rotation evaluation pro forma by 66 participants (in percentages)

bedside teaching and relationship to the objectives of the course.[10]

In a controlled study to evaluate whether structured teaching of bedside cardiac examination skills would improve the medical residents' examination technique, two groups of medical residents were evaluated using either a traditional demonstration and practice method or an innovative collaborative discovery method against a control group which received usual ward teaching. Both intervention groups had better technical examination skills compared with controls after the session. However, there was only modest benefit as it did not translate into a significant increase in recognition of key clinical findings.[14] Another study investigated medical students' and tutors' views on competencies and behaviors in small group settings and they concluded that collaborative learning promoted constructiveness of feedback; active listening and contribution and goal orientation.[15] The value of collaborative learning to ease conceptualization and retention of practical knowledge has also been advocated in a recent review.[16] Another structured bedside teaching module in pulmonary medicine helped students enhanced their clinical skills, understand complex material, and promoted inquiry and critical thinking.[17]

In the present study, participation in case history, examination, and consideration of alternative clinical possibilities was significantly higher in the SF; however, the use of additional learning resources, other than standard prescribed textbooks such as e-resources or references was inadequate. Although the students spent more time in discussion in the SF but on a whole, the percentage of individual participation was poor in both the formats. The possible explanation for failure to

achieve the intended outcomes is that students did not have prior training in PBL processes in the preclinical years, resulting in their inability to achieve the expected goals as learners by identifying material for self-learning. Probably, the TF did not encourage the development of collaborative learning skills and peer-learning and therefore their participation was limited despite sensitizing them regarding the key features in the new case format before the allotment of the case. Students who enter a medical school where a PBL curriculum is already in place have been observed to adapt and embrace the independence and responsibility generated by this process to transition successfully in clinical clerkships. On the other hand, students from institutions with traditional teaching appear to find this transition to the clerkships difficult as they are not prepared to be more independent or to naturally assume responsibility for their learning.[10] It is suggested that bedside sessions should be structured well before, during, and after the encounter.[18] The structured approach may provide a "scaffolding" by directing students toward more effective learning strategies with emphasis on preparation, participation, and accountability.[13]

In the present study, the role of the teacher in both sessions was that of an expert and students felt that active participation by teachers with experience would help in implementing this methodology. In different forms of PBL, the teacher has often been ascribed a facilitative or a nonexpert role but the importance of a teacher having subject as well as process expertise has been also highlighted in studies.[19,20] Teaching is similar to clinical situations, and an expert supervisor can result in increased efficiency and reduced cognitive load for students. A subject matter expert to facilitate the PBL process was observed to be especially relevant in an environment where prior exposure to active self-learning or PBL strategies have not been ingrained in the students in their earlier educational years.[8-10] The utilization of educational resources by students in the present study was inadequate, indicating a need for the teacher to direct them toward relevant resources or internet-based searches.

A structured teaching format, ACTIVE, was observed to improve resident engagement and knowledge with minimal resources and offered an innovative alternative to a standard lecture without compromising on other activities or introducing major structural changes in the residency program.[21]

In the present study, students perceived that the two formats were different and the new format enabled them to express their views in a comfortable environment that encouraged group participation. It must be appreciated that, in educational research,

enthusiasm of students for innovative teaching strategies has often produced a biased opinion in favor of any new method used in educational research.[10] However, it has been observed that students prefer a more positive learning environment with higher levels of involvement, task orientation, innovation, and individualization.[22]

The MBBS teaching program is tightly scheduled and extra time for participation in new teaching activities encroaching on students and faculty time is an administrative deterrent. An evaluation of ward-based teaching identified clinical teaching to be a valuable but underutilized methodology, with incongruence between student and teacher expectations and indicated a need for protected time for this activity, as well as blended teaching and faculty development.[23] As review meetings after an interval are not always possible due to other competing teaching schedules, an asynchronous learning mode may be adopted.[10] Such an approach using an online virtual learning environment, within a PBL strategy was a viable opportunity for student as well as faculty training.[24] PBL is an established means of effective small group teaching method for medical students.[25] In addition, training with simulated patients blended with small group teaching at the bedside with real patients may achieve an increase in student competence.[26]

The present study conducted among a small group of students with a single faculty member and topic in a single institution is a factor that will not set the stage for immediate generalization of the results. There are, however, similarities with other studies on this subject. Developing countries are gearing up to meet the shortage of medical professionals by increasing intake of students into undergraduate medical courses which may not be matched by a proportionate increase in trained medical faculty. Therefore, faculty priorities, which include, among other things, an increasing clinical work load, leadership role in the workplace, administrative commitments, research, and teaching activities without losing sight of personal development and self-care will need to be constantly recalibrated.[27] This brings in the concept of faculty development which should mirror the rapidly changing educational landscape.

Limitation and recommendation
There were few limitations and had they been foreseen; the study would have provided more vital information on student learning processes. The response rate of 60% in the TF was poor. While case selection was opportunistic, it would have been better to prepare standard cases with predefined learning objectives. In addition, the students did not independently generate learning objectives to enable Self directed learning (SDL). The gap between

case presentation and the review session was too short to allow a meaningful SDL experience.

The clinical bedside case presentation is an ideal modality for the development of competent clinicians of the future by combining communication with the patient, analysis of history, skills in clinical examination, synthesis of information, formulation of a differential diagnosis, order relevant investigations, learn professionalism, and ethics by observing faculty. This study moves away from the standard bedside teaching by including a hybrid of bedside case presentation, a SDL period, and a review session with an attempt to give more control of learning to students.

Conclusion

Whatever teaching model is used, whether it is structured or traditional teaching, it needs to take into view the learning methodology adopted by the educational system. The development of a PBL program in the preclinical years can make the transition of students easily into independent, self-motivated learners in later years. The present study was an attempt to use a structured case presentation format to enhance student learning strategies. SF generated higher participation among the students in the aspects of history taking, clinical examination, and consideration of differential diagnoses through self-directed learning and utilization of learning resources. Any innovation in the educational teaching–learning processes will also need to be synchronized with the assessment system and the regulatory authority, on its part, needs to develop matching assessment, and evaluation systems which will serve as the driver of student learning.

Conflicts of interest
There are no conflicts of interest.

References

1. Williams KN, Ramani S, Fraser B, Orlander JD. Improving bedside teaching: Findings from a focus group study of learners. Acad Med 2008;83:257-64.
2. Spencer J. Learning and Teaching in the clinical environment. Br Med J 2003;326:591-4.
3. Peters M, Ten Cate O. Bedside teaching in medical education: A literature review. Perspect Med Educ 2014;3:76-88.
4. Irby DM. Three exemplary models of case-based teaching. Acad Med 1994;69:947-53.
5. Ramani S, Leinster S. AMEE Guide no. 34: Teaching in the clinical

environment. Med Teach 2008;30:347-64.

6. Borich GD. The effective teacher. In: Borich GD, editor. Effective Teaching Methods: Research Based Practice. 9th ed. New York, USA: Pearson; 2016. p. 2-35.

7. Loewen P, Legal M, Gamble A, Shah K, Tkachuk S, Zed P. Learner: preceptor ratios for practice-based learning across health disciplines: a systematic review. Med Educ. 2017 Feb; 51 (2):146-157. doi: 10.1111/medu. 13144.

8. Pront L, Gillman D. Supervisor expertise to optimize learner: Preceptor ratios. Med Educ 2017;51:126-33.

9. Karimi N, Saadat-Gharin S, Tol A, Sadeghi R, Yaseri M, Mohebbi B. A problem-based learning health literacy intervention program on improving health-promoting behaviors among girl students. J Educ Health Promot. 2019 Dec 31;8:251. doi: 10.4103/jehp. jehp_476_19.

10. Macallan DC, Kent A, Holmes SC, Farmer EA, McCrorie P. A model of clinical problem-based learning for clinical attachments in medicine. Med Educ 2009;43:799-807.

11. Wass V, Jones R, Van der Vleuten C. Standardized or real patients to test clinical competence? The long case revisited. Med Educ. 2001 Apr; 35 (4):321-5. doi: 10.1046/j. 1365-2923.2001.00928.x. PMID: 11318993.

12. Baker KF, Jandial S, Thompson B, Walker D, Taylor K, Foster HE. Use of structured musculoskeletal examination routines in undergraduate medical education and postgraduate clinical practice – A UK survey. BMC Med Educ 2016;16:277.

13. Cardozo DL, Raymond L, White B. A structured PBL tutorial involving small teams for teaching the human nervous system. Med Teach 2012;34:e763-71.

14. Smith CA, Hart AS, Sadowski LS, Riddle J, Evans AT, Clarke PM, *et al.* Teaching cardiac examination skills. A controlled trial of two methods. J Gen Intern Med 2006;21:7-12.

15. Iqbal M, Velan GM, O'Sullivan AJ, Balasooriya C. Differential impact of student behaviours on group interaction and collaborative learning: Medical students' and tutors' perspectives. BMC Med Educ 2016;16:217.

16. Ratnani I, Fatima S, Mithwani A, Mahanger J, Surani Z. Changing paradigms of bedside clinical teaching. Cureus 2020;12:e8099.

17. Fernandes L, Mesquita AM. Developing knowledge and clinical competency in a respiratory system-based practice of final-year medical students through a novel structured bedside teaching module. J Educ Health Promot 2018;7:82.

18. Sultan AS. Bedside teaching: An indispensible tool for enhancing the clinical skills of undergraduate medical students. J Pak Med Assoc 2019;69:235-40.

19. Couto LB, Bestetti RB, Restini CB, Faria M Jr., Romao GS. Brazilian medical students' perceptions of expert versus non-expert facilitators in a (non) problem-based learning environment. Med Educ Online 2015;20:26893.

20. Bestetti RB, Couto LB, Romão GS, Araújo GT, Restini CB. Contextual considerations in implementing problem-based learning approaches in a Brazilian medical curriculum: The UNAERP experience. Med Educ Online 2014;19:24366.

21. Sawatsky AP, Berlacher K, Granieri R. Using an ACTIVE teaching format versus a standard lecture format for increasing resident interaction and knowledge achievement during noon conference: A prospective, controlled study. BMC Med Educ 2014;14:129.

22. Yazdankhahfard M, Ravanipour M, Mirzaei K. The gap in the clinical learning environment: The viewpoints of nursing students. J Educ Health Promot. 2020 Nov 26;9:311. doi: 10.4103/jehp.jehp_438_20.

23. Young L, Orlandi A, Galichet B, Heussler H. Effective teaching and learning on the wards: Easier said than done? Med Educ 2009;43:808-17.

24. Cavicchia ML, Cusumano AM, Bottino DV. Problem-based learning implementation in a health sciences blended-learning program in Argentina. Int J Med Educ 2018;9:45-7.

25. Sahu PK, Nayak S, Rodrigues V. Medical students' perceptions of small group teaching effectiveness in hybrid curriculum. J Educ Health Promot. 2018 Feb 9;7:30. doi: 10.4103/jehp.jehp_71_17.

26. Kurz S, Lohse J, Buggenhagen H, Schmidtmann I, Laufenberg-Feldmann R, Engelhard K. Improving competence and safety in pain medicine: a practical clinical teaching strategy for students combining simulation and bedside teaching. BMC Med Educ. 2021 Feb 25;21 (1):133. doi: 10.1186/s12909-021-02554-6.

27. Irby DM, Wilkerson L. Educational innovations in academic medicine and environmental trends. J Gen Intern Med. 2003 May; 18 (5):370-6. doi: 10.1046/j. 1525-1497.2003.21049.x.