WJMER

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Introduction

The World Journal of Medical Education and Research (WJMER) (ISSN 2052-1715) is an online publication of the Doctors Academy Group of Educational Establishments. Published on a quarterly basis, the aim of the journal is to promote academia and research amongst members of the multi-disciplinary healthcare team including doctors, dentists, scientists, and students of these specialties from around the world. The principal objective of this journal is to encourage the aforementioned, from developing countries in particular, to publish their work. The journal intends to promote the healthy transfer of knowledge, opinions and expertise between those who have the benefit of cutting edge technology and those who need to innovate within their resource constraints. It is our hope that this will help to develop medical knowledge and to provide optimal clinical care in different settings. We envisage an incessant stream of information flowing along the channels that WJMER will create and that a surfeit of ideas will be gleaned from this process. We look forward to sharing these experiences with our readers in our editions. We are honoured to welcome you to WJMER.

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A WELCOME MESSAGE FROM THE EDITORS

Dear Reader,

It is our great pleasure to bring you the twenty-seventh edition of the World Journal of Medical Education and Research (WJMER). This edition consists of several intellectual articles in order to provide an insight into the innovative research that is being conducted around the world.

The opening article by Pearce et al. evaluates how the COVID-19 pandemic prompted a surge in digital transformation of a medical career experience programme. They discuss how 'The Young Doctor's Programme' has had to adapt in order to deliver this programme to a high standard, despite the students not being physically present.

In the following article, Karali et al. investigate the benefits of 'The Golden 5 Minutes' of preparation for the 'Multiple Observed Standardised Long Examination Record for Clinical Encounter in Obstetrics and Gynaecology'. The study was carried out amongst Year 3 and Year 5 medical students who were split into two groups, with one being given the five-minute preparation session before the exam. The authors found that the chances of passing the exam increased significantly.

El-Masry et al. explore the different learning styles by asking medical students to complete a self-reported questionnaire including the VARK learning styles inventory. They found that 80.8% had a unimodal learning style. It was also observed that the most common learning style for those under 21 was kinesthetic; those 21 years or older preferred a visual learning style. The authors thus conclude that there is a statistical significance between age and learning style.

Rajaratnam et al. performed a qualitative study to explore patients' and surgeons' experiences of brachial plexus injury in Cambodia. They video-recorded interviews with two patients and two hand surgeons, noted the themes appearing throughout the interview, and deciphered how the injury affected the patients' lives.

The final article by Rawther et al. evaluates the effect of peer mentors in improving medical students' perceptions of evidence-based medicine (EBM). A conference held at the University of Buckingham Medical School allowed students to present their experiences of EBM, and recent graduates were also invited to talk on their experiences. Those who attended rated the impact of hearing from working Foundation Year Doctors, and it was shown that the students were motivated to implement EBM.

We sincerely hope that you find each article in this edition educational, enlightening and interesting to read.

Ms Karen Au-Yeung
Associate Editor

Dr Rebecca Williams
Associate Editor

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Digital Transformation of an Immersive Career Experience Programme in Medicine During the COVID-19 Pandemic

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Abstract
Medical career experience programmes enable students to gain a realistic insight into life as a doctor and learn about the application process in order to make an informed decision regarding their future career. Challenges presented by the COVID-19 pandemic prompted the innovative digital transformation of a medical career experience programme by InvestIN Education. This demonstrated that it is possible to still provide immersive, interactive and informative programmes in an online format. Suspended in-person programmes were rapidly re-designed, with integration of digital learning platforms including virtual reality software and live-streamed simulated hospital ward rounds. Whilst logistically challenging, combining educational technologies can enable the creation of high-validity, accessible learning experiences, which can maximise student motivation, engagement and knowledge. Similar online transformations continue to take place within medical school education as a result of ongoing uncertainty related to the pandemic, where the focus is to provide an effective and safe learning environment for students, teachers and patients from communicable disease such as COVID-19. It is important that educators feel empowered to trial and test these innovative digital learning methods and that they are captured and shared to maximise student learning both during these rapidly changing times and beyond.

Key Words
Selection; Online Learning; Educational Technologies; Simulation; Curriculum Design

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Introduction

InvestIN Education provides immersive career experience programmes to school students aged 12 -18 years old, committed to giving students an authentic insight into possible future careers. 'The Young Doctor's Programme' has run since 2014 and delivers courses ranging between one to ten days. Content is designed by medical trainees in a variety of specialities with experience in the application and interview process. Course aims include giving students a realistic insight into a career in medicine, the opportunity to interact with doctors and patients, be fully informed about the application process and learn relevant practical skills such as suturing and basic life support. Prior to the COVID-19 pandemic programmes were in-person, however due to restrictions such as social distancing, in April 2020 a rapid redesign of the programme was undertaken to transform content to be delivered online.

Discussion

'The Young Doctor's Programme' has had to rapidly adapt to continue to deliver a high quality, immersive and interactive program without students being physically present. This process demonstrated that by combining educational technologies, it is possible to provide simulation, communication skills training and interaction with patient volunteers in a virtual format, alongside more traditional approaches such as interactive lectures and small group discussions. Beyond the pandemic, there will be scope to apply this learning to improve the accessibility and flexibility of medical training.

Challenges included being able to continue to deliver a high-validity, immersive and interactive programme, whilst avoiding 'online fatigue' and a didactic delivery. The online video conferencing and webinar software Zoom™ is our platform of choice and has gained popularity amongst educators due to

functionalities such as the ability to create 'breakout rooms', facilitating smaller tutorial and discussion groups to maximise student interaction and participation.[1] Combining educational technologies, whilst logistically challenging, has remained a cornerstone of delivery to maximize student participation and enjoyment. The online polling platform Sli.do™ is regularly utilised in the majority of sessions and has enabled varied and creative interactive techniques which are interspersed within presentations, including word-clouds, polls, quizzes, question and answer boards and post-programme feedback capabilities.

Simulation-based learning (SBL) is an established, evidence based educational resource in medical training, as well as in other industries such as aviation and the military. Through mirroring and supplementing real practise, students can be immersed in a safe and educational environment.[2] In person programmes had allowed doctors to facilitate student use of virtual reality (V.R.) headgear and software to simulate cases within an emergency department. Delivery was adapted using an online platform with the doctor facilitator utilising the hardware and projecting an immersive scenario through Zoom™. Students were able to provide direction and lead the simulation through volunteering suggestions using the 'hands up' feature, and a facilitator selecting and unmuting participates. SBL has enabled students to gain an insight into the doctor's role in the recognition and management of emergency medical scenarios as well as providing an introduction to key simulation-based skills such as briefing, encounter, debriefing, reflection and evaluation,[2] utilising the experiential learning model.[3] With increasing use of digital platforms, SBL is likely to be adapted in similar ways within medical education to continue to provide a safe, controlled learning environment to protect patients, but also to protect students and facilitators from communicable disease such as COVID-19.

The pandemic has undoubtedly restricted students' ability to obtain vital work experience in healthcare settings, required to ensure candidates have a realistic insight into the career and provide an opportunity for self-reflection into the skills and qualities required as a physician. Whilst virtual programmes cannot replicate in-person experiences with the same authenticity, the opportunity to interact with doctors and patients has remained a key focus for the programme. This is delivered utilising a simulation department in a London teaching hospital to live-stream a doctor and medical student led ward round with simulated patients as well as a general practitioner clinic and specialist clinic with selected real patient volunteers. This has been a highlight for students who have the opportunity to observe the doctor-patient relationship, as well as communicate with patients directly in the context of history taking and participating in discussions surrounding investigations and management plans.

Student feedback has been overwhelmingly positive, with the majority feeling the online format was immersive, varied and educational, providing a realistic insight into the career. Students were able to reflect on key skills and attributes needed in medicine and appeared to particularly value their interactions with doctors, medical students and patient volunteers. We believe the collaboration of varied, interactive online learning platforms helps avoid declining engagement, motivation and deficient learning which can be unfortunate by-products of home-based learning.[4] Over successive programmes, we acted on feedback from students to improve their experience; for example, increasing the number of screen breaks, incorporating online Sli.do polls with other SBL activities such as V.R. and livestreaming clinic-based consultations, and using smaller breakout rooms more frequently.

Conclusion

Medical schools worldwide have faced similar challenges in delivering essential theory and practical teaching to students in virtual and innovative ways, with COVID-19 acting as a catalyst for change. The restrictions faced by medical schools have forced educators to clarify their priorities and pilot new ways of teaching, delivery and assessment. With continued uncertainty relating to the pandemic, educators are required to be increasingly flexible in their response.[6] Through digital transformation of 'The Young Doctor's Programme' by combining virtual educational platforms, it has been possible to continue to deliver high quality, interactive and engaging teaching. Through reflecting upon and evaluating teaching practises during these fast changing times, teachers should feel empowered to trial and test multimodal methods to maximise student learning. It is important that innovative activity is captured and communicated, so that educators can learn from one another and utilise shared experiences to improve the quality and accessibility of learning experiences beyond the pandemic.

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The Golden 5 Minutes for Preparation of Multiple Observed Standardised Long Examination Record for Clinical Encounter in Obstetrics and Gynaecology

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Abstract
Objectives: To investigate the effectiveness of the 5-minute preparation session in improving the passing rate and reducing the number of failed domains for Year 3 and 5 medical students during the Multiple Observed Standardised Long Examination Record for clinical encounter in Obstetrics and Gynaecology. Also, to evaluate the student's perception towards the session.
Methodology: This was a cross-sectional study that was carried out between 15th October 2017 and 1st July 2018 among Year 3 and 5 medical students who had undertaken their Obstetrics and Gynaecology clinical placement (n=170). Using a purposive sampling, the study sample was divided into two groups of Year 3 and 5, with a group of the students given the golden 5-minute preparation session pre-Formative Multiple Observed Standardised Long Examination Record for clinical encounter and another group given post -Formative Multiple Observed Standardised Long Examination Record for clinical encounter to study the effectiveness of the session. Students were asked to complete a post-Summative Multiple Observed Standardised Long Examination Record for clinical encounter questionnaire on the last day of their Obstetrics and Gynaecology clinical placement. Binary logistic regression was used to investigate whether attending the session increased the odds of passing the exam with 95% confidence intervals. The overall student's perception of the session was evaluated using a simple statistical technique.
Results: Almost all the students (90-100%) responded that they achieved the alignment of their knowledge and skills to the exam format, as well as improved self-confidence and motivation. The odds of passing compared to failing more than one domain, was significantly greater for students who had attended the session pre-FM (OR = 2.28, 95% CI = 1.02-5.13). There was an increase in Year 3 and 5 failure for students who did not attend the session; 28.6% vs 21.4% and 21.4% vs 17.1%, respectively.

Conclusion
The session improved achievement, knowledge, critical thinking, confidence, as well as the alignment of knowledge and skills to the exam format.

Key Words
Five-Minute Answer Planning; Improving Confidence; Motivation; Structured Study; Alignment of Knowledge; Skills to Exam

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Introduction

The Golden 5-minute preparation session is designed, taught and practiced to assist Year 3 and 5 medical students in planning for their Multiple Observed Standardised Long Examination Record for clinical encounter (MOSLER/c) hoping to improve their confidence, motivation and structure their study, as well as aligning their knowledge and skills to the exam format.

Inadequate planning prior to clinical examination could cause anxiety and stress for students, which leads to loss of focus and an inability to recall knowledge.[1] Students often do not feel prepared for exams, and more often than not they may focus on more than one section of the exam. However, making a timed schedule and committing to it can ensure adequate attention is given to each section of the exam. This may help to reduce the physical and mental exhaustion associated with the exam.[2] Most of the students did not plan to prepare for their exam and planned to just study to various extents. It is important to outline in writing a strategy for an exam since "*failing to plan is planning to fail*".[3]

Eriksson, a Swedish soccer coach, said "*the greatest barrier to success is the fear of failure*". This quote

shows that confidence in our own abilities can affect our performance and ultimately lead to our success.[4] Stiggins (1999) offered to use assessment to build student confidence and emphasised on the relationship between confidence and success.[5] Reviewing class notes, clarifying areas that were not understood and organizing information in an easy way to recall (e.g. outlines, note cards, flow charts, diagrams, etc.) were effective to improve students' exam confidence.[2]

Understanding the exam concepts and format also increased the confidence in answering in the exam. Collaborative testing improved performance, motivation, and decreased exam anxiety. They were less stressful than a traditional exam format.[6]

Information about the course, its expectations, and the exam can help students to get a better idea of what to anticipate in their exam and allow them to tailor their way of studying accordingly.[2] Knowing the exam format influenced a student's engagement with the course material, which can achieve deeper learning and focus on the main ideas and core concepts.[7] Moving students from superficial to deep conceptual understanding is linked to the higher Bloom's-level exams.[8]

Students need to align their knowledge and skills to the exam format. Alignment can be defined as "how much of student's learning objectives agree and serve in conjunction with exam expectations". By this, students have the opportunity to learn and meet the expectations of the programme.[9] Alignment should be conducted based on the cognitive demand, learning objectives and outcomes content that are applicable to the exam format.[10]

To achieve the cognitive alignment, Anderson and Krathwohl (2001) reviewed Bloom's Taxonomy and stated that the higher-order thinking should go through the process of applying, analysing, evaluating, and creating a structured answer plan.[11,12] Students need to acquire critical-thinking skills and subsequently the instruction and assessment must work together to promote these higher-order thinking skills.[9]

"Learning by doing" is the most effective strategy in helping students to prepare for an unfamiliar exam format. It is most effective when instructors provide timely feedback on how students are doing – so that students can adjust their approach as needed. This may be achieved by doing an exam-type sample, practice step by step and giving explanations for each step.[13]

Practicing exams, especially under time pressures, is shown to improve exam performance.[14] This practice improved the retrieval of information from the long-term memory of the student and created a correlation between answers given to the questions in the real exam.[15]

Exams are unavoidable stressors, in which medical training may create negative consequences of stress.[16] During an exam, every second counts so using a stopwatch will be helpful to prepare for exams.[3] Time management is significant in improving exam performance. If a student struggled with a component, moving on to the next task can ensure that time is not wasted.

Multiple Observed Standardised Long Examination Record (MOSLER)

Introduced in 2008, MOSLER is used to address concerns over low reliability and case specificity of single long cases. It is delivered over six sites in the North-East of England to about 340 students in each assessment. Cronbach's alpha, variance components, failure rates and examiner markings were reported in the attempt to obtain a clearer picture of the reliability of this complex examination.[17]

The MOSLER is an assessment tool designed to assess candidates' knowledge, clinical skills, and professionalism. The MOSLER may be considered as an evolution of both the OSCE (Objective Structured Clinical Examination) and Long Case assessment formats.[18]

Each MOSLER involves multiple assessments made by multiple examiners, by which the interaction between candidate and patient is observed by the examiner and candidates are graded in standardised domains against standardised grading criteria. A MOSLER is comprised of several OSLERs (Observed Standardised Long Examination Record) more commonly known as clinical encounters, each of which is designed to simulate a real clinical situation as far as possible.[18]

OSCEs are highly reliable, although often criticised as having a low validity. Long case exams are more valid but are known to be unreliable as only a small number of assessments may be made (usually only one) by a few (usually one or two) examiners and standardizing scoring is difficult. Furthermore, the candidates' interaction with the patient is usually not observed by the examiners, so clinical skills and behaviours are difficult to be assessed. It is impossible to take into account the effect the patient's behaviour during the encounter may have on an individual candidate's performance.[17]

All clinical encounters have a duration of 25 minutes: 5 minutes of preparation time during which the candidate can familiarise themselves with the candidate information specific to the clinical

encounter and prepare themselves to perform required tasks; 20 minutes of assessment time during which time those tasks are to be performed; 20 minutes of assessment time which is divided into two components - 14 minutes for a focused history and clinical examination and followed by 6 minutes of discussion with the examiner.[18]

Candidate information which specifies the clinical encounter will be provided to candidates just prior to the 5 minutes of the preparation time, followed by 20 minutes of the exam. Thereafter, the assessment will be graded in the following areas:

Assessed Area	Grade
Information Gathering	Competent/Not yet competent
Technical and Procedural Skills	Competent/Not yet competent
Communication Skills	Competent/Not yet competent
Clinical and Diagnostic Reasoning	Competent/Not yet competent
Management	Competent/Not yet competent
Professional Behaviour	Acceptable/ Unacceptable

Newcastle University Medicine Malaysia (NUMed) medical students require to sit for an in-course MOSLERs both Formative MOSLER (FM) and Summative MOSLER (SM) during Year 3 and 5, in addition to the end of the Year 5 final Examination MOSLER.

The session

Throughout my work as a lecturer and examiner in the medical schools, I noticed that students did not do adequate planning for their exams in the given time just before the exam starts. The feedbacks that were given mostly by students were in planning outlines of history taking and some investigation listing. High level of anxiety and stress throughout the exam causes loss of focus and inability to recall knowledge. Therefore, a well-structured session on the 5 minutes preparation prior to the start time of the exam may help students to align their knowledge and skills towards the exam format, plan their MOSLER/c, improve their critical thinking skill, self-confidence and to help them get back their focus in the event they were panicking during the exam.

A "Golden 5 minutes" planning session was designed to assist students to plan for their formative and summative MOSLER/c during the Obstetrics and Gynaecology (OG) placement. The teaching session was designed and taught to students over the years in 2016 and 2017. The aim of the session was to help students to structure their thoughts and plan their answers in that 5 minutes prior to the exam just after receiving the case scenario. The objective was to develop a positive impact on the student experience by improving their confidence and alignment of their knowledge and skills to the exam format.

Students gave positive feedback on the session, saying that "*It was very effective in structuring their thoughts at those stressful moments before the exam*". Some mentioned that "*It helped them in their study approach, given them more confidence towards the exam, and helped to manage their performance expectation in the exam*". The session was carried out over two to three hours in a small teaching group depending on the number of students in the group (ranging from 5 to 9). Each student will be given a case scenario mimicking common cases in OG and asked to do a 5-minute MOSLER/c preparation.

The preparation was repeated through four cycles on the same scenario for each student. In each cycle, 5 minutes for planning was given followed by feedback from the lecturer. In the first cycle, the student received feedback on time management and key entrance for each case. They were advised to distribute one minute for each of the following components: history, examination, investigations, differential diagnosis, and management plan. Then the second cycle was performed, and feedback was given in the form of case-based discussion to consolidate knowledge and align it to exam expectations. After the third cycle, an individualized feedback was given to each student to achieve a structured plan. After the fourth cycle, students' plans were marked, and personalized feedback was given to those who did not achieve the target plan on time. Students were asked to compare their first and last attempt in planning for MOSLER/c to check their progress. At the end of the session, students received a verbal feedback. They were encouraged to use the techniques learned and implement them in their case preparation throughout the rotation as a team prior to their SM.

This study aimed to investigate the effectiveness of the Golden 5 minutes' preparation session in improving the pass rate and reducing the number of failed domains during MOSLER/c, as well as to evaluate the student's perception towards the session.

Methodology

This was a cross-sectional study that was carried out between 15th October 2017 and 1st July 2018. Respondents were Year 3 and 5 medical students in NUMed who had undertaken their OG clinical

placement.

A pilot study was conducted between 1st Sept and 14th October 2017, where golden 5-minute preparation teaching session was given to the first two clinical placements of Year 5 students (n=47). Pre-testing of the teaching session and questionnaire (Appendix 1) were conducted using these groups of students to identify any gaps and modify the questionnaire if necessary. Two OG specialists also reviewed and finalised the study design and questionnaire after the pilot testing. The students who participated in the pilot study were not included into the main study.

All the remaining students in Year 5 (n=70) and all Year 3 students (n=100) participated in the session during OG clinical placement, which made up a total number of 170 students who participated in this study. All the students participated in the session were given equal opportunities of learning. Using a purposive sampling, the study sample was divided into two groups of Year 3 and 5 with a group of the students given the session pre-FM and another group post-FM to study the effectiveness of the session. Their performance in FM was captured to determine if they had passed FM successfully or failed FM with one or more domain. All the students were given the opportunity to evaluate and share their views towards the session.

After all the students had completed their SM, the anonymous questionnaire which contained ten questions ('YES', 'NO' or no response options) and a written informed consent form (Appendix 1) were distributed at the end of their clinical placement to collect further data including students' perception towards the effects of the session on their confidence, motivation, and study, also alignment of their knowledge and skills to the exam format. However, a third option was left blank to indicate uncertainty. All the students attended the session (n=170), however, nine of the forms were completed without consent, hence were omitted from the study. Written informed consent was taken prior to participation and anonymity was maintained. The study was approved by NUMed Research Ethics Committee and Newcastle Institutional Review Board.

Binary logistic regression analyses were used to assess whether attending the session before FM increased the odds of passing the FM. Data analyses were performed using R Environment for Statistical Computing. The odds ratio (OR) was computed as an effect size metric with 95% confidence intervals. Simple statistical techniques (percentage) were used to evaluate the overall perception related to the session post-SM.

Results

The session was attended by almost half of the students pre-FM (n=83) and the rest attended post-FM (n=87). The questionnaire was answered by all the students (n=170) post-SM, whereas 9 participants were omitted due to no informed consent, hence only 161 participants were included in the study. All the students attended the golden 5-minute preparation teaching session at the end of the rotation; hence the learning was achieved at 100%.

The session showed to improve the students' critical thinking and knowledge through the case-based discussion of the common cases practiced during the session. This also improved the alignment of knowledge and clinical skills to the exam format through increased student's awareness and practice of exam format. This was reflected by the odds of passing compared to failing in more than one domain, which was significantly greater for students who had attended the session pre-FM, in addition to the remarkable responses of student's questionnaire on the session post-SM.

All the students' perception (n=161) towards the session which was based on the questionnaire results at the end of their clinical placement post-SM was evaluated and the results were shown in Figure 1. Almost all of the students understood the concept of the session (99.4%), 93.7% were able to achieve 5 minutes MOSLER planning by the end of the teaching session, 96.2% of students had applied the planning technique during their SM, and 89.9% had successfully passed their SM.

All the students believed that the session had helped them to align their knowledge (100%), 92.5% students believed that it helped to align their clinical skills to the needs of SM and 99.4% of the students said that it had structured a good planning for SM. Students also recognised that the session improved self-confidence in exam performance (93.7%) and they were motivated to use the new strategies for their exam performance (91.8%).

Model predictions (probability of passing) from the logistic regression models are shown in Figure 2. The odds of passing compared to failing a single domain did not differ significantly between students who had attended the session and those who did not (OR=1.13, 95% CI = 0.54-2.37). However, the odds of passing compared to failing more than one domain, was significantly greater for students who had attended the session pre-FM (OR = 2.28, 95% CI = 1.02-5.13).

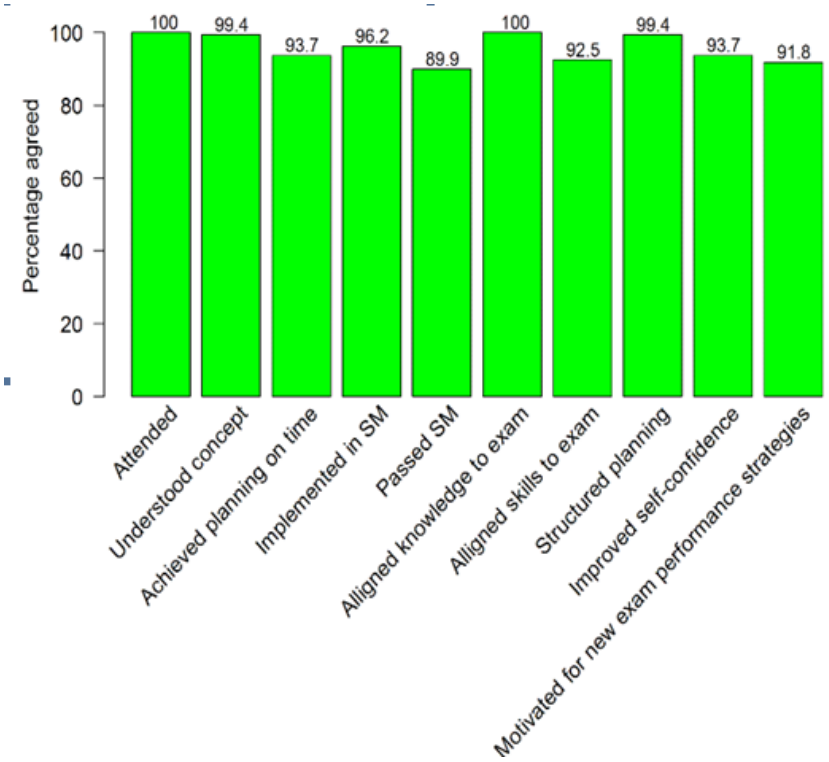

Figure 1: *Percentage based on structured feedback for student's achievement and perception towards the session (SM=Summative MOSLER)*

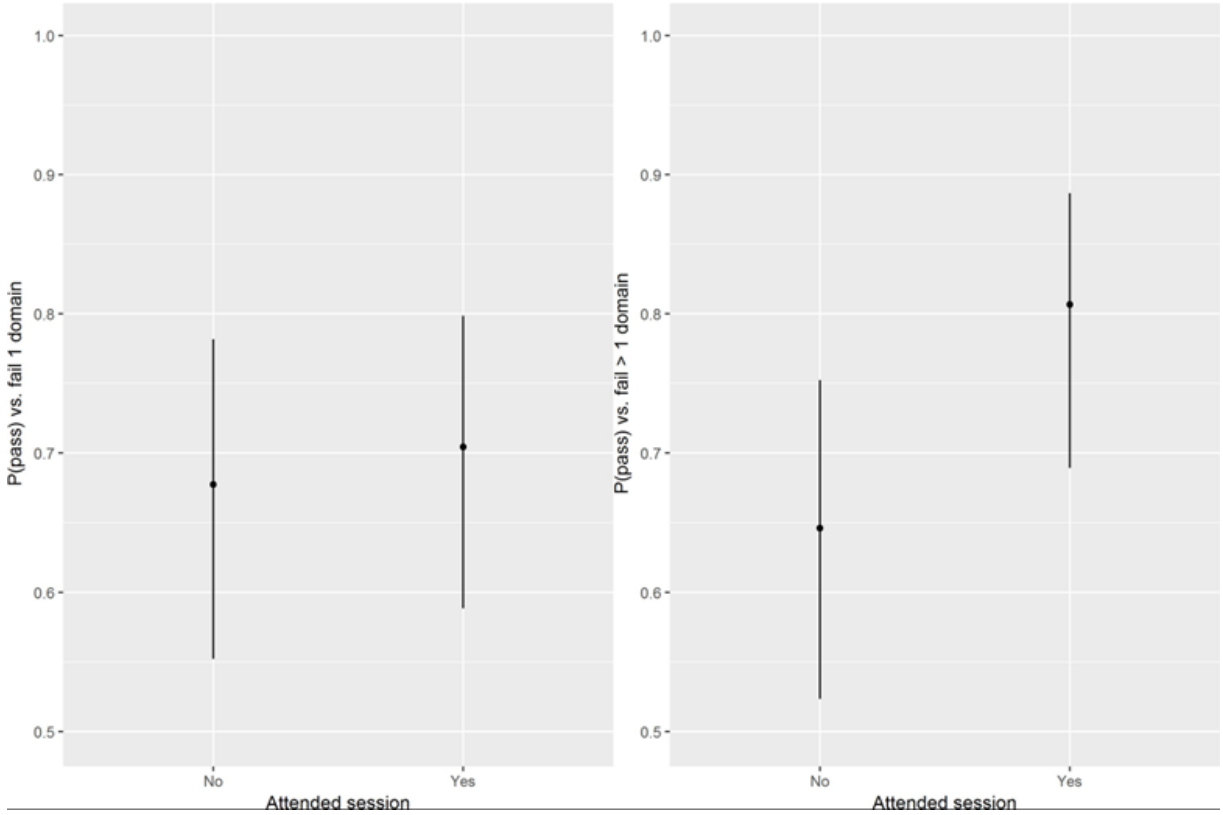

Figure 2: *Odds of passing compared to failing in a single or more domains.*

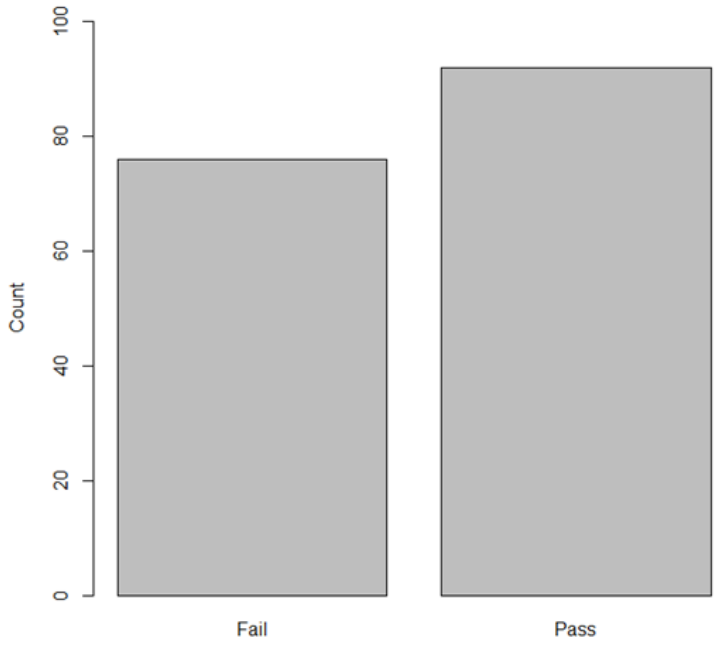

Figure 3: *Comparison of the total pass to total fail.*

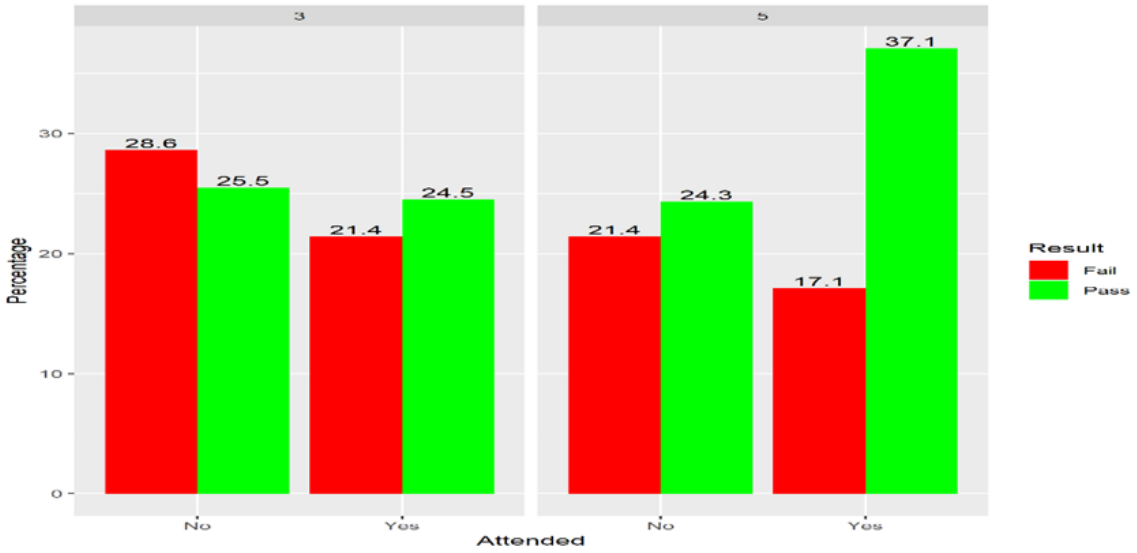

Figure 4: *Percentage of students pass or fail the Year 3 and 5 upon attending or not attending the session.*

The study compared total pass to total fail (fail = ≥ 1 domain), which was not significant (p-value = 0.217), refer to Figure 3. Further details based on whether the students attended the session or not and the impact on the results for Year 3 and 5 is shown in Figure 4.

Comparison between the Year 3 and 5 for pass or fail showed no significant difference in proportion passing between years (P = 0.1433), as shown in Figure 5. There was a difference in the numbers of students with an improvement in passing the FM in Year 5 more than those in Year 3, although this did not achieve statistical significance. This may be due to the small sample size of Year 5 students, an increase in Year 3 and 5 failure for students who did not attend the session; 28.6% vs 21.4% and 21.4% vs 17.1%, respectively, as well as an increase of passing students among Year 5 upon attending compared to not attending the session (37.1% vs 24.3%) as shown in Figure 6. This difference which favoured Year 5 students can be rationalized to say that they have more mature experiences in exams, programme outcomes and implementations.

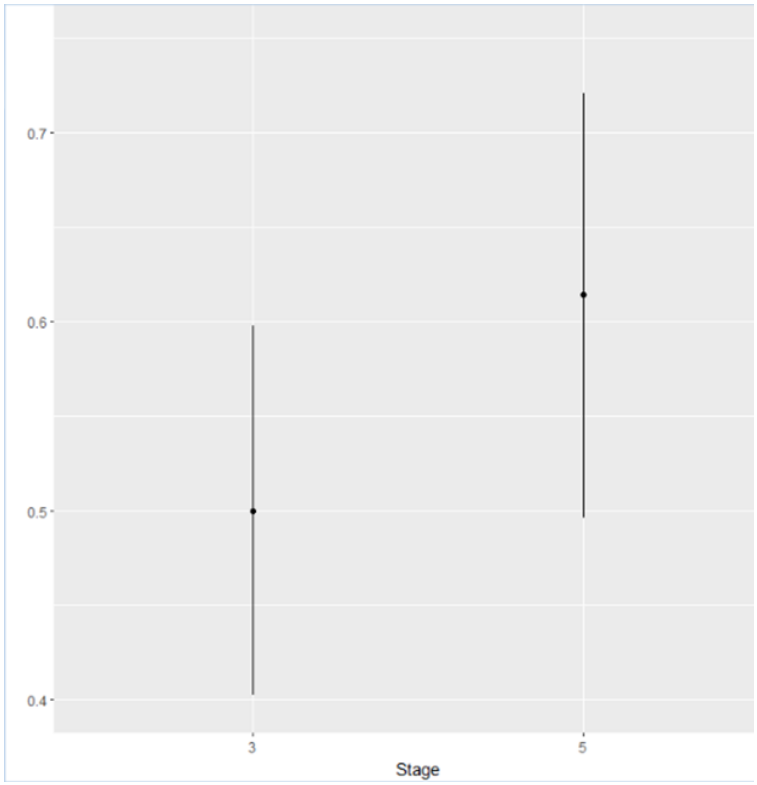

Figure 5: *Comparison of Year 3 and 5 pass or fail.*

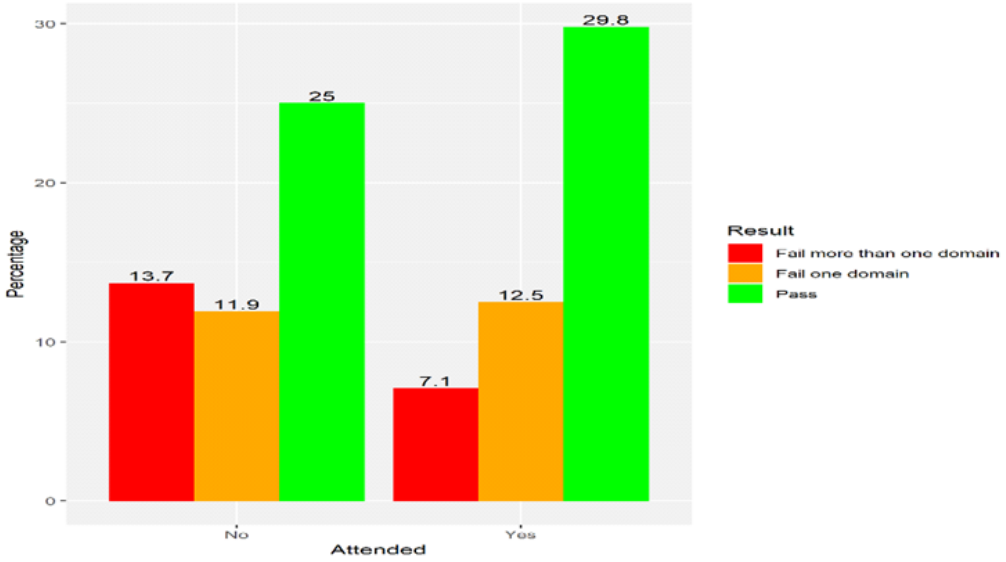

Figure 6: *Total percentage of students pass, fail one or fail more than one domain upon attending or not attending the session.*

Discussion

Our findings are consistent with McLean's[19] and Giacalone's[20] findings in their research which supported the impact of case-based discussion on improvement of their critical thinking and knowledge.[19] The use of feedback loop concepts can improve the student performances.[15]

Memory failure can occur under stressful situations such as by 'going blank' due to the exam pressure. Self-testing and retrieval or recall practice can increase the subsequent recall rates and develop more robust memory which can become resistant to the effects of stress and anxiety.[21] Pre-class reading can also help students to achieve the course content and result in improved exam performance.[22]

Chua stated that "we think that exams are an objective measure of learning, but they're really not". Students might know the information very well, but if they did not have effective exam-taking skills, they might be under-evaluated. Performance in exams can be improved when students are familiar with the exam structure, different sections of the exam and answers to the questions.[3]

Dunlosky et al. (2013) supportedthe positive impact of the training session on the alignment of knowledge and clinical skills to the exam format.[15] Sweiry et al. supported that improvement of performance was due to awareness on the exam format and expectations.[23] Stanley and Karbalaei believed that strengthening the student's critical thinking improved the student's academic achievement and performance. [24,25]

Limitation

Our study was conducted in a single site with a small number of participants. Therefore, the results of our study may not be generalized to other settings. Future studies should be carried out with a larger sample size and implementing the session in subsequent years or other medical schools may add on to the creditability of this session as a teaching tool.

Conclusion

Timely practice on the exam format and managing the exam expectations raised the students' confidence, motivation, and reduced the exam stress. Implementation of the modified educational experiences helped with the alignment of the knowledge and skills to the exam format. A well-structured and scheduled practice on the exam format helped the students plan for their study, improve their learning, recall their knowledge and perform in their exam.

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Appendix 1

Golden 5 Questionnaire – Study Information and Consent Form.

STUDY INFORMATION.

Thank-you for agreeing to take part in this study which aims to evaluate the impact of having a "Golden 5 minutes" training session on the pass rate of a MOSER examination. It also aims to assess the perceived benefits of introducing such a session.

The study asks the candidates to complete a questionnaire which should take less than five minutes.

Before starting we need you, please, to sign the consent form below. To protect your privacy the form will be stored separately to the completed questionnaire which will be completed anonymously.

CONSENT FORM.

All information you provide on the study questionnaire is strictly anonymous and will only be used for research purposes. You have the right not to take part in this study. Refusal to participate or withdraw from this study will incur no penalty or loss of rights and benefits. The study personnel retain the right to withdraw your participation at any time. Further information about the study can be obtained from Dr. Hassan Karali (hassanfadhil.hussainkarali@newcastle.edu.my)

I hereby give consent for the information provided in this questionnaire to be used for research purposes, including publications.
Academic year: …… Year: …….. Student Number: ……..

☐ Please tick box if you wish to give consent.

Signature…… Date …….

Questionnaire on "Golden 5 teaching session"

Feedback of student's perception for the session:

Please tick YES or NO box. If unsure do not tick.

1. Have you attended the 5-minute Pre- MOSLER preparation session?	YES	NO
2. Did you understand the concept of the session?	YES	NO
3. Were you able to achieve your planning in the given time during the teaching session?	YES	NO
4. Did you implement the concepts you have learned in the session during case preparation in the actual MOSLER?	YES	NO
5. Did you successfully pass your MOSLER?	YES	NO
6. Do you think the session helped you to align your knowledge to the needs of MOSLER?	YES	NO
7. Do you think that the session helped you to align your clinical skills to the needs of MOSLER?	YES	NO
8. Did the session help you to structure a plan for your MOSLER?	YES	NO
9. Did the session improve your confidence to do well in the exam?	YES	NO
10. Did the session motivate you to try new performance strategies?	YES	NO

Thank you for your Feedback

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Learning Styles of Undergraduate Medical Students: Effect of Socio-Demographic and Educational Background Characteristics

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Abstract

Background: Every student has his own specific learning style. Studying medicine in particular with the vast and extensive medical curriculum, has always been a matter of argument by the teachers.

Objectives: This study aims to identify the main learning style and the effect of socio-demographic and educational background characteristics on learning styles of Mansoura medical students.

Material and Methods: A cross sectional study was conducted during the academic year 2018-2019 on 427 undergraduate medical students. A self-reported questionnaire was used including the VARK learning styles inventory.

Results: The study found that 80.8% of the observed medical students had unimodal learning style with 48.8% being kinesthetic followed by 38.6% being auditory learners. Students aged ≥21 years (42.5%) had significant visual learning dominance, 57% of the students aged <21 years had significant kinesthetic dominance, 31.6% of female students had significantl visual dominance and 46.5% of the studied males had significant auditory dominance, 43.9% of students with university grade 4-6 were significantly auditory learners and 56.9% of students with university grade 1-3 were kinesthetic learners. Attending lectures had statistically significant association with auditory (p=0.02) and kinesthetic dominance (p=0.005). All VARK learning styles had significant association with the developed integrated medical education program. Multivariate analysis showed that the predictors of unimodal learning style were attending lectures (OR=5.15) and enrolling in conventional medical education program (OR=261.23).

Conclusion: This study concluded that many medical students at Mansoura medical college were unimodal learners with the most preferable learning style was kinesthetic. Unimodal learning was predicted by attending lectures and enrolling in conventional education program.

Key Words
Learning Styles; Undergraduate Medical Students; Socio-Demographic Characteristics; Educational Background.

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Introduction

Learning style as a term means different and unique ways used by individuals as they prepare to learn and recall information[1], or it is defined as the process by which a person understands and retains information, thereby gaining knowledge or skills.[2]

Every student has his/her own specific learning style that mainly affects the amount of learning under specific circumstances. Some students learn better via listening, while some others learn better through reading.[3] According to individual preference to learning style, learners can be classified as unimodal if they show predominantly one learning preference or multimodal if preference is shared between two or more learning styles.[4] It has been believed that understanding of learning styles can be useful to both teachers and students[5], teachers who well understand students' learning styles can tailor pedagogy to fit these styles. Correspondingly, students who are aware of their learning styles could be empowered to achieve better educational satisfaction[1] as well as to improve students' understanding of the course content.[6]

University education in general requires more deep learning and analytical thinking compared to simple factual recall required for advanced level or equivalent school examinations.[1] Furthermore, studying medicine in particular with the vast and extensive medical curriculum, has always been a matter of argument by the teachers that students

do not remember, recall and apply the knowledge given to them in efficient manner. This argument makes the medical school think about how the students should be conveyed knowledge so that they can absorb maximally and reproduce effectively when required. This aim can be well-achieved by identifying the various learning styles of students.[4]

Justification of the study

Up to our knowledge, there are inadequate published data on learning styles among the undergraduate Egyptian medical students in comparison to others. Thus this study was conducted to identify the main learning style and the effect of socio-demographic and educational background characteristics of students on learning styles at Mansoura Faculty of Medicine.

Material and Methods

Setting:

This cross-sectional comparative study was carried out in the Faculty of Medicine, Mansoura University, Mansoura, Egypt during the second semester of the academic year 2018-2019 over a period of 4 months (from February to May, 2019). The study was conducted on students of both the traditional undergraduate medical program and the developed integrated program. The traditional program consists of two stages; the preclinical stage in the first 3 years which is devoted to basic medical sciences and the clinical stage in the last 3 years, during which students rotate to different clinical departments. The curriculum depends heavily on the use of lectures and most of the tasks are teacher centered. However, the developed integrated program consists of modules depending heavily on problem based and self-learning with most of the tasks being student centered.

Study Participants:

Medical students of all 6 academic levels and both sexes who were enrolled in the undergraduate Mansoura medical program and underwent traditional lecture-based learning and developed integrated learning systems were targeted. International students from non-Egyptian nationality were excluded from the study. The researchers distributed 590 questionnaires and collected 427 completed questionnaires (response rate = 72.4%). None participation was due to lack of interest in the study, absence during the study period and incomplete questionnaires.

Sampling Technique and Sample Size Calculation:

According to students' affairs administration of Mansoura Medical College, the total number of students registered in 2018-2019, was 6894 of both sexes.

The students were selected from all the six grades in proportion to their total numbers through a stratified cluster sampling technique. Firstly, the students were stratified into six academic years (first to sixth), and then one cluster was randomly chosen from each year with a total of six clusters. All students in the selected clusters were targeted and interviewed at the practical sessions (section/ round). Each section/round was considered as a cluster.

To capture a representative sample of Mansoura undergraduate medical students, Raosoft sample size calculator was used[7], with total population size of 6894, response distribution of 43% (Based on previous study, where the students preferring to learn using multi VARK modalities represented 43%)[8], and 5% margin of error with 95% confidence level. Thus the final total has to be at least 415 students after adding 10% to the estimated sample size (377) in order to overcome the attrition.

Ethical Considerations:

The study was approved by the Institutional Research Board (IRB) of Faculty of Medicine with Code Number: R/18.11.347. The participation was entirely voluntary. The researchers introduced themselves to the students in each grade, who were informed about aims of study, guarantees of anonymity and confidentiality and the need for informed written consent. The students were interviewed after taking permission from the respective heads of departments. The students were allowed to respond in their own time and privacy.

Study Instrument:

A structured self-administrated anonymous questionnaire was developed in English form (the formal teaching language) to collect data. The questionnaire was designed as a packet of 4 parts:

Part I and Part II were developed by the researchers via reviewing the literatures to collect data on the necessary socio-demographic characteristics and educational background of studied students. The content validity of the questions was insured by consulting subject experts to be amended according to their comments.

Part III was the VARK learning styles inventory (Version 7.8)[9] which is a valid and reliable tool.

Learning styles of students were evaluated via the 16-item VARK learning styles inventory which has confirmed satisfactory reliability and validity.[10] It was also selected because it is concise, easy to complete and has been used extensively among medical students in many studies and countries.[11, 12, 13] The inventory consists of 16 multiple choice questions that were designed to measure four sensory domains (subscales) used for learning, namely visual,

auditory, read/write and kinesthetic. In the VARK questionnaire, students could choose more than one option for each answer. The subscale scores were first calculated according to protocol where each item consisted of 4 options; each indicated one of the learning styles. Thus, the score range from 0-16 in each style. Then the preferred learning style of each student was determined as the one in which they obtained the highest score. Finally, unimodality or multimodality style is determined according to sub scale scores. If a student obtains similar scores in two or more styles, they will be identified as a learner with multimodal learning styles where the minimum and maximum scores were 16 and 64 respectively.

The Final version of the questionnaire was pilot tested on a group of undergraduate medical students of Mansoura university (they were excluded from the full-scale study) in order to check the clarity and validity of the questionnaire.

Data analysis:

Data was analysed by using SPSS program, version 16 for Windows. Descriptive statistics (frequency, percentage, mean and standard deviation) were used primarily to summarize the data in graspable form. Sensory modality preferences/VARK mode distributions are expressed as percentages of students in each category. Scores of individual VARK components are expressed as means ± SD. Chi-Square, Fischer exact and Monte Carlo tests were used for comparison of VARK scores based on socio-demographic characteristics and educational background. $P \leq 0.05$ was considered statistically significant.

Results

The present study was carried out on 427 medical students where their socio-demographic characteristics showed that their mean age was 21.39±1.74 ranging from 18 to 29 years, 52.7% were females, 98.1% were single, 50.4% had urban residence and 89.9% had satisfactory income. The majority had parents with high education and non-health related occupations. The educational background of the studied students revealed that 91.3% came from governmental schools and 57.6% enrolled in university grade from 4 to 6 with nearly 82% registered in the conventional medical education program. Most of the students mentioned that they attend lectures (67.2%) and didn't enroll in private lessons or research projects (70.3% and 88.5% respectively). Among them, nearly 30% took training courses with only 1.9% of these courses being overseas (**Data is not shown in table)**.

Figure (1) shows that the most frequent learning styles among students were kinesthetic (48.8%) followed by auditory (38.6%), visual (22.2%), multimodal (19.2%) and reading (15%).

Table (1) shows among the studied students, age illustrated a statistically significant association with visual and kinesthetic dominance style of learning with 42.5% of the students aged 21 years or older had higher frequency of visual learning style, however 57.0% of the students aged less than 21 years had more frequent kinesthetic dominance learning style. A statistically significant association was found between gender with visual and auditory learning styles with 31.6% of the studied female students having visual dominance and 46.5% of the studied males had auditory dominance. University grade and attending lectures had statistically significant association with auditory and kinesthetic dominance. All VARK learning styles had significant association higher frequencies with the developed integrated medical education program.

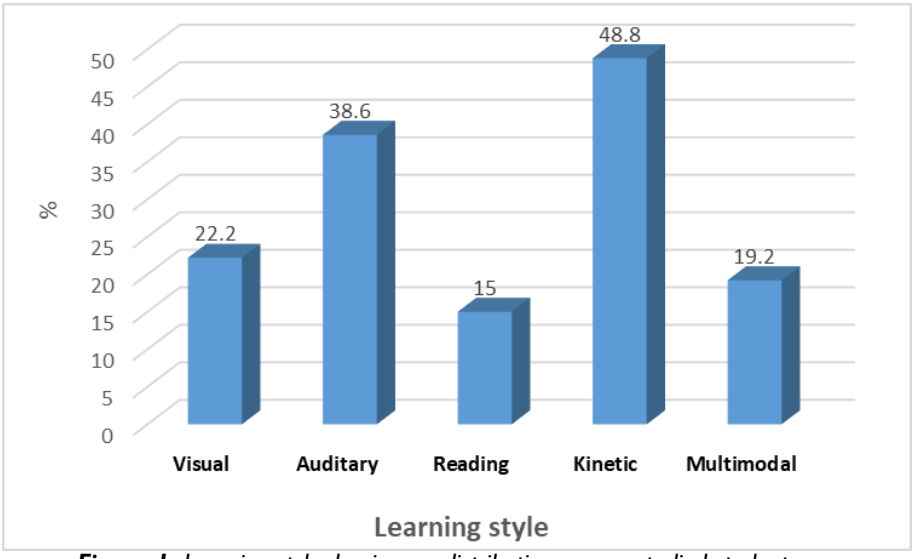

Figure 1: *Learning style dominance distribution among studied students*

Table 1: *Socio demographic and educational background factors affecting dominant learning style among studied students*

Variables	Total N= 427	V n=95 (%)	A n=165 (%)	R n=64 (%)	K n=209 (%)
Socio demographic factors					
Age/years:					
- <21	142	33 (23.2)	44 (31.0)	23 (16.2)	81 (57.0)
- ≥21	285	62 (21.8)	121 (42.5)	41 (14.4)	128 (44.9)
Test of significance		χ^2=0.121, p=0.728	χ^2=5.5, p=0.02*	χ^2=0.24, p=0.62	χ2=5.2, p=0.02*
Sex:					
- Male	202	24 (11.9)	94 (46.5)	31 (15.3)	91 (45.0)
- Female	225	71 (31.6)	71 (31.6)	33 (14.7)	118 (52.4)
Test of significance		χ^2=23.82, p<0.001*	χ^2=23.82, p=0.002*	χ^2=0.04, p=0.84	χ^2=2.33, p=0.13
Marital Status:					
- Single	419	95 (22.6)	162 (38.7)	62 (14.8)	205 (48.9)
- Married	8	0 (0.0)	3 (37.5)	2 (25.0)	4 (50.0)
Test of significance		χ^2=2.33, p=0.13	χ^2=0.04, p=0.95	χ^2=0.65, p=0.42	FET, P=1.0
Residence:					
- Urban	215	53 (24.5)	76 (35.3)	30 (14.0)	106 (49.3)
- Rural	212	42 (19.8)	89 (42.0)	34 (16.0)	103 (48.6)
Test of significance		χ^2=1.38, p=0.23	χ^2=2.1, p=0.15	χ^2=0.39, p=0.546	χ^2=0.02, p=0.882
Mother education:					
- Illiterate or primary	12	2 (16.7)	5 (41.7)	3 (25.0)	8 (66.7)
- Secondary education	106	22 (20.8)	47 (44.3)	16 (15.1)	48 (45.3)
- High education	309	71 (23.0)	113 (36.6)	45 (14.6)	153 (49.5)
Test of significance		χ^2=0.43, p=0.799	χ^2=2.1, p=0.35	χ^2=0.99, p=0.61	χ^2=2.09, p=0.35
Father Education:					
- Illiterate or primary	8	1 (12.5)	5 (62.5)	2 (25.0)	4 (50.0)
- Secondary education	91	21 (23.1)	37 (40.7)	19 (20.9)	38 (41.8)
- High education	328	73 (22.2)	123 (37.5	43 (13.1)	167 (50.9)
Test of significance		χ^2=0.48, p=0.79	χ^2=2.3, p=0.32	χ^2=4.1, p=0.13	χ^2=2.32, p=0.31
Mother Occupation:					
- House Wife	178	43 (42.2)	69 (38.8)	24 (13.5)	84 (47.2)
- Health related occupation	63	16 (25.4)	23 (36.5)	14 (22.2)	32 (50.8)
- Non-Health related occupation	186	36 (19.4)	73 (39.2)	26 (14.0)	93 (50.0)
Test of significance		χ^2=1.56, p=0.44	χ^2=0.23, p=0.927	χ^2=3.05, p=0.22	χ^2=0.33, p=0.82
Father Occupation:					
- Non-Working	8	2 (25.0)	4 (50.0)	1 (12.5)	1 (12.5)
- Health related occupation	80	19 (23.8)	31 (38.8)	14 (17.5)	41 (51.2)
- Non-Health related occupation	339	74 (21.8)	130 (38.3)	49 (14.5)	167 (49.3)
Test of significance		χ^2=0.14, p=0.92	χ^2=0.45, p=0.79	χ^2=0.45, p=0.78	χ^2=4.4, p=0.11

Variables	Total N= 427	V n=95 (%)	A n=165 (%)	R n=64 (%)	K n=209 (%)
Family Income:					
- Satisfactory	384	90 (23.4)	143 (37.2)	59 (15.3)	191 (49.7)
- Unsatisfactory	43	5 (11.6)	22 (51.2)	5 (11.6)	18 (41.9)
Test of significance		χ^2=3.09, p=0.08	χ^2=3.2, p=0.07	χ^2=0.42, p=0.52	χ^2=0.93, p=0.33
Educational background factors					
School Type:					
- Governmental Arabic	367	82 (22.3)	149 (40.6)	55 (15.0)	174 (47.4)
- Governmental Language	23	5 (21.7)	6 (26.1)	3 (13.0)	14 (60.9)
- Private Arab	24	7 (29.2)	7 (29.2)	5 (20.8)	12 (50.0)
- Private Language	13	1 (7.7)	3 (23.1)	1 (7.7)	9 (69.2)
Test of significance		χ^2=2.26, p=0.52	χ^2=4.29, p=0.23	MC, p=0.74	χ2=3.87, p=0.28
University grade:					
- G 1-3	181	40 (22.1)	57 (31.5)	28 (15.5)	103 (56.9)
- G 4-6	246	55 (22.4)	108 (43.9)	36 (14.6)	106 (43.1)
Test of significance		χ^2=0.01, p=0.94	χ^2=6.9, p=0.009*	χ^2=0.05, p=0.81	χ^2=7.97, p=0.005*
Attend lectures:					
- Yes	287	64 (22.3)	122 (42.5)	45 (15.7)	154 (53.7)
- No	140	31 (22.1)	43 (30.7)	19 (13.6)	55 (39.3)
Test of significance		χ^2=0.001, p=0.97	χ^2=5.52, p=0.02*	χ^2=0.328, p=0.567	χ^2=7.78, p=0.005*
Medical educational program:					
- Conventional	350	59 (16.9)	110 (31.4)	40 (11.4)	153 (43.7)
- Developed integrated	77	36 (46.8)	55 (71.4)	24 (31.2)	56 (72.7)
Test of significance		χ^2=32.6, p<0.001*	χ^2=42.59, p<0.001*	χ^2=19.30, P<0.001*	χ^2=21.26, p<0.001*
Private lessons:					
- Yes	127	32 (25.2)	55 (43.3)	17 (13.4)	55 (43.3)
- No	300	63 (21.0)	110 (36.7)	47 (15.7)	154 (51.3)
Test of significance		χ^2=0.91, p=0.34	χ^2=1.72, p=0.19	χ^2=0.35, p=0.56	χ^2=2.2, p=0.13
Research project:					
- Yes	49	11 (22.4)	22 (44.9)	9 (18.4)	20 (40.8)
- No	378	84 (22.2)	143 (37.8)	55 (14.6)	189 (50.0)
Test of significance		χ^2=0.001, p=0.97	χ^2=0.94, p=0.33	χ^2=0.51, P=0.48	χ^2=1.42, p=0.23
Training courses:					
- Yes	128	31 (24.2)	51 (39.8)	15 (11.7)	57 (44.5)
- No	299	64 (21.4)	114 (38.1)	49 (16.4)	152 (50.8)
Test of significance		χ^2=0.43, p=0.51	χ^2=0.13, p=0.74	χ^2=1.50, p=0.22	χ^2=1.43, p=0.23
Site of training courses taken					
		n=31	**n=51**	**n=15**	**n=57**
- Egypt	120	30 (25.0)	50 (41.7)	13 (10.8)	51 (42.5)
- Overseas	8	1 (12.5)	1 (12.5)	2 (25.0)	6 (75.0)
Test of significance		χ^2=0.64, p=0.43	χ^2=2.66, p=0.10	χ^2=1.46, p=0.23	χ^2=3.21, p=0.07

χ^2=Chi-Square test

Table 2: *Association between learning style modality with socio-demographic and educational background characteristics of the studied students*

Variables	Total N=427	Learning style modality		Test of significance
		Uni-modal n=345 (80.8%)	Multi-modal n=82 (19.2%)	
Age/years:				
- <21	142	110 (77.5)	32 (22.5)	χ^2=1.52
- ≥21	285	235 (82.5)	50 (17.5)	p=0.22
Sex:				
- Male	202	175 (86.6)	27 (13.4)	χ^2=8.42
- Female	225	170 (49.3)	55 (67.1)	p=0.004*
Marital Status:				
- Single	419	338 (80.7)	81 (19.3)	χ^2=0.24
- Married	8	7 (87.5)	1 (12.5)	p=0.63
Residence:				
- Urban	215	174 (80.9)	41 (19.1)	χ^2=0.005
- Rural	212	171 (80.7)	41 (19.3)	p=0.94
Mother education:				
- Illiterate or primary	12	8 (66.7)	4 (33.3)	χ^2=1.68
- Secondary education	106	85 (80.2)	21 (19.8)	p=0.43
- High education	309	252 (82.6)	57 (18.4)	
Father Education:				
- Illiterate or primary	8	5 (62.5)	3 (37.5)	χ^2=2.07
- Secondary education	91	72 (79.1)	19 (20.9)	p=0.36
- High education	328	268 (81.7)	60 (18.3)	
Mother Occupation:	178	146 (82.0)	32 (18.0)	χ^2=0.55
- House Wife	63	49 (77.8)	14 (22.2)	p=0.76
- Health related occupation	186	150 (80.6)	36 (19.4)	
- Non-Health related occupation				
Father Occupation:	8	8 (100.0)	0 (0.0)	χ^2=3.82
- Non-Working	80	60 (75.0)	20 (25.0)	p=0.15
- Health related occupation	339	277 (81.7)	62 (18.3)	
- Non-Health related occupation				
Family Income:				
- Satisfactory	384	307 (79.9)	77 (20.1)	χ^2=1.77
- Unsatisfactory	43	38 (88.4)	5 (11.6)	p=0.18
School Type:				
- Governmental Arabic	367	295 (80.4)	72 (19.6)	MC
- Governmental Language	23	18 (78.3)	5 (21.7)	p=0.72
- Private Arab	24	20 (83.3)	4 (16.7)	
- Private Language	13	12 (92.3)	1 (7.7)	
University grade:				
- G 1-3	181	143 (79.0)	38 (21.0)	χ^2=0.65
- G 4-6	246	202 (82.1)	44 (17.9)	p=0.42
Attend lectures:				
- Yes	287	213 (74.2)	74 (25.8)	χ^2=24.43
- No	140	132 (94.3)	8 (5.7)	p<0.001*
Medical educational program:	350	338 (96.6)	12 (3.4)	χ^2=311.3
- Conventional	77	7 (9.1)	70 (90.9)	p<0.001*
- Developed integrated				

Variables	Total N=427	Learning style modality		Test of significance
		Uni-modal n=345 (80.8%)	Multi-modal n=82 (19.2%)	
Private lessons: - Yes - No	 127 300	 101 (79.5) 244 (81.3)	 26 (20.5) 56 (18.7)	 χ^2=0.19 p=0.67
Research project: - Yes - No	 49 378	 39 (79.6) 306 (81.0)	 10 (20.4) 72 (19.0)	 χ^2=0.05 p=0.82
Training courses: - Yes - No	 128 299	 106 (82.8) 239 (79.9)	 22 (17.2) 60 (20.1)	 χ^2=0.48 p=0.49
Site of training courses taken: - Egypt - Overseas	 120 8	 100 (83.3) 6 (75.0)	 20 (16.7) 2 (25.0)	 χ^2=0.37 p=0.63

χ2=Chi-Square test MC: Monte Carlo test *statistically significant (if p<0.05)

Table 3: *Predictors of unimodal learning style modality among studied students*

Predictors	β	p	Odds ratio (95%CI)
Sex: - Male - Female (r)	0.679	0.172	1.97 (0.744-5.23)
Attend lectures: - Yes - No (r)	1.64	0.012*	5.15 (1.43-18.62)
Medical educational program: - Conventional - Developed integrated (r)	5.56	<0.001*	261.23 (94.71-720.49)
Overall % predicted =95.6%	Model χ^2=275.18	p<0.001*	

Table (2) shows that 80.8% of the studied medical students had a unimodal learning style versus 19.2% who were multimodal. A statistically significant association was detected between mode of learning and the following factors: gender, attending lectures and type of medical education program with 86.6% of the studied males using unimodal learning style versus 49.3% of the studied females, 94.3% of the students who didn't attend lectures had unimodal learning style versus 74.2% of those who attend lectures and 96.6% of the students enrolled in conventional medical education program use unimodal learning style versus 9.1% of those with developed integrated medical program.

Table (3) shows multivariate analysis of the studied factors affecting learning style mode. It illustrates that the predictors of unimodal learning style were attending lectures and conventional medical education program whereas attending lectures increased using unimodal learning among medical students by 5.15 times more than those who were not attending lectures. Also, enrolling in the conventional program increased using unimodal learning among students by 261.23 times more than those who enrolled in the developed program with the overall percent predicted as 95.6%.

Discussion

The VARK questionnaire is widely used by researchers to identify the learning preference of students.[14, 15] Learning style varies from one group to another based on culture, the nature of the studies and the characteristics of students.[16] The present study found that kinesthetic learning was the most preferable learning style among medical students. It was reported that manipulating models and role playing satisfies kinesthetic learners.[16] Kinesthetic learners tend to gain knowledge via experience and practice as well as they favour to learn information that has linked to reality.[17] Since the preferred unimodal presentation was kinesthetic, most students may benefit from active learning strategies over the traditional lecture.[18] The present result was in line with other studies that found students were more kinesthetic learners.[15, 19, 20] In contrast to our finding, previous studies reported that medical students had multimodal preferences.[14, 16] In addition, other studies showed that the preferred style amongst the majority of medical students was the auditory learning style.[21, 22, 23] Medical teachers can develop their educational strategies if they know the learning preferences of their students. This allows them to shift from their own preferred mode of teaching towards the learning preferences of medical students which may help to develop their knowledge, skills and attitudes and that may enable them to become a more competent student.[24]

The current study revealed that the age of students had significant association with visual and kinesthetic learning style, where older students had visual dominance versus younger students who had kinesthetic dominance. In contrast, an Iranian study on medical students found that there was no significant association between auditory, visual and kinesthetic learning styles and age, but there was a significant association between reading-writing learning styles of students and age.[24] Age was considered as factor for sharing of the learning method from one to another. It was reported that shifting of postgraduate students from multimodal to unimodal learners was due to around seven years difference in age between undergraduate and postgraduate students.[25] Another study found significant difference in preferences for visual and read/write learning style as age increases.[26]

Our result showed significant association of gender and visual and auditory learning styles, where female students had visual dominance versus males who had auditory dominance. In comparison, an Iranian study on medical students reported significant association of auditory and reading-writing learning styles with gender while no significant association of gender was found with visual and kinesthetic learning style of students.[24] Another study on 1st year medical students observed that a significantly higher number of femal e students preferred the auditory mode of learning style whereas a significantly higher number of male students preferred the kinesthetic mode.[27] Other studies concluded that learning style didn't differ between male and female students.[28-30]

The present work found significant association of university grade and attending lectures with auditory and kinetic dominance. Also, all VARK learning styles had significant association with the developed integrated medical education program versus the traditional program. It was expected that attending lectures could encourage the students towards auditory learning style. According to Samarakoon et al., first year medical students would be expected to favour auditory and read/write learning styles while final year students would be expected to switch to multimodal learning styles with greater emphasis on deep learning.[25] An American study conducted on first year medical students found larger number of auditory learners in an alternate group who are supposed to be academically challenged compared to the traditional medical students. The alternate group learners were less likely to signify visual learning preference than the traditional medical students.[31]

The current study found that most of the studied medical students (80.8%) had unimodal learning style versus only 19.2% who were multimodal. In contrast, 20 full text research papers were retrieved and reviewed worldwide. They showed that multimodal learning style was predominant over unimodal.[20] Also, another previous study showed that medical students generally prefer polymodal learning.[16, 32, 33] Our result was consistent with other studies which found that medical students showed dominant unimodal learning style.[34-36]

The result of the study showed that although there were significant association between gender, attending lectures and type of medical education program with learning mode; attending lectures and enrolling in conventional program were the only predictors of unimodal learning. This is a unique finding, not found to be previously reported on literature review. As the study revealed that conventional medical program and attending the traditional didactic lectures increased the unimodal learning preference, we have to encourage the multimodal learning for most students by using teaching methods other than lectures, that include

a blend of activities that stimulate visual, aural, read/ write and kinesthetic modalities. The developed integrated medical program and innovative teaching approach using multimedia can provide chances for multiple demonstrations of the content and provide various learning styles of the students. It was reported that multimodal learners have the advantage over the unimodal learners, which gives them a better chance for admission into medical school.[37] The results of the VARK questionnaire should convince teachers to use multiple modes of information presentation. This may require instructors to learn using a variety of styles, which will positively affect learning.[38]

In conclusion, this study demonstrated that many medical students at Mansoura medical college were unimodal learners with the most preferable learning style being kinesthetic. Additionally, this study revealed that older students had visual dominance versus younger students who had kinesthetic dominance. The study found significant association of gender and visual and auditory learning styles where female students had visual dominance versus males who had auditory dominance. Also, a significant association was found between auditory and kinetic preference with university grade and attending lectures. Furthermore, all VARK had significant association with the developed integrated medical education program. Finally, attending lectures and enrolling in the conventional program were the only predictors of unimodal learning. This finding is unique and so useful for improving the quality of lectures and teaching curricula and may control how teachers will deliver information to students in the future. However, more studies are necessary to be conducted among medical students investigating their learning style preferences and their affecting factors.

Limitations

This study has some limitations. First, the sample was from a single medical institution in Egypt so a larger sample from multiple institutions is needed. Second, we used a cross-sectional study design, which is not ideal for determining relationships between variables.

Disclosure statement

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Qualitative Study
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Patients' And Surgeons' Perceptions and Experiences of Brachial Plexus Injury Surgery in Cambodia: A Qualitative Study

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Abstract

Background: Brachial plexus injury (BPI) is a devastating injury, commonly caused by motor-vehicle accidents, especially those involving motorcycles. BPI causes physical limitations and psychosocial problems, which should be considered when assessing success of BPI surgery, not just by the degree of motor and sensory recovery.

Aims: The aims of this study were to explore the patients' and surgeons' perceptions and experiences of BPI surgery in Cambodia.

Methods: A qualitative study was used based on thematic analysis of the transcribed video -recorded interviews with two patients and two hand surgeons from the Children's Surgical Centre, Phnom Penh.

Results: The themes showed the importance of preoperative counselling to inform patients of the slow recovery and to encourage realistic expectations of the surgery. The patients' evaluation of surgical success may be different from the surgeon's assessment and goes beyond the physiologic measures in determining clinical improvement. The capacity to return to normalcy and to participate in life cannot be overemphasised. It is, therefore, important for the surgeons doing BPI surgery to understand and address the patients' needs.

It took the surgeons over five years to set up a robust training programme in Cambodia to train local surgeons to be able to perform BPI reconstruction to a level of satisfaction among the patients.

Key Words

Brachial Plexus Injury; BPI; Qualitative Study; Thematic Analysis; Patients' Perceptions and Surgeons' Perceptions; Volunteerism; Cambodia

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Introduction

Brachial plexus injury (BPI) is a relatively uncommon but devastating injury which can cause paralysis, intractable pain, loss of sensation and function in the affected limb[1]. Typically, it affects young men between 15 years to 30 years[2]. 70% of these individuals present with multiple injuries, 70% are supraclavicular lesions and 70% of them have at least one of the roots avulsed. Of these, 70% involve C7, C8 and T1 and 70% suffer chronic pain. The 'rule of 7 seventies' also states that motor-vehicle accidents, especially those involving motorcycles, account for over 70% of all traumatic BPIs[3].

With growing urbanisation and motorisation in countries like Cambodia, where motorcycles are the main mode of transport, BPI is a significant cause of morbidity. Cambodia has the highest motorcycle death rate in South-East Asia at 79.3 deaths per 100,000 motorcycles in 2011[2]. The prevalence of BPI in this country remains unknown. BPI has a profound impact on the daily lives of affected patients, with many having to endure the high levels of physical limitations, psychological stress, and discrimination of living with a flail limb. Regaining some form of ability to work and independence remain absolutely essential for their recovery and integration back into society[4–7].

The medical treatment decision-making process in BPI is complex because of the limited recovery potential of the upper extremity in nerve injuries, and thus patient education with adequate information for an informed decision is crucial[8,9]. The surgeons' priorities are treatment options and outcomes for BPI[10,11]. A quantitative study by Choi et al[12] provided some insight into the perceived quality of life of participants with BPI. However, the study was researcher-led and therefore lacked the flexibility for participants to elaborate on what was relevant to them[12].

Adults with BPI report a range of activities that are limited following injury and are under-represented in currently used patient-reported outcome measures[13]. There remains a paucity of qualitative research done on BPI to study patients' perceptions, experiences and emotions, but it is imperative that surgeons understand the lived experience of these patients to provide the help and support they need[8]. The use of qualitative research in total avulsion BPIs fills a void not addressed by its quantitative counterpart, as the former can provide an experiential perspective to help improve the quality of care of patients[8].

As most qualitative studies have only looked at the patients' perspectives[4–7], we designed a study to explore both patients' and surgeons' perceptions and experiences of BPI surgery.

Materials and Methods

Study Design

The study was located at the Children's Surgical Centre (CSC), Phnom Penh, with the two surgeon participants being part of a team of visiting accredited hand surgeons from the United Kingdom and Singapore. The centre is a non-profit, non-governmental and non-religious surgical hospital in Cambodia, founded in 1998. Approximately 5000 surgical procedures are performed there every year free of charge[14].

This qualitative study is based on a thematic analysis of interviews with two patients and two surgeons from the centre, who were selected using non-probability purposive sampling. The patients' information was obtained from their clinical records and an educational video-recording of their experiences post-surgery for pan-plexus BPI. The surgeons were interviewed remotely and in-depth using a semi structured interview guide via digital video-recordings of the interviews. Ethics approval was obtained from the local board of the Children's Surgical Centre (CSC), Phnom Penh. Informed verbal consent was obtained from all the participants.

The inclusion criteria were patients above 18 years of age with BPI, diagnosed clinically by accredited hand surgeons +/- electromyography (EMG), no confounding residual neurological problems or congenital anomalies affecting brachial plexus region or upper extremities; with normal function of the upper limbs prior to the injury and at least 1-year post surgery to allow the participants to have some experience of partial reanimation of the limb and a short period of adaptation of upper limb function.

The two patients were interviewed in Khmer, the official language of Cambodia, by a single investigator and were asked open-ended questions about their perceptions and experiences after BPI surgery. They were allowed time to express their concerns and feelings and elaborate on what was relevant to them. The interview was translated into English.

The two surgeons were requested to watch the video-interview of the two patients with English subtitles, following which they were interviewed, using a semi-structured interview guide consisting of non-directive, open-ended questions as follows: -

1. What is your impression and impact of the patient reported outcome measure in the video?
2. What is your experience of developing the BPI service in Cambodia?
3. How has your experience in Cambodia affected your BPI practice?

Results

Table 1 Patients' demographics and clinical case summary of their injuries and reconstructive surgery

Table 1: *Patients' demographics and clinical case summary of their injuries and reconstructive surgery*

	Patient 1	**Patient 2**
Age	28 years	28 years
Gender	Male	Male
Previous occupation	Motorcycle taxi driver	Construction worker
Referral	Self-referral – Seen at CSC on 28th Feb 2013	Referred from an NGO medical clinic in Phnom Penh (PP)
History	Road Traffic Accident (RTA) on 1st Feb 2013. No head trauma, no fractures, and no hospitalization.	RTA in Dec 2012 (motorcycle vs car). Had loss of consciousness x 2 days, taken to a government hospital in PP. Had craniotomy for evacuation of haematoma. Presented with complete paralysis of left upper limb. Had gone to see traditional healers only prior to CSC.
Clinical findings	Presented with loss of function and sensation of left upper limb. Clinically, he had trapezius motor power of MRC grade 5 with grade 0 for shoulder abduction, elbow flexion & extension, wrist flexion & extension and hand movement. There was loss of sensation below the shoulder, except inner arm (T2 and T3 dermatome). There was no Horner's syndrome.	Presented with complete paralysis of left upper limb. Clinically, he had trapezius motor power of MRC grade 5 with grade 0 for shoulder abduction, elbow flexion & extension, wrist flexion & extension and hand movement. There was loss of sensation below the shoulder, except inner arm (T2 and T3 dermatome). There was no Horner's syndrome.
Investigation	EMG showed latency of motor nerves: axillary, median, radial, and ulnar nerves.	No EMG was done.
Diagnosis	Pan plexus BPI left upper limb	Pan plexus BPI left upper limb
Surgery	On the 23rd May 2013, with no further improvement, he underwent reconstructive surgery in the form of nerve transfers as follows: spinal accessory nerve to suprascapular nerve for shoulder abduction , phrenic nerve to musculocutaneous nerve with sural nerve graft for elbow flexion.	On the 24th May 2013 with no further improvement, reconstructive surgery in the form of nerve transfers were performed as follows: phrenic nerve to musculocutaneous nerve with sural nerve graft for elbow flexion. Spinal accessory nerve to suprascapular nerve for shoulder abduction was not possible due to suprascapular nerve avulsion.
Follow-up	Progress was satisfactory with a three year follow up outcomes as follows: Shoulder abduction M4, elbow flexion M4	Progress was satisfactory with a one year biceps recovery of M3 and 2 years post-reconstruction a shoulder arthrodesis was performed to improve upper limb function through scapulothoracic movement as he had functional scapulothoracic motion, periscapular musculature (trapezius,) and 6 months later a wrist arthrodesis for stable hand placement
Current employment	Security guard	Looks after other people's farms
Patient reported experience	Satisfied with outcome of his surgery	Reported satisfaction with the results despite some residual pain in the left forearm.

Analysis

The video-interview of the two patients was transcribed verbatim by the first author, who watched the video repeatedly, paying attention to their speech, arm movements, facial expressions, and body language until saturation was reached. The analysis was done following the principles of thematic analysis. During the initial open coding phase, all verbatim responses were analysed line by line, by the first and last authors. The codes were discussed, following which they were then assigned to categories. The process was repeated to determine there was consensus following which the categories were grouped into themes through an iterative process. The qualitative analysis was corroborated by two investigators, the first author has previously done qualitative research and the last author is a consultant hand surgeon. Each investigator conducted the qualitative analysis independently and then through consensus, arrived at the final set of themes.

The video-interviews of the two surgeons were similarly transcribed verbatim and analysed based on thematic analysis. The videos were analysed, paying attention to the surgeon's language, tone, and facial expressions. Preliminary codes were assigned to the data, following which they were categorised and then placed into a coherent set of themes. The process was repeated several times until all relevant data have been coded and saturation achieved.

Trustworthiness and credibility of this study were ensured by having two researchers review the transcripts independently to ensure consistency of the interpretation of data. The first author repeatedly double-checked the transcriptions against the video-interviews to make certain they were true to the data. There were consistencies in the data from the patients while there were also consistencies in the data from the surgeons. Due to circumstances, only the surgeons were able to verify the accuracy of their transcripts.

Thematic analysis of patients' video-interview

The analysis of the patients' video-interview identified eight categories, which were subsequently organised into five emergent themes. These themes were identified from the statements they made during the interview, which were entirely driven by their perspectives.

Table 2: *Data analysis – Categories and themes of the interview with patients*

Categories	Themes	Description
Uncertainties of recovery time	Desire to restore functions	Patients tried to make sense of the slow recovery post-surgery
Not knowing what to expect		
Emotional "ups and downs"		
Commitment to rehabilitation	Experience of the health services	Patient 1 invested his time to help his recovery
To get life back on track	Employability	Being employed is part of their recovery
Return of some functions	Achieving goals and return to some normalcy	Described patients' satisfaction at return of some functions of the paralysed limbs
Participating in life		
Satisfaction of surgical outcomes	Perceived value of emotional and functional gains	Described the overall picture captured by the video during the interview

Theme 1: Desire to restore some functions

Both men reflected on what the doctors had told them before and after their surgery. They were unsure about what to expect and tried to make sense of the slow recovery. They were counselled by the surgeons about the slow recuperation.

Patient 1: "I wasn't sure about what to think because before I had surgery, the doctor told me that it would take a long time!"

Patient 2: "After I had surgery, I was told to wait 2 years for the results."

The two men also had to deal with the 'ups and downs' of their emotions post-operatively during the recuperation, referring to feeling despondent at the slow recovery, frustration and pain and the happiness at small changes that occurred.

Patient 1: With despondency, he repeated "I didn't know what to think!" (video showed him looking glum)

Patient 2: With frown lines on his face and looking serious, he said, "My arm would move when I took a deep breath, but I still had pain in my arm like before the operation."

Patient 1: "When I saw results in the beginning, they were small. At first, I was able to make little movements and I felt very happy!" (video showed him grinning)

When asked to confirm by the interviewer, he replied laughing – "Yes, I felt maybe there can be results. Just like the doctor had told me before the surgery."

In the video, both men appeared happy and smiling whilst demonstrating their arm movements.

Patient 1: "I improved bit by bit for a year. By one year it got stronger and stronger."

Patient 2: "If I take a deep breath, I can lift my arm, but not all the way. I can only lift it up to here (video showed himself lifting his left arm to his chest), but only if I take a deep breath!"

Patient 1: "Then my muscles grew bigger right here". (showing the interviewer his muscle bulk in the left upper arm)

When asked to confirm by the interviewer, he replied "Yes, once I built my muscles, I was able to lift my arm." (video showed him smiling)

Theme 2: Experience of the health services

As part of the post-operative care, patients at the hospital have access to a team of local Khmer physiotherapists who help them with early mobilisation, passive and active movements, and functional exercises. However, not all patients are aware of this service and some may not be able to attend the sessions because of financial constraints, they live too far away, or they have no transport or the means to get to the hospital.

During the interview it was apparent that Patient 1 was committed to his rehabilitation, investing his time to attend the physiotherapy sessions in the hope of restoring function of his paralysed limb.

Patient 1: "I thought I would try my best to follow the advice of the physical therapist."
While demonstrating his arm movements, he said "It took a long time to see results".

" I did three weeks of exercises after surgery at the hospital, then the doctor let me go home but I came frequently for appointments."

"I came back at 2 weeks, a month, three months, six months…".

"Then by six months, I started seeing results!"

Patient 1 was obviously pleased that he noticed some progress at six months and although initially they were small, he felt that he was getting results, just as the doctor had told him before his surgery. He continued to make slow progress over a year, and he got stronger and once his muscle bulk improved, he was able to lift his left arm.

Theme 3: Employment

Employability is a part of their recovery, to get their life back on track.

Patient 2: "Now I watch over other people's farms". (video showed him with a wide grin on his face)

Patient 1 did not report if he was employed in the video but from his clinical records he apparently went back to work as a security guard.

Theme 4: Achieving goals and return to some normalcy

Both men reported that they had some return of function in their paralysed limbs at 6 months (Patient 1) and a year (Patient 2) post-surgery, which allowed them to participate in life.

Patient 2 still reported some pain when he regained

movement of his left arm, but it did not seem to affect him much when he was demonstrating his arm movements in the video.

Interviewer: "About a year after the operation, he could drive his motorbike, nearly the same as before the injury." (referring to Patient 1 who was showing off riding his motorcycle)

Theme 5: Perceived value of emotional and functional gains

Overall, this video has established and captured a significant link between the perceptions of emotional and functional value and patient satisfaction with the outcomes of their surgery for BPI.

Thematic analysis of surgeons' video-interviews

The two surgeons were interviewed separately, and the videos have been analysed according to the questions posed to them. There were thirteen categories identified from the analysis of the surgeons' video-interviews and they were subsequently organised into six emergent themes. They were based on the statements made during the interviews by the two surgeons.

Table 3: *Data analysis – Categories and themes of the surgeons' interviews*

Categories	Themes	Description
Patient satisfaction	Capturing patients' perception of the BPI surgery Surgeons' perspectives of carrying out the BPI surgery	Video described the patients' overall satisfaction with their functional recovery
Managing patients' expectations		
Surgical interventions		Described the potential of nerve surgery, how surgeons assess the success of the BPI surgery
Functional outcomes		
Surgeons' outlook/resigned acceptance		
Needs analysis of the community	Developing the BPI service in Cambodia	Described how the environment dictates the services needed
Transfer of skills		
Identify interested surgeons	BPI training programme	Described a robust training programme to train local surgeons to perform the BPI reconstructive surgery
Workshops and hands-on training		
Overall impact of the project		
The value of doing BPI surgery	Meaningfulness of work	Described the impact of the experience in Cambodia on their own practice
Other lessons learnt from the BPI experience in Cambodia		
Qualitative study for measuring outcomes in healthcare	A change is needed for the future	Described subjective evaluation of participants' reported outcomes

Theme 1: Capturing patients' perceptions of the BPI surgery

Both the surgeons managed to capture the patients' positive perceptions of their BPI surgery when they watched the video.

Surgeon 1: "The first impression … was the satisfaction, that there was a sense of satisfaction in both the patients with the outcomes."

"Their expectations were generally managed quite well by the preoperative counselling."

Surgeon 2: "This was a very powerful video!"

He was extremely encouraged by the results achieved by the two patients despite one patient initially being lost to follow-up.

Theme 2: Surgeons' perspective of carrying out the BPI reconstructive surgery

Surgeon 1: From his experience (spanning 3 decades) performing brachial plexus reconstruction – nerve transfer has been a significant shift in the management of BPI but "the outcomes from nerve transfer … where we are bringing live nerves to damaged nerves to reanimate the upper limb has been rather poor from the surgeon's perspective, in the sense that the recovery that we get is not that satisfying!"

"The functional outcomes were just good for show, during presentations, where they have M3/M4 in the biceps, some shoulder function…. So, the objective assessment is not spectacular, but the video showed the patients found them useful subjectively."

"We resigned ourselves to the fact that this was all that we could achieve, especially, in pan plexus injuries ... we helped the limb to become an assisted living apparatus for the patient following the reconstruction."

"I can see that the patients' expectations have been managed and that they have a satisfactory outcome from their perception of the results from the brachial plexus reconstruction."

Surgeon 2: He was pleased with their decision to carry out the surgery – "….. Just the amazing potential of a nerve transfer surgery ... you need to have a little bit of faith because you are actually stitching two very small nerves together in the hope that something will happen."

"It was extremely encouraging to see the results of these two patients. So, you do something very small, but then, the impact is so profound as you can see in the video".

"I think brachial plexus surgery can make such a big difference!" Furthermore, he felt that having the right skills were important in carrying out reconstructive surgery of this level of complexity - "To do something small, simple but really relying on my training … "

"And just having the knowledge that nothing will happen for a year or so because that's the nature of nerve surgery, and then seeing the results, so that it requires a certain kind of perseverance …"

Theme 3: Developing the BPI service in Cambodia

Surgeon 1 expressed that to develop the BPI service, they needed to understand the needs of the community - "…once you identify a need which we did in Cambodia that there was a high incidence of brachial plexus injury and they were only offered an amputation as a surgical intervention."

"One of the positive things that we have learned is that it is possible to bring the surgical skills and transfer these surgical skills over to the local surgeons to provide a sustainable form of surgical training that would continue."

Surgeon 2: "we realized that, shocking truth - that is, there are so many of these cases in Cambodia, and that nobody is doing it in the entire country, and that their standard treatment is amputation of the limb and shoulder fusion."

"….. we are constantly aware that whatever we do, we need to be able to pass on the skills and so we were not sure whether we can pass on these skills."

Theme 4: BPI training programme

Surgeon 1: "We found a core group of surgeons who were committed and dedicated to learn the skills. And this is crucial, and we therefore conducted a series of workshops to train them in basic microsurgery and did hands-on training in the operating theatre to help them gain these skills."

"We devised the training program, both in terms of cognitive elements and skill elements with the running of workshops, we were able to therefore produce a very robust system of training, which we then took time over a period of five years to train the local surgeons to be able to do this."

Surgeon 2 said they had started off with the two patients and the numbers increased subsequently. "…. the joy of teaching has been a very big part of our journey - in identifying interested surgeons, in training them exclusively for this and seeing them pick up the skills."

"I think it brings a lot of hope, and so I think that really has been the sort of theme of this whole BPI service development. It brings hope to a hopeless situation!"

Theme 5: Meaningfulness of work

Surgeon 1: " I was wondering whether it was worth the effort - the amount of time and resources that are being committed to brachial plexus reconstruction and the results that we obtained in terms of our perception of the outcomes weren't really very satisfactory but having seen the outcomes and the patients' perceptions, I realised that even though it is little from the patients' perspective, it is significant!"

"…. this video and the outcomes I have seen in Cambodia, and the expectations, have spurred me on to continue to work on brachial plexus reconstruction, even when we perceive that the outcomes aren't as satisfactory, as it is, but from the patient's perspective, it is fantastic!"

Surgeon 1 believes that a qualitative approach should be undertaken to understand the patients' expectations and concerns following a major injury or disease.

"So the patient reported experience measures must go beyond the mere experience of how they were seen in the clinic or how they were consulted but through the disease itself, the impact of the disease, both in terms of biophysical and the psychosocial impact of the disease and its management."

"And I think this is how we need to measure the quality of outcomes rather than just using instruments and scores that don't mean much, though, it looks good, and statistical analysis and quantitative studies ….."

Surgeon 2: "I think it comes back to this theme of hope, the joy of teaching and learning, and I've certainly been able to apply that."

Surgeon 2 stressed "the importance of clinical skills - to go back to the basics of clinical skills because in Cambodia, difficult to get an MRI scan or nerve conduction studies. So, it's taught me the importance of examining the patient, getting a diagnosis. And all the other things are supplemental to that."

"I have picked up certain tips and tricks while doing this high-volume surgery in Cambodia. … ways of innovating, thinking deeply about certain problems, why things work and why they don't work."

Theme 6: Change is needed for the future

Surgeon 1: "the impact of the disease or its treatment on the patient's life - qualitative patient reported outcome measures is what is needed for the future of measuring outcomes in healthcare."

Discussion

The aim of BPI surgery is to try and restore some functions of the paralysed limb and improve the patient's quality of life[15]. Patients with BPI have suffered greatly; for the treating surgeon, success must be measured not just by the degree of motor and sensory recovery, but also in its long term psychosocial and economic impact[6].

This study is the first qualitative study to investigate, describe, and analyse the experiences and perceptions of patients and surgeons treating total brachial plexus injury in Cambodia. It has shown the importance of providing adequate preoperative education and counselling to patients with BPI to advise them of the slow recuperation, and to encourage realistic expectations of the surgery. In this video, both patients reflected on what their surgeons said to them beforehand, and only understood what was truly said, when they experienced the delay in their recovery. This realisation was important to overcome their initial frustration at the delay in their functional recovery. This has previously been shown to be true; patient satisfaction with surgical outcomes after complete avulsion BPI depends on whether their preoperative expectations are met[16].

The patients' evaluation of success may differ from the surgeon's assessment. Both patients reported improvement in the movements of their paralysed limbs within six months to a year. Surgeon 1 questioned if BPI surgery was worth the effort as the results that they obtained in terms of their perception of the outcomes were not satisfactory. Levine et al.[17] reported that patient reported outcomes were more accurate than physiologic measures in determining clinical improvement in carpal tunnel surgery. Liang et al.[18] advised against an emphasis on surgeons' measures of technical success rather than on the satisfaction of the patient or the quality of life. The video-interview of the two patients was conceived in part to determine the long-term patient reported outcomes following surgical treatment for BPI. Despite the devastating nature of their injuries, both reported that they were satisfied with their overall functional recovery.

As BPI tends to occur in young men who are in the employable age, the issue of employment is an important one and may affect the type of work they do (4). Patient 2 in the video was pleased to be

employed to watch over other people's farms and Patient 1 (from his records) gave up being a motorcycle taxi-driver to become a security guard. It is apparent from the video as in Patient 2 that returning to work was a positive step. Despite their severe nerve injuries, both patients are employed. The capacity to return to normalcy, and what it does to a person's self-esteem, cannot be overemphasised, as was evident in Patient 1, which showed him riding his motorcycle in the video and participating in life.

Quantitative methods allow the researcher to test a hypothesis by systematically collecting and analysing data but tends to miss out on the experiences of the participants in-depth. Even if validated tools are used to study patient-reported outcomes they tend to be too restrictive and lack the flexibility for the participants to elaborate on matters that are important to them. The experience of health, illness and medical intervention cannot always be measured; researchers need to understand what they mean to the individuals. Qualitative studies allow for subjective evaluation of the patients' perceptions, experiences and emotions and can be incorporated into management strategies to inform clinical practice and improve patient experience. They allow surgeons to understand their own experiences and reinforce the impact of intervention beyond the quantitative outcomes[18]. The assessment of outcomes in terms of patients' subjective reports provides a deeper understanding of the effects of treatment[17,19]. The results of the brachial plexus surgery are far from normal and despite that, the two patients reported their satisfaction with their functional recovery.

The expectations of the two surgeons on the development of the BPI service in Cambodia must also be appropriate and it took them over five years to set up a robust training programme, both in terms of cognitive and skill elements with the running of workshops, and hands-on training in the operating theatres to train local surgeons to be able to perform BPI reconstruction to a level of satisfaction among the patients.

Both surgeons have learnt from their experiences doing BPI reconstructive surgery in Cambodia, despite their initial scepticisms. The video-interview of the two patients has established and captured a significant link between the perceptions of emotional and functional value and patient satisfaction with the outcomes of their surgery for BPI.

Limitations

Potential limitations of this study include the recollection of data pre and post BPI surgery as the patients' interview took place 4 years post-surgery. The sample for both patients and surgeons were small but data saturation was achieved. Since this study attempted to measure perceptions, there is a possibility of introducing a social desirability bias[20] but the videos have captured the voice, facial expressions and body language well to support patient satisfaction with the outcomes of their surgeries and surgeons' perceptions of their work on BPI surgery in Cambodia.

Further research using qualitative methods should be conducted to ensure comprehensive and authentic capture of patients' experiences following severe traumatic injuries to incorporate both the biophysical and psychosocial impact of the injuries on their lives. It is also important to include surgeons' or healthcare professionals' experiences in the care of these devastating injuries, as they are bound to be affected by the challenging encounters. This will allow the surgeons to understand the dynamics of the interactions between patients and surgeons.

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The Effectiveness of Near Peer Mentorship in Improving Medical Student Engagement with Evidence Based Medicine

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Abstract
Mentorship programmes help cultivate a positive attitude towards a particular subject matter through personal and first-hand experience, which in turn allows course content to be taught in a more relatable manner. Near peer mentorship (NPM) is where a more experienced colleague (mentor) aims to offer guidance to a less experienced individual (mentee). The aim of this study was to evaluate the effect NPM's had on medical student perception of Evidence Based Medicine (EBM) in clinical practice using an EBM Conference as platform for mentorship.
An annual student-led EBM Conference held at The University of Buckingham Medical School (UBMS) provided the opportunity for current students to present their experience of EBM via posters and presentations.
In addition, in the year of 2020 the conference invited recent graduates to talk on how their experience in EBM has shaped and transformed their working clinical practice. Attendees were then asked to rate the impact of having a working foundation doctor present at the conference using a Likert Scale.
The results demonstrated that the students were motivated by the conference and NPM to implement EBM in their practice. Additionally, being a mentor at a conference enabled graduates as well as senior students to develop their teaching and presentation skills. The future scope of the NPM programme at the conference would be to provide small workshops led by NPMs prior to the conference. Incorporation of EBM into clinical practice is becoming an essential task for the modern clinician. The EBM conference organised by students provided a unique way to implement EBM in their clinical rotations and allowed early engagement and exposure to the importance of good evidence based medicine.

Key Words
Evidence Based Medicine (EBM); Near-Peer Mentors (NPM); Medical Education

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Introduction

Evidence based medicine (EBM) is an approach to clinical practice that integrates best available evidence from well-designed studies in conjunction with patient preference and clinical expertise[1]. Sacket et al were the first to formally describe EBM in the early 1990s[2]. Since then EBM has become increasingly incorporated into the core curriculum of medical undergraduate and post-graduate courses worldwide[3]. The General Medical Council (GMC) has recognised the importance of this practice and have made it part of its Outcomes for Graduates[4]. Despite the increasing emphasis in the medical school curriculum there is still a dearth of evidence on how best to teach this subject[5].

Globally many medical schools have adopted a mentoring system to facilitate engagement in a variety of different subjects[6]. Near peer mentorship (NPM) is where a more experienced colleague (mentor) aims to offer guidance to a less experienced individual (mentee) [7].

Recent evidence by Nimmons et al suggested that mentoring programmes have been beneficial in promoting research and academia among junior doctors and medical students[6]. Medical mentorship programmes have helped to cultivate a positive attitude around their subject and help express course content in a way that is relatable to students. Additionally, NPM is mutually beneficial because it develops the mentor as a teacher[8]. Medical Schools can use NPM programmes to compliment traditional teaching methods in the EBM course curriculum.

The University of Buckingham Medical School

(UBMS) is the first independent UK medical school. The UBMS MBChB programme is taught over four and a half years and is split into two phases. The first phase is taught over two years, it focuses on the core biomedical sciences required as the foundation for medical practice. The second phase is over two and half years, this is clinical based, where students have clinical placements in hospitals and primary care. The University has taught EBM via a longitudinal, competency based, clinically integrated curriculum with assessments[9]. The longitudinal structure at UMBS facilitated the integration of EBM with clinical practice. This approach has proven to be more effective than the traditional standalone EBM course[10].

The medical school has explored the role of NPMs in addition to traditional teaching methods by experts and clinical facilitators to improve student perceptions of EBM. Prunuske et al recognised the blend of teaching methods that medical students are exposed to, their paper demonstrated the benefit of NPMs versus other methods[8]. Uniquely mentors say, "in my experience, this has worked"[11], as a result NPM's use their similar encounters to guide students.

Traditional didactic teaching has failed to highlight the clinical relevance of EBM[12]. Although the longitudinal approach at UBMS has aimed to address this problem, evidence has demonstrated blended learning has improved student attitudes towards EBM[13]. The use of mentorship in conjunction with the longitudinal theme can help improve student attitudes towards EBM and develop a greater appreciation of its clinical relevance.

Described in this paper is a student led EBM conference that has also provided mentorship from the previous winners. Briefly, the EBM conference invited students in their first year of clinical practice to submit educational prescriptions. The University of Wisconsin first used the educational prescription (EP) in the form of a web-based tool to guide individuals through the four A's of EBM - Ask, Acquire, Appraise and Apply[14]. Research has demonstrated that the use of EPs is perceived as beneficial when used by medical students during clinical rotations. The EBM conference has used a similar prescription (Appendix 1, 2) wherein the students described a scenario from their clinical placements and demonstrated how they applied EBM in clinical decisions. Three shortlisted semi-finalists are subsequently invited to present their scenario at the conference. The semi-finalists are encouraged to be creative with their presentations by recreating the clinical uncertainty and role modelling the patient doctor consultation. Previous semi-finalists have used creative outlets such as short two-minute videos (Appendix 3). The best of the presentations is awarded the EBM champion trophy.

Following the inaugural conference held in 2018, the EBM conference has been organised by the previous year's EBM champions. In doing so, the previous EBM champions offer guidance to those new to the conference. Data collected from the 2019 conference demonstrated increased engagement following the implementation of the student led format, which showed a 59% increase in student submissions[15].

The aim of this study was to evaluate the effect NPM's had on medical student perception of EBM in clinical practice using an EBM Conference as platform for mentorship.

Methods

Feedback was sought from the students attending the EBM conference 2019 and 2020. The 2019 conference was conducted in-person and feedback was collected with paper forms. The 2020 conference was held via an online platform, in keeping with UK government restrictions in response to the SARS-CoV- 2 (Covid-19) pandemic.

The focus of the presentations for both conferences were: their experiences of evidence-based medicine in their clinical practice, informing delegates of EBM tools applicable to practicing clinicians and concluded with encouraging the students to start incorporating EBM in their clinical placements as medical students. Additionally, for the 2020 conference, graduates from the University of Buckingham Medical School were invited back to present at the conference on their experience of EBM in clinical practice in foundation placements.

The feedback questionnaire included a likert scale feedback on the practice of EBM, targeted feedback on each of the speakers and feedback on using the educational template prescriptions. Additionally for the 2020 conference, there were questions pertaining to whether Buckingham graduates presenting on evidence-based practice as foundation doctors had encouraged them to practice evidence-based medicine. Ethical approval was received from the University of Buckingham School of Science and Medicine Ethics Committee.

Results

For the 2019 conference, a total of 107 students attended out of which 27 students completed the paper feedback form. Using the likert scale, the findings for the 2019 conference were as per Figure 1.

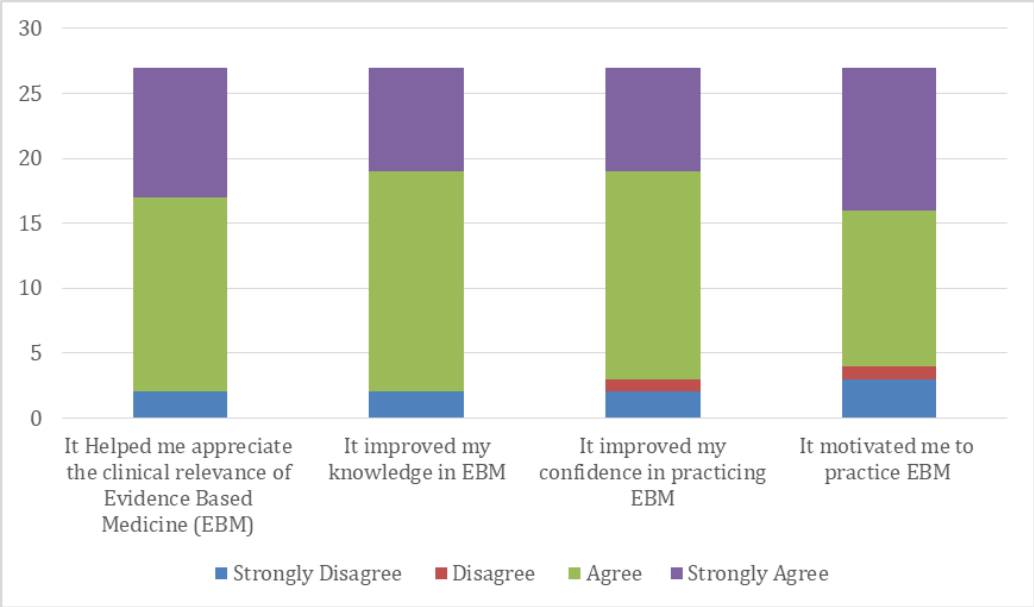

Figure 1: *Likert scale feedback results for the 2019 conference on practice of EBM*

Additionally, 21 students found the use of the educational prescription template to be a useful tool for practicing EBM.

Thematic analysis was conducted on the qualitative feedback. The major themes arising from these were that the students found the event very informative, organised and helpful. With regards to peer mentorship, they found that the elective experiences of their seniors were quite useful as they were planning their electives at the time. They found that the student presentations from their peers was also a highlight of the conference. One student also expressed 'Great to hear first hand from the year above'

In terms of further improvement, the students reported that the conference was long and compressing it to a half-day even would be desirable. They also noted that, in regards to the student presentation competition, they would like to be informed earlier and to have clearer guidance on the mark scheme.

For the 2020 conference, a total of 110 people attended the conference (96 delegates and 14 presenters). The 2020 conference also included talks by previous two graduates, both currently employed as foundation doctors. The questionnaire was posted to all attending students, of which 37 completed the survey. Using the Likert scale the findings for the 2020 conference were as per Figure 2.

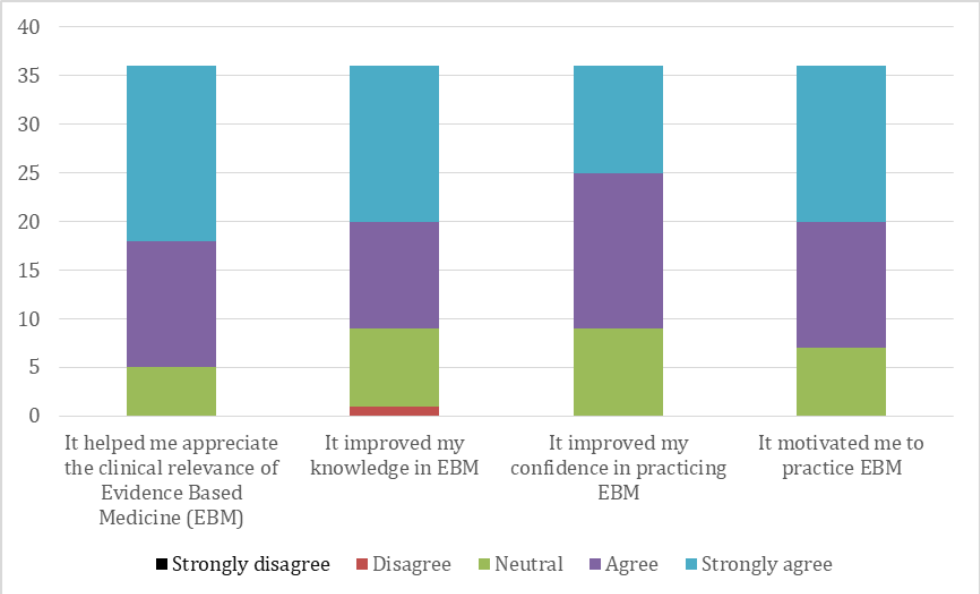

Figure 2: *Likert scale feedback results for the 2020 conference on practice of EBM*

A large majority of delegates found the additional presentation by Buckingham graduates helpful with 76 percent (Figure 3) of the attendees either in agreement or strongly agreement that the talk encouraged them to practice EBM. Supportively, there were no attendees that found the talk unhelpful.

Feedback from the foundation doctors on their role as near peer mentors showed that this experience has helped them reflect on their own clinical practice and how it has allowed them to develop and be able to impart that knowledge to the medical students. It also allowed them to develop their leadership skills, communication skills, to collaborate with the organisers and to be able to conduct research on the role of mentors.

own peers. A particular student commented *''Towards the latter part of the term, group work sessions were overseen by two Phase 2 students who would check our work and be available to answer any questions. I found this helpful, as it was easier to ask questions as they arose instead of directing them to Dr. K well after the lecture or session. In the future, having someone to monitor or check the group sessions for questions throughout the term instead of just during these last sessions would be useful.'*

Feedback from the foundation doctors on their role as near peer mentors showed that this experience has helped them reflect on their own clinical practice and how it has allowed them to develop and be able to impart that knowledge to the medical students. It also allowed them to develop their

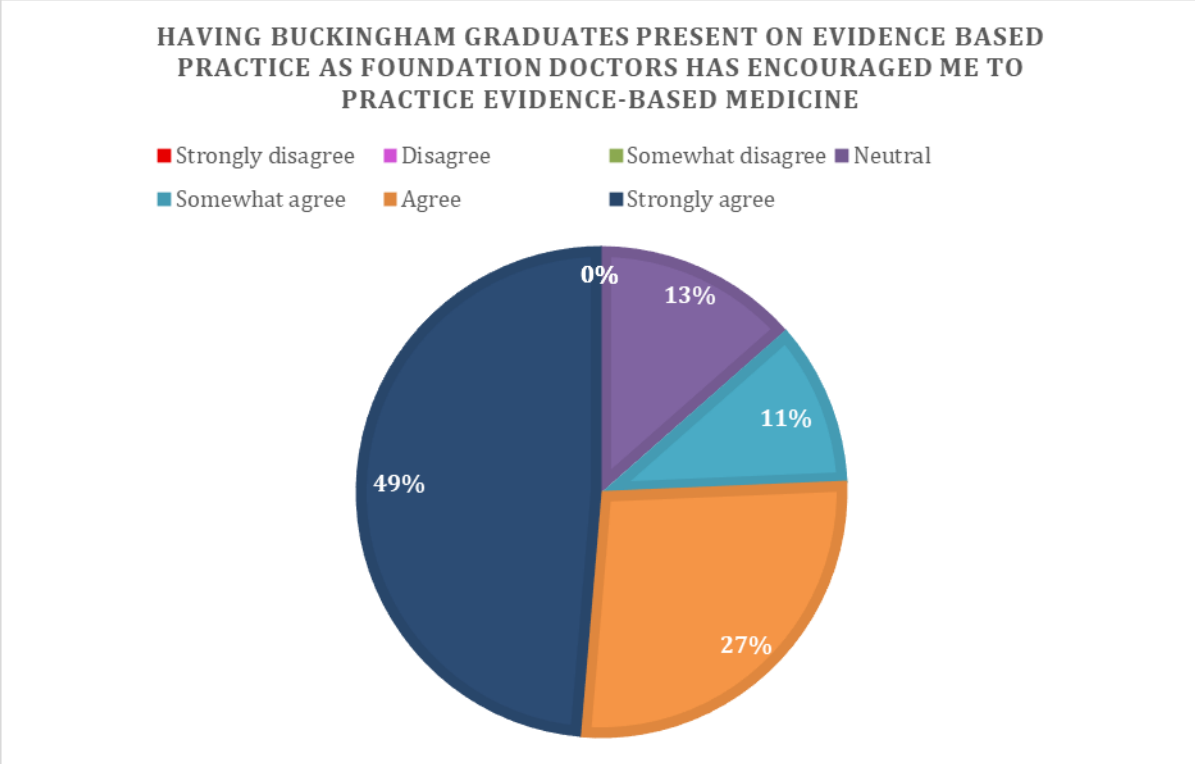

Figure 3: *Pie chart showing 7 point Likert scale feedback on whether having Buckingham graduates present on evidence based practice as foundation doctor has encouraged them to practice EBM.*

Figure 3 shows how 76 percent of the attendees strongly agree/agree that having Buckingham graduates present on EBP as foundation doctors has encouraged them to practice EBM and no participant felt that it was not useful. Hence it shows the impact of having near peer mentors to inspire and motivate mentees.

Additionally, students in year 1 also communicated that having senior year students to help with group work in their health and disease population module made them felt at ease and more open to clarifying their questions and understanding it through their leadership skills, communication skills, collaborate with the organisers and to be able to conduct research on the role of mentors.

Discussion

This qualitative assessment of student attitudes towards near peer mentorship at a conference based on EBM in clinical practice has demonstrated a beneficial result. Nearly half of the attendees at the conference 'strongly agree' that having graduates return to present about EBM in their clinical practice encouraged them to practice EBM. There is a growing emphasis on EBM being

incorporated into clinical practice[16], Glasziou et al have stated "the search engine is now as valuable as the stethoscope"[17]. Practice can become quickly out -dated if the clinician is unable to stay current with recent evidence based medicine[18]. In 2015 there were over one million publications published to PubMed[19]. Clinicians need the skills to find the most relevant and robust data, which the modern medical curriculum should consider. The results of this paper have shown that the use of NPMs at a student run conference improves student knowledge of EBM, with 72% of responders 'agreeing' or 'strongly agreeing' with this statement.

A qualitative study on 'undergraduate medical student perception and use of Evidence Based Medicine'[12] identified barriers and enablers for medical students integrating EBM. The paper found that students recognised the importance of EBM for their clinical training and future clinical practice[12]. Furthermore, evidence has shown that student attitudes towards EBM can be positively modified if one is able to demonstrate a connection between competency in EBM and facilitating medical decisions in practice[20]. Our study has demonstrated that the student EBM conference reinforced the importance of EBM in clinical practice. Of the thirty -seven responders to the questionnaire, eighteen 'strongly agree' the conference has helped delegates appreciate the importance of EBM in clinical practice. Furthermore the results demonstrated that NPM has a positive impact on the attitudes of medical students towards EBM as 78% 'agreed' or 'strongly agreed' that it motivated them to practice EBM.

Barriers towards the implementation of EBM in clinical practice that have been identified are changing the behaviour and practice of more senior clinicians[12]. A suggested method to overcome these barriers is to integrate EBM in clinical practice into the medical school curriculum. This conference has demonstrated a method in achieving this by engaging students early on in their clinical rotations to demonstrate how they have used EBM to answer a clinical problem. Additionally, it has reflected the change in attitude towards EBM as it invites junior doctors to act as near peer mentors and explain how they have used EBM in their qualified clinical roles. Having more experienced seniors demonstrate their use of EBM is an important enabler and the findings from this study reinforces this principle.

Limitations of this study are completion rate of delegate feedback forms. Furthermore there is scope to seek more mentor feedback in the future in order encapsulate an understanding of mentor perspective.

Not only has NPM demonstrated a benefit for mentees but also a valuable experience for the mentors**.** Students at the University have had the opportunity to run a conference and provide guidance to their less experienced junior colleagues through these means. In doing so, mentors have been able to achieve a core recommendation outlined by the GMC for graduates; to 'work effectively and appropriately as a mentor and teacher for other learners in multi-professional teams'[21]. Furthermore, having the opportunity to act as an NPM at the conference has allowed practicing junior doctors to develop key skills required for completion of foundation training. Graduates have been invited back to speak at the conference and answer questions about how they have used EBM in their clinical practice. In particular it supports the opportunity to achieve the competency 'developing the clinical teacher' (DCT), a mandatory requirement for all foundation trainees. The conference will continue to be held annually and organised by students. An improvement of the conference is that students will be made aware of the conference from the beginning of the academic year to afford them the opportunity to implement EBM throughout their placements.

Conclusion

Increasingly incorporating EBM into clinical practice is becoming an essential task for the modern clinician. Traditional didactic methods of teaching EBM fail to integrate the subject into clinical practice. The EBM conference organised by students provides a unique way to implement EBM in their clinical rotations. Having the conference as a platform for students to demonstrate how they have used EBM in their clinical practice motivates attendees to practice EBM. Furthermore, this paper has shown that the use of NPM motivated students use EBM in their clinical practice. Additionally, being a mentor at a conference enabled graduates as well as senior students to develop their teaching and presentation skills. A future potential of the NPM programme at the conference would be to provide small workshops led by NPMs prior to the conference. Ultimately, medical schools should consider providing near peer mentoring for highlighting the significance of EBM in clinical practice.

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