REVIEW ARTICLE

Strategies for teaching in clinical rounds: A systematic review of the literature

Amin Beigzadeh, Peyman Adibi[1], Kambiz Bahaadinbeigy[2], Nikoo Yamani

Department of Medical Education, Medical Education Research Center, Isfahan University of Medical Sciences, Isfahan, Iran, [1]Integrative Functional Gastroenterology Research Center, Isfahan University of Medical Sciences, Isfahan, Iran, [2]Medical Informatics Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

Background: Strategies for teaching in clinical rounds are dispersed. There is a need to comprehensively collate bedside strategies to enhance teaching and learning and make clinical rounds more effective. **Materials and Methods:** A systematic review of English articles using Web of Science, PubMed, Embase, Scopus, and Cochrane library was conducted. Relevant keywords for teaching rounds/medical teachers/medical students/strategies and their synonyms were used accordingly. Additional studies were identified by searching reference lists of retrieved articles. All searches were conducted within a 10-day period from May 25, 2017, to June 3, 2017. In this systematic review, studies with any design on the subject of strategies for clinical rounds from clinical teachers' and medical students' perspectives were identified. Our search strategy yielded 524 articles. After removing duplicates, 337 articles remained. Based on the title and abstract review, 37 articles were obtained for further review and finally 18 entered the study. Data were extracted from the included studies. Two authors independently screened and scored the studies. We used inductive content analysis, and categories of strategies were derived from the data. **Results:** Content analysis yielded identification of strategies for clinical rounds in nine categories named: *system issues, advance planning, a preround huddle, patient issues, teachable moments, teacher issues, student issues, atmosphere issues,* and a *postround huddle*. These were classified as "before rounds," "during rounds," and "after rounds" activities. Quality assessment scores for the research studies ranged from 5 to 14 (possible range, 1–16). Fourteen (77.8%) studies received quality scores at or above 10, and 4 (22.2%) studies received quality scores below 10. **Conclusion:** Due to the importance of clinical rounds in students' learning, medical teachers should divide their teaching session into activities before, during, and after rounds. These strategies on rounding practices can improve teaching and learning.

Key words: Learning, systematic review, teaching, teaching rounds

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INTRODUCTION

Teaching and learning of medicine is basically premised upon patients' encounters in the clinical environment where patients and their problems lie at the heart of clinical teaching. At both undergraduate and postgraduate levels, clinical teaching encompasses routine teaching rounds, bedside rounds, daily clinical care, its analysis by discussion and decision-making, and opportunistic or highly structured teaching sessions held in inpatient and outpatient settings.[1] Clinical environment is the only setting where skills of history taking, physical examination, decision-making, clinical reasoning, and the humanistic aspects of medicine such as professionalism can be taught and learned.[2] Therefore, clinical teaching is the cornerstone of medical education where we should give heed to as much clinical exposure as possible because the identity and professional development of medical students is formed in this setting.

Although teaching in such an environment with the presence of the patient is very common, but clinical exposures or clinical rounds are conducted with little standardization.[3] In parallel, studies suggest variable teaching quality or varied rounding practices

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Address for correspondence: Dr. Nikoo Yamani, Department of Medical Education, Medical Education Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. E-mail: yamani@edc.mui.ac.ir

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by teachers[4] and lacking creativity for teaching at the bedside.[5] Finally, effective rounds cannot be practiced due to lack of teachers' preparedness before bedside teaching.[6-8] The resultant of such instances is students' incompetency by having inadequate bedside teaching skills[7,9,10] and lack of confidence when examining patients.[11]

By the same token, evidence shows that, in recent years, there has been a shift in clinical teaching from inpatient care to outpatient care or the clinics. This not only brings down the proportion of routine teaching rounds and daily clinical care at the bedside, but also hinders medical students from following and learning the natural history of a disease.[1] The results of surveys reveal that the move from bedside teaching, a dominant model of instruction, to conference rooms and hallways is on a rise, and time allocation spent at the bedside varies from 15% to 25%.[12] This signifies that teaching in rounds or by patients' bed is losing its popularity among medical community.

On the premise of the current literature concerning the paucity of comprehensive and widely recognized best practices for rounding practices and the shift away from the teaching rounds which make teaching in the clinical environment less intrinsic, we conducted this systematic review based on the available information to generate an extensive list of strategies to be used on rounds to enhance teaching, learning, as well as patient care. The comprehensive identified strategies are pinpointed steps that guide the medical teacher to move from one activity to another by taking into account the needs of students and patients. Our findings can be a basis for more research concerning teaching in the clinical environment to manage clinical rounds more effectively. A management plan can also be used to redesign or reorganize teaching in the clinical environment by taking the findings of this study into consideration. Thus, to improve rounding practices to be beneficial for the clinical teacher, students, and patients, we sought to provide a reliable synthesis of the available evidence with prespecified eligibility criteria to address our specific research question: What are the strategies for clinical rounds in order to increase the effectiveness of teaching and learning from clinical teachers' and students' perspectives based on the available literature?

MATERIALS AND METHODS

Search methods for identification of studies

We performed a systematic literature search on the subject of strategies for clinical rounds from clinical teachers' and medical students' perspectives, using Web of Science, PubMed, Embase, Scopus, and Cochrane library [Table 1]. No time limit was considered for article searching to collate as many relevant papers as possible. Synonyms were used for the domains "medical students/clinical teachers/strategies" and the determinant "clinical round" [Table 1]. We tried to consider our searches as extensive as possible to ensure that as many possible of the necessary and relevant studies will be included in our review. In this regard, comprehensiveness and maintaining relevance were taken into consideration when developing the search strategy. The reference sections of all retrieved articles were manually scanned to identify additional potentially relevant articles as well [Figure 1].

Criteria for considering studies for this review

Articles meeting the following criteria were eligible for review. They encompassed (a) English-language articles; (b) electronic full-text articles; (c) articles regarding the strategies for clinical rounds from the perspectives/opinions of clinical teachers and medical students; (d) in case of reflections from multidisciplinary teams, only those related

Table 1: Search syntax for Web of Science, PubMed, Embase, Scopus, and Cochrane

Database	Syntax (June 03, 2017)	Hits
Web of Science (TO)	("teaching round" OR "ward round" OR "ward round teaching" OR "bedside teaching" OR "bed-side teaching" OR "bedside round" OR "bed-side round" OR "attending round" OR "clinic round" OR "training round" OR "educational round" OR "bedside education" OR "bed-side education" OR "clinical round" OR "bedside case presentation" OR "bed-side case presentation" OR " bed-side teaching" OR "teaching at bedside" OR "bedside demonstration" OR "bed-side demonstration" OR "bedside training" OR "bed-side training") AND ("medical students" OR "students" OR "externs" OR "interns" OR "residents" OR "externship" OR "internship" OR "residency" OR "medical externs" OR "medical interns" OR "medical residents" OR "clinical clerkship" OR "medical teachers" OR "clinical teachers" OR "medical clinical teachers" OR "faculty members" OR "clinical faculty members" OR "clinical instructors" OR "clinical practitioner" OR "clinical preceptor" OR "clinical trainer" OR "clinical mentor" OR "clinical doctor" OR "academe" OR "medical house staff" OR " medical house-staff" OR "medical tutors") AND ("solutions" OR "strategies" OR "improving" OR "remedies" OR "overcome" OR "advantages" OR "benefits" OR "merits" OR "enhancing")	61
PubMed (TI, AB)	The above-mentioned search: All search terms in title and abstract	131
Embase (TI, AB)	The above-mentioned search: All search terms in title and abstract	109
Scopus (TI, AB, KW)	The above-mentioned search: All search terms in title, abstract, and keyword	175
Cochrane (TI, AB, KW)	The above-mentioned search: All search terms in title, abstract, and keyword	33
Total		509

TO=Topic; TI=Title; AB=Abstract; KW=Keyword

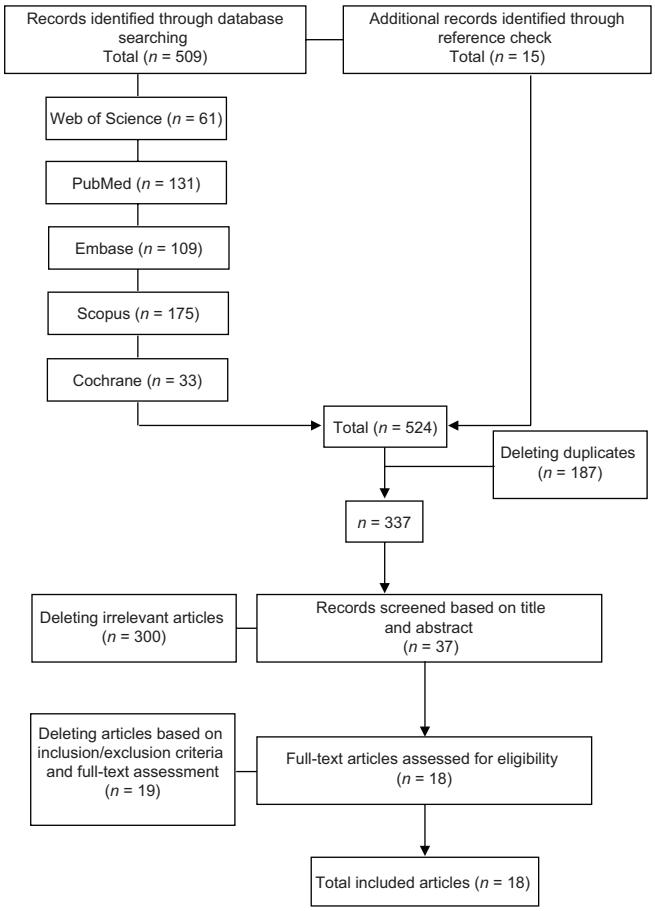

Figure 1: Flowchart depicting the literature search and study selection process

to medical teachers and medical students were included; (e) original articles not letter to editor, short communication, review article, editorial, commentary, conference paper, discussion paper, and any sort of gray literature; and (f) articles with any research design could be included in our systematic review. It is important to mention that the result and discussion sections of all included studies were perused for data extraction. We also used conclusion section for data extraction in order not to miss any strategies put forward by the writer of the article as some papers might have indications of writer's point of view in this section. In our systematic review, we considered the term "clinical round" with all its variations such as bedside teaching, ward round teaching, and attending rounds when searching for relevant articles. Our main focus was on the encounters involving the clinical teacher and a team of multilevel learners (medical students, interns, and residents) where teaching takes place on a round. We excluded other formats of rounding practices such as family-centered bedside rounds where patient's family is present and involved in the process of clinical care and teaching.

Screening process and selection of studies

At the initial screening stage (preliminary screening), we screened relevant articles with regard to title and abstract. Irrelevant articles were excluded at this stage. Full text of relevant articles was obtained to be screened for eligibility. By the same token, we removed duplicate records of the same study (if any identified). In case of not accessing some databases due to access limitation, the name of the articles, DOIs, or any relevant information was forwarded to a person in the main medical library of Kerman University of Medical Sciences with access to such databases to find the studies.

Verification of extracted data

To extract or obtain data, a strategy search was compiled and confirmed by a health-care librarian. Then, relevant databases were searched by one of the authors (AB). The search results were checked with the health-care librarian and modifications were made as appropriate. Concerning the eligibility assessment, two authors independently examined the titles and abstracts of the retrieved articles to obviate irrelevant studies; full text of the potentially relevant studies was retrieved and examined for compliance with the eligibility criteria. In case of any disagreement between the two reviewers regarding article inclusion, a third person of the research team was negotiated to resolve any discrepancies. However, in case of existing disagreement, arbitration by another person was sought. The reviewers assessing the relevance of studies were not blinded to the names of authors or journal publication.

Data abstraction

All data were abstracted from the included studies in the review by one member of the research team (AB) to confirm eligibility for full review, and another review author (NY) checked the extracted data relevant to the study questions. This was done using a data abstraction form. The final version of the form was created after the initial data abstraction on six randomly selected included articles and the discussion among the research team to refine and confirm it (whether the abstraction form served to collect all relevant data). The following information was sought from each article: first author's name, type of study design (any type), participants, sample size, geographical location of the study, and year of publication [Table 2].

Data extraction form (quality scoring form)

To assess the quality of the included studies (both quantitative and qualitative) in our systematic review, we developed a valid and reliable scale. This quality scoring form was developed based on the literature review by aggregating our findings and designed a form specific for our systematic review. Some modifications were applied based on the feedback received from experts competent in doing systematic reviews. In this regard, some items were added

Table 2: Summary of Included Studies identifying the strategies for clinical rounds (sorted by year)

Source	Design (data collection)	Participants	Sample size	Country	Year	Quality score
Farhan Khashim Al-Swailmi *et al*.	Focus group discussion	4th-year and 5th-year medical students	75	Saudi Arabia	2016	10.5
Nader Najafi *et al*.	Focus group discussion, interview, open-ended questions	Attending physicians, residents, interns, medical students	54	USA	2015	11.5
Jade Force *et al*.	Questionnaire	Surgical consultants, 4th-year medical students	35	UK	2014	9.5
Jed D. Gonzalo *et al*.	Telephone interview	Attending physicians	34	USA	2014	12
Ishtiaq Alikhan	Questionnaire, group discussion	Clinical teachers	18	Pakistan	2014	10
Praveen L. Indraratna *et al*.	Questionnaire	Senior medical students	517	Australia	2013	14
Abdullah Shehab	Questionnaire	SPRs, consultants	45	UK	2013	12
Jed D. Gonzalo *et al*.	Telephone interview	Attending physicians	34	USA	2012	12
Brita Roy *et al*.	Card sorting technique	Attending physicians, Residents, 3rd-year medical students	119	USA	2012	13
Andrew Claridge	Small group discussion, questionnaire	SPRs, FY1 and FY2 doctors	47	UK	2011	9
Graeme Dewhurst	Focus group discussion	SPRs, SHOs, FY1 doctors	17	UK	2010	11
Chrystal Jaye *et al*.	Group interview, individual interview	Clinical teachers, 4th-year medical students	21	New Zealand	2009	11
Keith N. Williams *et al*.	Focus group discussion	4th-year medical students, 1st and 2nd year residents	33	USA	2008	10
Analia Castiglioni *et al*.	NGT technique	Residents, interns	28	USA	2008	12
Celenza A and Rogers IR	Questionnaire	Registrars, consultants	31	Australia	2006	9
Regina W. Janicik and Kathlyn E. Fletcher	Group discussion, workshop	Clinical teachers, Senior residents	135	USA	2003	10
Subha Ramani *et al*.	Focus group discussion	Chief residents (PGY4), program directors, bedside teachers	22	USA	2003	12
McLeod P.J	Report writing	Clinical teachers, medical students	49	Canada	1986	5

SPRs=Specialist registrars, SHOs=Senior house officers, FY=Foundation year

and revised. We then pilot tested the form on six articles, and the obtained results were negotiated with the research team for further modification. The quality assessment form has scores ranging from 1 to 16, with 16 being the highest score. The form contains 10 indicators divided into study type, total sample size, study aims, setting, study sample, data collection, data analysis, findings, conclusions, and internal validity [Appendix 1]. Quality scores were independently obtained from two reviewers (AB and KB). The interrater reliability (agreement between the two reviewers) was assessed, and the overall agreement was 83.3%. In case of any disagreement, negotiations between the two reviewers resolved the differences and a final quality score was reached.

Qualitative analysis of strategies for clinical rounds

Content analysis is a method of analyzing written, verbal, or visual communication messages.[13] Through this method, the researchers can test theoretical issues to enhance understanding of the data. In addition, it would be feasible to distil words into fewer content-related categories; thus words, phrases, and the like share the same meaning.[14] This method involves an iterative process allowing themes and patterns to arise from the data.[15] We used inductive content analysis, and categories of strategies were derived from the data. Inductive content analysis moves from the specific (phrases/codes) to the general (subcategories), so that particular instances are observed and then combined into a larger whole (categories).[16] Using this technique, one member of the research team (AB) identified all references to strategies for clinical rounds in the reviewed articles and listed them in phrase format (codes) in a list for strategies used in clinical rounds. The list was then negotiated with another member of the research team (NY). This was done in an iterative process until reaching completeness and agreement on the final contents. The final, categorized lists were reviewed by other members of the research team (PA and KB) for coherence and consistency.

RESULTS

Study selection

A total of 524 articles were identified for inclusion in the review (Web of science 61 hits, PubMed 131 hits, Embase 109 hits, Scopus 175 hits, Cochrane 33 hits, and reference check 15 hits). After adjusting for duplicates, 337 remained and were screened based on the title and abstract for possible inclusion. Of these, 300 studies were discarded, and 37 studies were obtained for further review. In total, on the

premise of inclusion/exclusion criteria as well as full-text considerations, 18 articles contained useful information related to strategies for clinical rounds, and they were analyzed in depth. Among this batch, five studies that met the criteria for inclusion were identified by checking the references.

Study characteristics

Concerning the year of publication, 11 (61.2%) articles were published during a 7-year period from 2010 to 2016. Two (11.1%) articles were published in 2009 ($n = 1$) and 2006 ($n = 1$). Four (22.2%) articles were published in 2008 ($n = 2$) and 2003 ($n = 2$). One (5.5%) article was published in 1986.

Regarding the place of study, most researches were conducted in the USA ($n = 8$), the UK ($n = 4$), and Australia ($n = 2$). The rest of the studies were conducted in countries including Canada ($n = 1$), New Zealand ($n = 1$), Pakistan ($n = 1$), and Saudi Arabia ($n = 1$).

In terms of data collection method, four studies used a questionnaire,[4,17-19] five studies used focus group discussion,[6,9,20-22] two studies used telephone interviews,[23,24] one study used card sorting technique,[25] one study used NGT technique,[26] and one study used report writing.[27] In addition, other studies used a combination of methods such as focus group discussion/interview[28,29] and questionnaire/group discussion.[8,30]

Qualitative analysis findings

Content analysis yielded identification of 299 codes concerning strategies for clinical rounds in nine major categories classified as "before rounds," "during rounds," and "after rounds" [Table 3]. Quality assessment scores for the 18 research studies ranged from 5 to 14 (possible range, 1–16). The majority of the research studies (10 out of 18 studies; 55.5%) received quality scores in the range of 9 to 11.5; 7 (38.9%) studies received scores at or above 12 to 14, and only one (5.6%) study received the quality score of 5.

Table 3: Strategies for clinical rounds

Strategy categories	
Before rounds	**During rounds**
System-related issues	Provide feedback on examination
Increasing institutional recognition of teaching	On spot order writing
Faculty development	Come up with a management plan
Teachers' responsibilities	**Teacher-related issues**
Sufficient teacher expertise	Prioritization of teaching
Teacher motivation	Match teacher-learner goals
Plan in advance	Integrate knowledge
Teacher preparation	Share thought processes
Proper round planning	Be a positive role model
Proper organization	Be keen on teaching
Perform a preround huddle	Be clear and concise
Select patients	Engage everyone
Prepare learners	Use time efficiently
Set learners roles and expectations	Admit unknowns
Elaborate on the layout of the round	Avoid interruptions
Explain do's and don'ts	**Student-related issues**
	Learners' autonomy
	Share thought processes
	Respect learners
	Involve learners
	Motivate learners
	Learning atmosphere-related issues
	Create a positive learning climate
	Make bedside an aura of success
	Generate enthusiasm
During rounds	**After rounds**
Patient-related issues	**Perform a postround huddle**
Introduction	Clarification on round
Orient patients	Debrief
Respect patients	Closing
Involve patients	
Enhance communication with patients	
Decrease patient discomfort	
ABCs of teaching on rounds (teachable moments)	
Case presentation	
Clarification on history	
Provide feedback on history	
Model physical examination	
Provide hands-on experiences	
Clarification on physical exam	

DISCUSSION

Our review aimed to discuss good bedside teaching strategies/practices which were derived from a systematic literature review. The significance of this systematic review lies in the fact that the identified strategies arise from both qualitative and quantitative methods of data collection as well as the opinions and experiences of clinical teachers and medical students. There is also a paucity of evidence which has comprehensively categorized the strategies for rounding practices to be applied when teaching students at the patients' bedside. By taking the findings of this study into consideration, the effectiveness of clinical rounds will be increased, making rounds mutually beneficial for teachers, students, and patients. We identified numerous strategies for clinical rounds that could be classified into nine major categories and fifty subcategories [Table 3]. We describe them in greater depth here that can be carried out before rounds, during rounds, and after rounds.

Before round strategies

System-related issues

Before the initiation of the clinical round, it is highly important for the medical education system to take into account five essential factors in advance: (1) Teaching at the bedside must be a high priority for the system. In this regard, provide institutional incentives,[9] create rewards for bedside teaching,[9,23] promote awareness about students' learning,[20] and have an integrated curriculum for bedside teaching.[8] (2) The medical education system must have ongoing faculty training in clinical skills and teaching methods for medical teachers.[6,9,20,23] (3) If the best is going to be achieved from teaching at the bedside, responsibilities or competing demands on teachers should be reduced or eliminated.[9,17,19] (4) Make sure that teachers have a comprehensive knowledge base or expertise to offer to learners.[6,25] (5) Last but not least, it is crucial to have motivated teachers to conduct rounds for medical students.[8]

Plan in advance

There are three important factors to be done by medical teachers before rounds. These are "teacher preparation," "proper round planning," and "proper organization." To have an effective round and to increase teacher comfort at the bedside, preparation plays a pivotal role. When planning bedside rounds, a preparatory phase is invaluable. The activities that could be carried out in this phase are to consider advance planning and preparation.[8,18,20] Familiarize yourself with the clinical curriculum[20] and formulate goals for each session.[6,22] Evidence shows that clinical teachers usually do not have any briefing on the clinical curriculum to be taught.[31] In addition, investigate the actual clinical skill levels of all the learners[20] and review physical examination skills to be taught during bedside rounds.[24] Make a list of specified learning objectives[18,24,30] and set explicit teaching expectations.[9,23] Finally, select a definite course study resource for students[20] and make handouts for rounds or the teaching session the night before.[24] This preparation puts the teacher on track when conducting bedside encounter. In addition, think about when, where, who, what format, and length of rounding. Meet with the senior resident the day before round to discuss what kind of problems will be presented on round.[24,27] Decide between morning or afternoon rounds if no limitation exists. Plan for morning rounds as minds are fresh and enthusiasm is at its highest.[30] Similarly, afternoon rounds can be arranged for the completion of ward work.[30] In case of assistance from staff on round, invite nurses into rounds.[28] As participation is central in knowledge acquisition, plan for a small round with smaller groups.[29] Break the round into manageable parts[30] with a focused teaching time.[4,26,28] If you want to accomplish your goals, set a firm start date for bedside rounds to occur.[23] Make it public that everyone knows when, where, and on which days of the week bedside round occurs.[24,30] Do not forget to arrive on the teaching unit to assure continuity and availability[27] and initiate the session at the start of a shift without a preexisting patient load.[18]

Perform a preround huddle

At this phase, try to draw a road map for students by "selecting patients," "preparing them," "explaining their roles and expectations," "elaborating on the layout of the round," and "explaining do's and don'ts" of the round. This enables them to step into the encounter with some confidence. A very important part of the planning for the bedside encounter is patient selection. It is vital as all the teaching at the bedside round goes around the patient. Based on the embedded situation at the bedside by evaluating patients before round[24] or seeking help from the resident in charge, apply different approaches in selecting patients. As a general rule of thumb, consider consent of patient in his selection at first. If it is the first bedside rounding experience, select ideal patients for students[24] or plan bedside round for most patients[28] to make them familiar with the rounding experience. This can go with a sit down round with students before seeing the patient.[26] If the situation is exacerbated with patient condition and high patient volume, it is better to go first with sick patients requiring immediate care[24,27] or patients who need clinical decision-making[24] as well as pending discharges.[24,28] Plan the patient rounding order based on the 3 D's (decompensating, dischargeable, and complex decision-making)[28] if appropriate. As a general rule, go for patients with high educational value[24] and patients with interesting features for discussion and learning.[27] It is worth investing some time and energy in preparing learners.[17] This can be done by organizing

an orientation meeting before round.[24] It is significant if learners are prepared cognitively and emotionally and also the preparation may revolve around providing guidance on the content of presentations for learners.[28] Orient the learners to your plans for the session and clearly express the expectations for each team member's role in rounds[24,28] and negotiate goals/objectives[6,9,24,26,27] with students. This assists learners to focus on the goal of the session and get the most out of the round. In addition, by assigning roles, the chaos that might be present during bedside teaching can be avoided, and learners' participation will be maximized. It is critically important to provide an overview or a clear layout for the session[8,24,28] and review how encounters should be accomplished[24] if it is the first session of the round. Finally, establish ground rules set by program[26] in terms of discipline and accountability,[8] positioning of team at bedside,[24] and appropriate bedside dress code.

During round strategies

Patient-related issues

The patient is at the heart of clinical education, and as William Osler states, medical students begin with the patient, continue with the patient, and end study with the patient.[32] The first encounter on a round is the patient's bedside. Before anything to be done, say to the patient that you are the person in charge of the round,[24] and then introduce everyone else to the patient.[22] This step is very important because it might cause confusion about who the real physician is, as large crowds attend the bedside. As learning occurs by taking history or doing physical examination on a patient, there is a need to orient the patient to the purpose of the session.[6,9] Evidence shows that this orientation by physician team is often lax and it causes patients to be baffled during and after the encounter.[33] Hence, provide information/explanation as needed[17,22] and consider what the patient could expect and prepare the patient as well.[24] As you are moving on the round, delineating knowledge or modeling a physical examination, show respect to the patient. Request permission from the patient to examine,[9] treat him/her as a human being, not the object of teaching exercise,[6] consider desired bedside actions to ensure respect,[24] and be sensitive to how the disease has affected the his/her life.[6] Bear in mind that a bedside teaching cannot be effective if patients are not involved during the round. This can be achieved by including the patient in discussions,[9] encouraging the patient to correct and contribute to details of history,[6,17] informing the patient about his care and decisions,[9,28] and asking him/her questions.[24] The last two factors that must be taken into account are enhancing communication with the patient and decreasing patient discomfort. During discussions with the medical team on rounds, use lay terms to communicate with the patient.[6,22,24,28] If you use too many medical jargons while communicating, this would baffle and alienate the patient. Try to have communication strategies for patients with language barriers as well.[28] After taking history or performing a physical examination and providing on spot explanations, if more lengthy discussions are going to be traded back and forth, postpone them to an appropriate time,[28] or resume them in another room[20,30] to care for the patient's comfort. Also, decrease the time students spend at bedside near patients.[20]

ABCs of teaching on rounds (teachable moments)

To have an effective bedside round with maximized satisfaction, look for teachable moments and use them to teach history and physical exam as well as rectifying deficiencies in students' knowledge or clinical skills. This phase is of utmost importance as most of learning occurs at this stage. Ask one student or the primary person caring for the patient to present a synopsis of the case.[22,24] Alternatively, you can go for subjective, objective, assessment, and plan to have a more efficient and shorter round.[24] Look for how the student demonstrates the skills of interviewing.[27] When this is done, provide clarification on history points to students[24] and verify the main points of the history.[27] At this stage, allow room for questions to be traded among learners and you if any. It is now the best time to provide feedback following oral presentation.[17,19,21-23,27,28,30] Try to give positive and negative feedback as well.[25] After case presentation teachable moment, go for physical examination and model it to students.[21,24] Based on the case, try to perform a complete physical examination.[4] Show technique when teaching procedures[17] and demonstrate key physical findings.[26] Then, it is time for hands-on experiences on students' part by providing opportunities to practice clinical examination skills.[22,29] Ask one or a couple of students to perform a complete physical examination and let others elicit key signs afterward.[4,27] Supervise examination technique done by students.[4] Like case presentation teachable moment, do the same for physical exam by clarifying physical examination points,[24] adding teaching points to what was done[24] and verifying the main points of the physical examination.[27] After demonstration and clarification, provide feedback as appropriate.[17,19,21-23,25,27,30] Before calling the session a day and moving for the postround huddle, teach and write orders for the patient.[25] This can be done using mobile computers or devices to write orders down.[28] Your last teachable moment is to come up with a management plan with students for the patient. Have a consistent and coherent plan of care in place when seeing a patient.[26] Discuss it with students[19] or push students to establish a care plan by your help.[28,27] And finally, as appropriate, address discharge plans for and with each patient by students.[25]

Teacher-related issues

Plan for an organized and efficient round[25] with enough time spent at the bedside[22,27] and focus more on teaching

than getting the work done.[25,26] Take learners' needs into account and make sure that teacher–learner goals are in line with each other.[6] When transferring knowledge to students, try to consolidate it[19] and provide real-life examples.[26] This can be achieved by challenging the learners to think critically,[6] emphasizing on problem-solving rather than accumulating facts,[27] integrating theory with actual patients and work,[9,25] and focusing on examination findings and symptom management rather than interpretation of results and diagnosis management.[30] Explicitly explain what on your mind is when dealing with the patient. Students need to know what sort of thinking you have when treating the patient. Share this thought process and think aloud.[26] Be aware of your role as a professional who is observed and imitated by medical students concerning your professional behaviors, the values, and ethics.[34,35] Be a good role model and demonstrate good bedside manner during patient care[17,26] as positive role models have a great impact on students learning.[20,21,22] Show enthusiasm and passion for your teaching[23,30] and be clear and concise instead of belaboring on issues at bedside.[26] Have succinct teaching points and lead encounters, demonstrating desired actions.[24] To engage everyone, plan for some activities to keep everyone involved in the teaching and learning. First of all, obviate didactic lecturing at the bedside which would diminish participation.[6] As appropriate, invite ward staff in bedside teaching to boost engagement. In your teaching, use a format that would involve all parties[4] and provide room for questioning and answering.[19,30] Keep a balance between student involvement and time spent at the bedside. Although keeping all learners engaged is paramount, but dragging the time causes boredom. Consequently, select some cases to present in full and abridge others,[25] plan teaching in a flexible manner to accommodate other duties and work schedules,[9,26] and set time limits when teaching.[9,22,26] Admit your own limitations, errors, and gaps in your knowledge on rounds.[9,17,21,27] Admitting your own lack of knowledge might set the tone for students to follow suit. This encourages them to admit their limitations and evokes a willingness to inquire questions. Try to make all students vigilant by requesting them to minimize interruptions[24] or avoid interruptions such as noise on rounds.[30] This can also be related to presentations by ensuring that no interruptions exist while they are being discussed.[28,25]

Student-related issues

This category includes "learners' autonomy," "thought processes," "respecting learners," "involving learners," and "motivating learners" issues. When students feel that they are part of the caring team by sharing responsibility with them,[9] giving them autonomy[9,26] and allowing a degree of independence in decision-making[26] better learning outcome will be achieved. It is vital to inculcate a sense of responsibility in students and show them the way to lifelong self-directed learning to equip them with required skills dealing with patients. As students are presenting patients, ask them to think aloud and trigger a professional conversation to share their thought processes.[21] Respect all team members[6,25] and defer to them as a primary caregiver for the patient.[6] Bear in mind that embarrassing students can destroy team morale. Show to students that you have a zest to learn from them as this raises involvement. Include them in collegial discussions and clinical decisions[25,29] and encourage them to participate in daily ward work and patient care.[29] As learner involvement about patient care boosts the aura of usefulness and connectedness,[29] encourage students to be part of a team[30] and make them feel important in the learning process.[27]

Learning atmosphere-related issues

It is highly important for the clinical teacher to have an emphasis on the importance of a comfortable learning environment as trust between the teacher and the students facilitates communication during the encounters. In this regard, provide a comfortable environment with rooms for asking questions and discussion without restraint and humiliation.[6,26] Reassure students that their mistakes on rounds will be cushioned with grace.[23,25] Be approachable not intimidating[26] and induce a serious but a relaxed and friendly learning atmosphere.[8,25] If you have a desire for more participation and involvement, you should make the learning environment free of pressure by creating a safe, nonpunitive, nonthreatening environment.[19,23] Such considerations increase students learning. This can be augmented by providing support as well.[19] Inculcate a desire in learners to be at bedside by emphasizing its importance.[6] If you facilitate bedside rounds to enhance learning for all team members[23] and teach new things about an area of specialty[17] to students, you can make the bedside an aura of success. Finally, try to eliminate the mundane task of bedside which at times causes boredom for students by showing enthusiasm,[17,26] appreciation for team members for work performed,[26] and make the so-called boring diagnostic problems exciting.[6] Evidence shows that the learning environment and the learning atmosphere of medical schools should be investigated by standardized tools such as the Dundee Ready Education Environment Measure. A study conducted by Dehghani *et al*. in Iran showed that to augment learning, there is a need for some improvements in the environment concerning the residents' supervision on students learning activities and the clinical teaching of attending doctors.[36]

After round strategies

Perform a postround huddle

Get together after round before leaving the bedside. It is your job to summarize or recap what was taught and learned during the session.[21] Tell students that the

session was mutually beneficial[6] and if a point needs to be clarified, offer a summary about the patient's illness or the management plan.[22,24] Do not forget to provide feedback after bedside teaching encounter on what was done during the session.[6] This kind of debriefing can be accompanied by self-evaluation of learners on their own performance and your comments on positive aspects of their performance before pointing out the areas that require improvement.[27] At last, provide room for students to ask their questions.[6,24] Allow discussion of sensitive issues if any and resolve confusion. Finally have a genuine, encouraging closure[22] and decompress after the intense encounter. This postround huddle maximizes clinical learning and leads to improvement in the teaching process for succeeding rounds.

Limitations

This study has its own limitations. First, we only included original articles not articles of other types such as perspectives, correspondence, book reviews, letter to editors, short communication, or any books as well. Second, gray literature sources, such as internal reports and conference proceedings, were not included in our review. We only encompassed published papers and averted our effort to obtain unpublished information which was impossible and beyond the control of the review authors. Furthermore, language restriction was included in the search strategy. Third, it is important to highlight that information about strategies for clinical rounds might not apply to every rounding situation as the rounding practices might be different due to the level of students, the content to be taught, and the context in which rounding practice occurs. In addition, the codes extracted from each included article and our interpretation of data are dependent on the authors' views. Despite the existent limitations, our study has its own strengths owing to the explicit search strategy, clear inclusion/exclusion criteria, and the systematic process applied to identify and evaluate articles to be included in our review. In addition, both qualitative and quantitative methods as well as the opinions and experiences of clinical teachers and medical students were incorporated in our findings which fortify our research. Concerning our quality scoring system, it is important to mention that despite its acceptable interrater reliability, it has not been used in other studies. We assume that the weightings may require refinement and there may be additional relevant categories.

CONCLUSION

Most of students' learning concerning history, physical examination, communication skills, decision-making, humanism, and role modeling to name a few occurs at the bedside. This invaluable venue is perfect for the acquisition of such tangible and intangible skills. Therefore, finding strategies to applaud good work and foster knowledge, skills, and attitudes is critical. In this review, we have provided some pinpointed strategies for medical teachers to take into account when teaching at the bedside. These were classified as before rounds, during rounds, and after rounds. Following these strategies once teaching students make bedside encounter run more smoothly and the resultant will be an improvement in the quality of teaching rounds. This not only improves knowledge and skill acquisition but also offers better services of care by more qualified doctors to society in general.

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Conflicts of interest

There are no conflicts of interest.

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Appendix 1: Quality scoring system for evaluation of research studies on strategies for teaching in clinical rounds

Quality assessment form	Points	
Study type		
Single-group cross-sectional, or single-group posttest only, or qualitative study, or mixed-method	1	
Single-group, pre- and posttest, or cohort	1.5	
Nonrandomized trial (includes control or comparison group)	2	
RCT	3	
Total sample size		
Unclear	0	
≤10	0.5	
11-50	1	
51-100	1.5	
101-150	2	
151-200	2.5	
≥201	3	
	No	**Yes**
Aims		
Is the hypothesis/aim/objective/philosophical approach/purpose of the study clearly described?	0	1
Setting	0	1
Is the setting of the study described in sufficient detail as well as the time period of the study?		
Study sample		
Are the participants clearly described? (including criterion for inclusion and exclusion, appropriate sampling method, appropriateness of the sample to the aims of the study)	0	1
Data collection		
Are the methods appropriate and described with enough details to address the research question? (e.g. intervention, comparison intervention, interview process, and instrument)	0	1
Data analysis		
Are the analysis methods clearly described? (appropriate statistical tests applied and correctly executed; an in-depth description of the analysis process)	0	1
Findings		
Are findings fully supported by the data and analysis?	0	1
Conclusions		
Are the reported conclusions follow from the reported results? (adequate discussion of the evidence)	0	1
Internal validity		
Did the authors use a previously validated or published instrument, questionnaire, or interview script?	0	1
Did they conduct any validity assessment (for example, analyze reliability, validity, inter-rater reliability)?	0	1
Did they report obtaining institutional review board approval? (e.g. an ethical committee approval/informed consent from participants/confidentiality of information)	0	1

RCT=Randomized, controlled trial