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ORIGINAL ARTICLE

Simulation-based interprofessional education for teaching evidence-based medical practice.

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ABSTRACT… Objective: To achieve consensus on opinions of expert medical educationist on utilization of simulation-based interprofessional education as teaching strategy for evidence based practice teaching in undergraduate medical education. **Study Design:** Qualitative Case study. **Setting:** Bahria University Health Sciences Campus. **Period:** March 2023 to August 2023. **Methods:** Research using modified Delphi technique was done under ERC 16/2023-BUMDC. Communities of practice and transformative learning theory were used for guiding research design. Non-probability, snow-ball sampling technique was used to select expert panel as participants. Inclusion criteria were medical educationist with masters in health professional education and ten year of experience in department of medical education. Content analysis was used for analyzing data and atlas ti-9 was used for organizing data collected through online email interviews. **Results:** Final consensus of participants was attained on, third year, Simulation-based interprofessional education/ Assignments/ Journal Clubs/Case-based discussions, Fourth year, Simulation-based interprofessional education/ Journal Clubs/Case-based discussions, Content: Final year, Simulation-based interprofessional education/ Clinical setting/ Journal Clubs. **Conclusion:** Expert showed ninety percent consensus that simulation-based interprofessional education is good teaching strategies for teaching evidence –based practice in undergraduate medical.

Key words: Evidence-based Practice Teaching, Interprofessional Education, Medical Education.

INTRODUCTION

In last few years there has been paradigm shift of medical practice to evidence-based practice which mandates implementation of evidence-based medical education. Evidence based practice refers to integration of expert opinion with research evidence and patient preferences for particular clinical problem. Research evidence required is of three types including randomized control trial for best treatment option, cohort studies for prognosis and qualitative studies for patient experience with that specific treatment option. Many recent research studies identified, lack of research skills as main barrier to evidence to implement evidence based practice. Teaching of evidence based practice at undergraduate level could overcome this barrier. For evidence-based practice, physicians should know how to access, evaluate and interpret research.[1,2,3] Critical appraisal of research is required for problem where physicians think expert opinion needs to be justified. We need more local research articles and undergraduate as well as continuing medical education training on evidence-based medical education and practice. For many clinical questions, there is insufficient good quality evidence. Multiple teaching strategies can be used for evidence based practice teaching in undergraduate medical education. Lectures, assignments, workshops, journal club as well as bedside teaching are already identified teaching methodologies for teaching of evidence based practice.[4,5,6] But simulation based interprofessional education seems to be a better teaching methodology as it provides high fidelity simulation settings and evidence retrieval is a time consuming task so it's difficult to perform in clinical environment. This research aims to explore expert opinion on utilization of interprofessional educational

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sessions for evidence based practice teaching at undergraduate level. Currently evidence based curriculum is applied in many medical colleges but so far there is no standardization on how and when to teach it. Few medical colleges are teaching it in first year while other in final year, usually for duration of six to eight weeks. Standardization is required for its teaching strategies, time and duration in curriculum.[7,8,9]

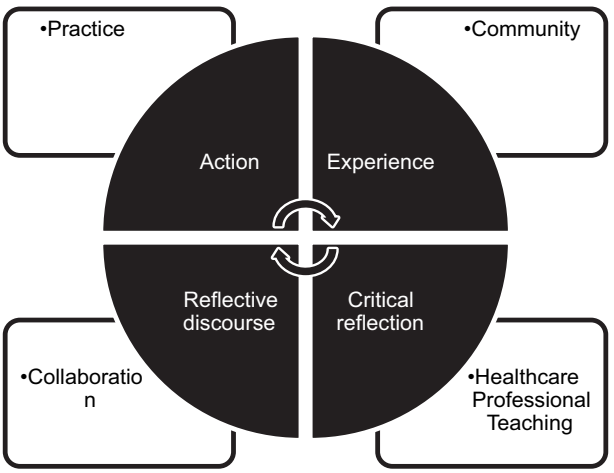
METHODS

A qualitative research design was done in Bahria University Health Sciences Campus for duration of six months, ERC-16/2023-BUMDC. Modified qualitative Delphi technique was used to collect data from expert panelist. Community of practice and transformative learning theory were used as theoretical underpinnings. Community of practice refers to group of professionals working in collaboration towards common goal, while transformative learning theory focuses on adult learning. Transformative learning theory states that critical reflection and critical review could lerad to transformative change in learning process.

A systematic literature research was conducted using Pubmed and Medline between 30th November and 1st December and seven studies were selected which highlighted barriers of evidence based practice teaching. Delphi technique is an expert consensus method consisting of multiple rounds of data collection until expert consensus is achieved, usually used to develop guidelines with expert health professional educators. Health professional educators experience difficulty in decision making when inadequate information is present regarding a subject or there is excess of the information which is usually contradictory. Snow-ball sampling technique was used to select expert panel as participants. Inclusion criteria were medical educationist with masters in health professional education and ten year of experience in department of medical education. Exclusion criteria were medical education with experience less than ten year or do not have masters in health professional education and those who did not gave consent. Informed consent was taken from all participants.

Data was collected using email interviews and participants never met other participants or researcher in person. Participant anonymity is maintained throughout data collection process. Open-ended interview questions were developed using PEACE framework themes for evidence based practice teaching. Themes include were teaching problem identification by students, evidence retrieval from data base, teaching of appraisal of evidence, suggesting change in practice or suggesting further research on the given topic and finally evaluation by integrating evidence with expert opinion and patient preferences. Data was collected in three rounds. In first round email interviews were done using PEACE framework themes based open-ended questions. Open codes were formulated after first round and all statements were compiled. In second round, controlled feedback was given to participants and only those statements were shared with all participants in whom they differ in opinions through email. Those items which reached consensus were dropped out from the next rounds. Participants were asked to agree or disagree to the given statement or mention that they have no experience of the fact stated. After second round axial and selective codes were formulated and final information was shared with all participants through email for endorsement in round three. The items that are consistently not achieving consensus regardless of controlled feedback were dropped. Items in which consensus was achieved but stability was not present in multiple rounds were also removed.

Finally statements were ranked in sequence from highest to lowest consensus for interpretation and presentation of finding. Pre-defined value of 90% was decided for considering consensus on specific statement. There was active effort of the steering group in generating consensus throughout iterative rounds of data collection. CREDES checklist was used to assure quality assurance in reporting the research study.[10]



Theoretical Framework integrating community of practice and transformative learning theory.

RESULTS

Round-1

Responses on utilization of Simulation-Based Interprofessional education for evidence based practice teaching

Benefits

It provides opportunities to develop personal relationship among healthcare professional students. Simulation based interprofessional environment gives experiential knowledge of roles and responsibilities at different levels of clinical exposures. It provides high fidelity simulation for learning communication skills and flow of information in clinical settings.

Challenges

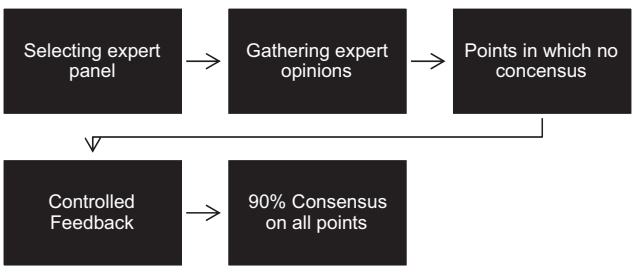
Faculty members of all healthcare professionals have limited knowledge of simulation-based interprofessional education. Faculty development programs like, workshop and seminar should be organized to improve healthcare professional understanding and change their attitude. Although working in collaboration with different healthcare students on same page might be a difficult task but can be achieved by formulating common learning objectives which are related to all healthcare students. Different timetables and different curriculum are difficult to be integrates, so parallel session should be planned. One of the participant highlighted that the physical space and time. All disciplines have busy schedule is it's difficult to adjust sessions like simulation based interpprofessional education which are time consuming.

Suggestions

Planned evaluation of healthcare curriculum at early stage of curriculum implementation. Comprehensive evaluation model should be used to incorporate changes at learning objectives, teaching strategies and outcome levels so that it could improve product, process and outcome. Change in attitude is required at part of all stakeholders which is possible by imparting them knowledge on simulation-based interprofessional education and evidence based practice.

Teaching Strategies

First year	Problem identification/ Inquiry and Evidence retrieval	Simulation-based interprofessional education
Second year	Critical appraisal	Assignments and Journal Clubs
Third year	Change in practice or suggesting more further research	Simulation-based interprofessional education
Fourth year	Evaluation of evidence implemented	Simulation-based interprofessional education
Final year	Reflection on the best practice and practice implemented after evidence retrieval	Simulation-based interprofessional education



Round-2

Controlled feedback was shared with participants after first round. After which ninety percent of participant attain consensus on teaching strategy model given below.

Final statement 1st round		Final statement after 2nd round with controlled feedback
First year Simulation-based interprofessional education **Second year** Journal Clubs Simulation-based interprofessional education **Third year** Simulation-based interprofessional education **Fourth year** Simulation-based interprofessional education Final year Simulation-based interprofessional education		**Third year** Simulation-based interprofessional education/ Assignments/ Journal Clubs/ Case-based discussions **Content:** Critical appraisal of research RCT, Cohort studies and qualitative research on patient experiences **Fourth year** Simulation-based interprofessional education/ Journal Clubs/Case-based discussions **Content**: Problem identification and Research retrieval **Final year** Simulation-based interprofessional education/ Clinical setting/ Journal Clubs **Content:** Integration of research evidence, expert opinion and patient preferences/experience

Round-3: Endorsement of statements

Final statement	1	2	3	4	5	6	7	8
Third year Simulation-based interprofessional education/ Assignments/ Journal Clubs/ Case-based discussions **Content:** Critical appraisal of research RCT, Cohort studies and qualitative research on patient experiences	Partially Endorsed	Strongly Endorsed	Strongly Endorsed	Strongly Endorsed	Strongly Endorsed	Partially Endorsed	Strongly Endorsed	Strongly Endorsed
Fourth year Simulation-based interprofessional education/ Journal Clubs/Case-based discussions **Content**: Problem identification and Research retrieval	Endorsed	Strongly Endorsed	Strongly Endorsed	Strongly Endorsed	Strongly Endorsed	Partially Endorsed	Strongly Endorsed	Partially Endorsed
Final year Simulation-based interprofessional education/ Clinical setting/ Journal Clubs **Content:** Integration of research evidence, expert opinion and patient preferences/experience	Endorsed	Strongly Endorsed	Strongly	Strongly Endorsed	Strongly Endorsed	Strongly Endorsed	Strongly Endorsed	Strongly Endorsed

Teaching evidence-based medicine (EBM) in undergraduate medical education is crucial for producing competent and informed healthcare professionals. Here are some effective teaching strategies to help students learn and apply EBM principles. Start introducing EBM concepts in the early years of medical school. Create a foundational understanding of the importance of EBM in clinical practice. Ensure students understand key EBM terminology such as PICO (Patient, Intervention, Comparison, Outcome) questions, systematic reviews, meta-analyses,

and levels of evidence. Integrate EBM throughout the curriculum rather than as a separate module. Relate EBM concepts to clinical cases and real-world scenarios. Organize small group discussions or workshops where students can actively engage in critiquing research papers, interpreting statistics, and discussing clinical scenarios. Encourage debates to enhance critical thinking. Provide students with access to reputable EBM resources such as Cochrane Library, PubMed, and evidence-based guidelines. Teach them how to navigate and search these databases effectively. Use PBL cases and interprofessional simulation scinarios that require students to search for evidence to answer clinical questions. This approach encourages independent learning and problem-solving skills. Organize regular journal club sessions where students review and discuss recent research articles. This helps them develop skills in critically appraising literature. Offer online modules or courses that cover EBM principles, research methods, and statistical analysis. These can be self-paced or integrated into the curriculum. Invite experts in EBM to give lectures or workshops. They can share their experiences and insights, providing real-world context to EBM. Include EBM in assessments through written assignments, quizzes, or exams. Assess students on their ability to critically appraise research, formulate PICO questions, and apply EBM principles to clinical scenarios. During clinical rotations, encourage students to apply EBM principles to patient care. Ask them to identify and appraise relevant research articles for the cases they encounter. Provide constructive feedback on students' EBM skills and encourage self-reflection on their learning progress. Use real cases to illustrate how EBM can impact patient outcomes. Continually reinforce EBM principles throughout the curriculum, as repetition and practice are essential for retention. Encourage faculty members to model EBM principles in their clinical practice. Students are more likely to adopt these practices if they see their mentors doing so. Promote collaboration between medical students and other healthcare disciplines (nurses, pharmacists, etc.) in EBM activities. This mirrors real-world healthcare settings. Teach students about the ethical aspects of EBM, including conflicts of interest, research integrity, and patient-centered care. Encourage students to engage in quality improvement projects that require them to use EBM to drive changes in clinical practice. As EBM evolves, stay current with the latest guidelines and recommendations, and update the curriculum accordingly. EBM is a skill that develops over time, so it's important to provide ongoing support and opportunities for practice. By incorporating these strategies, you can help undergraduate medical students become proficient in evidence-based medicine, improving the quality of patient care they provide in the future.

DISCUSSION

There are many challenges regarding implementation of simulation based interprofessional education for teaching evidence based practice. As highlighted by experts unfortunately lack of cooperation among different healthcare professional teams and reluctance of faculty members to change can present as major challenge during implemention. Current literature reviews suggested few teaching methodologies for teaching evidence-based practice but there was no consensus on how, when and by which teaching method it should be taught to undergraduate healthcare professionals. There is no consensus on use of single teaching strategy which is most effective so far, which is due the fact that there is very limited research on thissubject.[11,12,13] Literature review provides evidence that research on simulation-based interprofessional education lacks rigorous design that can provide insight to effectiveness of interprofessional and how it impact healthcare process and outcome. However, there many studies reported significant improvement in knowledge, skills and attitude of healthcare learners.[14] A recent research compared simulation-based interprofessional education with video-enhanced interactive interprofessional discussion. Results opthe study showed improved knowledge, skills and attitude of simulation based interprofessional education group in posttest evaluation. However no change in attitude was observed in both the groups.[15] There is insufficiency in research on simulation-based interprofessional education and evidence-

based practice teaching in Pakistan.[16] Teaching of evidence-based practice could improve medical and nursing student's healthcare provision. Education of Evidence-Based Practice increases critical thinking, problem-solving, skills and attitude. Evidence Based Practice programs develop self-efficacy and the level of evidence utilization.[17]

Email interviews provided short and concise answers which is a disadvantage of data collection by online medium, as participant discontinued if asked to respond in detail. There was active effort of the steering group in generating consensus throughout iterative rounds of data collection. This active participation of the steering group can cause bias through opinion of members. Credibility of research has been enhanced by controlled feedback provided to participants and member check was enhanced by endorsement procedure. Transferability was established through the use of verification of applicability of Delphi findings. Dependability was increased by including wide range of expert participants from different educational settings.

CONCLUSION

Expert showed ninety percent consensus on the fact that simulation-based interprofessional education id good teaching strategies for teaching evidence –based practice in undergraduate medical education but it should be used along with other teaching methods as assignments, journal club, case-based discussions, workshops and bedside teaching.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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2	Fareeha Shahid	Review of paper & Data collection.	
3	Fatima Zehra	Data collection & Proof reading of paper.	
4	Samreen Iqbal	Review of literature & Paper writing.	
5	Samia Ghulam Mohammad	Data collection & Review of literature.	
6	Muhammad Ahsan	Data analysis, Review of paper.	