

ORIGINAL RESEARCH

Reducing Medical Student Performance Anxiety through the Pre-clerkship Residency Exploration Program (PREP)

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Abstract

Background: Medical students face numerous stressors during their pre-clerkship years, including selecting a specialty for residency. For those interested in specialties with limited integration into the traditional pre-clerkship curriculum, or students with broad interests at the end of pre-clerkship studies, a two-week Pre-clerkship Residency Exploration Program (PREP) could be a useful tool to reduce career-decision-making anxiety. This study assessed whether PREP, an elective for second-year medical students, can effectively reduce performance anxiety and stress related to the transition into a clinical learning environment and career decision making.

Methods: Eighty second-year medical students participated in PREP (2018-2019), and completed pre- and post-program surveys that assessed, on a Likert-scale, their level of performance anxiety during clinical electives, and anxiety surrounding future career decisions (i.e., clerkship, specialty selection, residency match). A modified version of the Test Emotions Questionnaire (TEQ) assessed student emotions regarding the Canadian Residency Matching Service (CaRMS) process.

Results: Sixty-nine students completed both surveys. Performance anxiety was low at baseline and unchanged at the end of PREP (p-value = 0.29). However, there was a significant decrease in stress surrounding exposure to enough specialties to make an informed career choice (p-value < 0.001). Furthermore, there was a significant decline in participant anxiety regarding CaRMS as indicated by the TEQ anxiety-subscale (p-value < 0.001).

Conclusions: PREP may serve as an effective tool to expose medical students to a high volume of specialties and reduce the stress associated with transitioning into a clinical learning environment and making career-related decisions.

Introduction

It is well established that medical students face higher than average levels of anxiety, burnout, and stress which can impact their learning and performance¹⁻⁴. Among common stressors for medical students is selecting a specialty to pursue for residency and as a career. To reduce this stress, pre-clerkship medical students are increasingly exploring options to gain more clinical exposure before reaching their clinical years. Researchers from many specialties have identified earlier clinical exposure as a key way to increase interest in their field⁵⁻⁷. While the majority of studies have focused on this recruitment lens⁵⁻⁷, there remains an absence of literature on the impact of earlier pre-clerkship exposure on the stress and anxiety of medical students facing career decisions.

Undergraduate medical students identify the transition to clerkship as a highly stressful time as they anxiously anticipate what lies ahead⁸. Medical students often aim to reduce this anxiety by spending more time in clinical environments, particularly in the context of confirming their competencies and career interests⁹.

Medical schools in North America have sought to minimize the anxiety of this transition through programs which focus on clinical skills and stress management^{10,11}. Additionally, changes to undergraduate medical curriculum such as adjusting course content, scheduling, and increasing elective time have been associated with significantly decreased levels of depression, anxiety, and stress. For instance, Slavin and colleagues implemented additional electives for first and second-year students for a total of 12 days per year, with the intent to provide additional opportunity to explore areas of interest³. The study found that compared to those without this increase in exposure, students who took part in the additional elective time were less anxious and showed a progressive reduction in their stress levels over the course of the electives³.

Many institutions have explored the use of intensive electives, workshops, or skills sessions to help students interested in surgical specialties explore different fields prior to entering clerkship. For instance, the University of Toronto established the Surgical Exploration and Discovery (SEAD) program in 2012, which allows

first-year medical students to rotate through seven core surgical specialties to help students identify or solidify their interests¹². The success of the SEAD program for surgically-minded medical students has been replicated at a number of Canadian medical schools since its founding and has expanded to include additional surgical subspecialties^{13,14}. Despite its demonstrated efficacy in helping pre-clerkship medical students identify specialties of interest and gain early exposure to the clinical environment, there has yet to be a similarly structured program to expose students to underrepresented areas of medicine.

Specialty interests at the beginning of medical school are strongly associated with residency match by graduation, despite limited clinical exposure and a lack of student confidence in pursuing their identified interests^{15,16}. We implemented the Pre-clerkship Residency Exploration Program (PREP) at Dalhousie University (2018) to allow second-year medical students to experience electives, workshops, skills sessions and lifestyle presentations in over 15 different specialties before transitioning to clerkship training.

This study may help support the implementation of intensive pre-clerkship elective programs to reduce the stress of entering clerkship and making future career decisions. In this study, we evaluated the effectiveness of PREP in reducing student anxiety about their clinical performance in clerkship and making career decisions.

Methods

PREP

A group of second-year medical students at Dalhousie University designed and implemented PREP. This occurred with significant support from the Department of Undergraduate Medical Education (UGME), Student Affairs (including Dalhousie Medicine's career counselor), and department heads or staff physicians from all specialties included in the program. The founding members spent several months in consultation with the aforementioned parties to determine the program structure and goals, selection criteria, and which specialties would be included. At our institution, the first two years are primarily non-clinical, with some opportunities for time-limited electives and observerships. Departments initially contacted were those with limited exposure in the pre-clerkship curriculum. This was followed by specialties with direct-entry in the Canadian Residency Matching Service (CaRMS) match. Participating departments needed to have capacity and interest in accommodating the 40 students annually. Where specialties were unable to accommodate 40 students due to administrative burden or department size, student preference was used to divide participants into

sub-groups (e.g., 20 students participated in adult hematology, and 20 in pediatric hematology).

Participants rotated through a combination of electives, skills sessions, and workshops over a two-week period. Two groups of 20 students (40 total) rotated through alternating schedules. Across both groups, pairs of students completed each of their ten half-day elective rotations through a combination of the following medical specialties: anesthesia, cardiology, endocrinology, general internal medicine, ophthalmology, pathology, radiation oncology, physical medicine and rehabilitation, hematology, neurology, nephrology, pediatric hematology, medical oncology, and neonatology. PREP students also completed skills sessions that included basic procedures (e.g., suturing, intravenous (IV)/intraosseous (IO) insertion), advanced procedures (e.g., endoscopy/bronchoscopy, femoral line insertion), trauma exercises (e.g., primary surveying, airway management), and ultrasound practice. Specialty-specific workshops involving career discussions and additional skills exposure were also included for physical medicine and rehabilitation, ophthalmology, anesthesia, radiology, and pathology. The specialties and workshops offered were consistent for both cohorts of the program. Finally, all participants attended lunchtime presentations and discussions from staff and residents from various specialties which focused on career decisions, CaRMS, and the lifestyle of their specialty.

Participants

Participants were 80 pre-clerkship medical students (male = 28, female = 52), composed of two years of consecutive cohorts of 40 students at the end of their second year of undergraduate medical training. Students were recruited for the program online via email and social media in addition to receiving an in-class presentation describing PREP and its purpose. Participants were selected using a blinded randomized lottery. A third party used an online randomization software system to select participants from the 133 applicants (60% of students) and place the remaining students on a waitlist. The only exclusion criterion was the inability to attend all of the program sessions during the two-week block of the program. The Nova Scotia Health Authority Research Ethics Board approved the ethics for this study (File No. 1023087).

Measures

We used a sixteen-item Likert-scale questionnaire to assess participant anxiety regarding their performance in a clinical setting. To assess performance anxiety at baseline, students completed a questionnaire on their most recent elective experience prior to PREP and

selected the number that best reflected the degree to which they agreed with the given statement (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). Participants completed the same sixteen questions again at the end of PREP. The first ten questions assessed behavioral, cognitive, and physical markers of performance anxiety. Behavioral items included “I avoided tasks that involved exposure to new clinical scenarios”; cognitive items included “I was worried I would panic or make a fool of myself while on elective”; and physical items included “I experienced trembling in my hands when trying to perform tasks”. The remaining six questions specifically assessed student anxiety surrounding the CaRMS process with respect to preparation and performance in clerkship, as well as exposure to a sufficient number of specialties to make an informed decision during the residency matching process.

Additionally, for the second cohort of 40 students, we implemented a modified version of the Test Emotions Questionnaire (TEQ), a subset of the Achievement Emotions Questionnaire (AEQ). This is a standardized survey validated for use with university students to assess the emotions they feel in particular academic achievement scenarios¹⁷. We adapted 25 questions from the TEQ to assess the following emotions related to CaRMS, before and after our intervention (PREP): test-related enjoyment, pride, hope, anger, hopelessness, and anxiety. This included items such as, “I worry whether the match will be too difficult”, and “Thinking about the match, I feel nervous and uneasy”. All items were answered on a Likert-scale.

Procedure

Before beginning PREP, students completed the online questionnaire using Opinio Surveys (Object Planet, Oslo, Norway) together in a classroom. We gave a verbal presentation to explain the nature of the survey and to obtain voluntary consent. Students had the opportunity to decline participation by choosing not to sign the consent form. If students chose not to consent then it did not impact their participation, experience or treatment during or at any time following PREP. The researchers were available for any question clarification if required. At the end of the two weeks, we administered a post-program survey containing the same questions as the pre-program survey, in addition to quality assurance questions pertaining to program feedback and improvement.

Statistical analysis

Cronbach’s alpha was calculated to determine the reliability of the two subscales used in the questionnaire

(performance anxiety and future-learning anxiety). Cronbach’s alpha determines the relatedness of each item used in the measure to indicate its reliability. The closer its value is to 1, the higher the internal consistency of the measure. Wilcoxon Signed-Rank Test was also determined to compare the pre-PREP and post-PREP responses for each question. This test was chosen as a non-parametric alternative to a dependent samples t-test as the assumption of normality was not met. The Wilcoxon Signed-Rank Test compares the average pre- and post-test scores for this study. Dependent samples t-tests were conducted for the TEQ overall, as well as each of the emotion subscales. All data were analyzed using v.25 of SPSS Statistics (SPSS, Chicago, USA).

Results

Descriptive statistics

Twenty-five males (33.8%) and 49 females (66.2%) completed the questionnaires (n = 74). Three students in each cohort of 40 participants who did not complete the questionnaires were program administrators and thus were excluded due to the potential for bias. We analyzed the pre- and post-PREP results for all remaining program participants, with two exclusions due to incomplete response data (total n = 72). Age ranged from 20 – 32 with all participants having at least a bachelor’s degree, and a subset of participants having a master’s degree or higher.

Performance anxiety

The performance anxiety subscale included 10 items¹⁸ ($\alpha = 0.79$), indicating that the questionnaire was reliable. The median pre-test and post-test scores were 2.00, corresponding with “disagree” on a Likert-scale (pre-test M = 2.31, post-test M = 2.19). The Wilcoxon Signed-Ranks Test showed that post-program performance anxiety was not significantly lower than pre-program performance anxiety ($Z = -1.06$, $p = 0.29$). Importantly, though not statistically significant, student responses to “I was worried I would panic or make a fool of myself while on elective” decreased from a median of 4 (agree) to 3 (neutral).

Clerkship and residency selection anxiety

This subscale of the questionnaire included 6 items ($\alpha = 0.80$). The Wilcoxon Signed-Ranks Test indicated that following PREP, students felt significantly less anxiety towards clerkship and residency decision-making than they did prior to the program ($Z = -5.69$, $p < 0.001$). Table 1 summarizes pre- and post-PREP Likert-scale responses of participants related to clerkship, residency, and future career decisions.

CaRMS-related emotions (TEQ)

Thirty-six students completed the TEQ. The t-test results from our modified-TEQ did not support a significant change in participant emotions towards the CaRMS match immediately after PREP (p-value = 0.151). However, when analyzing the modified-TEQ by subscale, there was a statistically significant decline in both anxiety and hope regarding the CaRMS match after our intervention (p-values < 0.05). CaRMS-related enjoyment, anger, hopelessness, and pride were unchanged (p-values > 0.05). Detailed results from each of the subscales can be found in table 2.

Discussion and Conclusions

Based on the results, participants in PREP did not find a significant change in their overall stress level about performance in electives through participation in the program. Both PREP and previous elective experiences appear to be low-stress environments for clinical learning, as statements pertaining to behavioral, cognitive, and physical anxiety symptoms during electives were, on average, disagreed with by participants. However, when participants looked forward to clerkship, residency, and having enough clinical exposure to make informed career decisions, there was a significant decline in anxieties following PREP compared to before participating. This finding suggests that, though only two weeks in length, an elective with a focus on exploring a high volume of residency options over half-day electives can provide enough exposure to help students feel more comfortable about their transition to a clinical learning environment.

The present results are consistent with past literature on the benefits of early clinical exposure during undergraduate medical education. For instance, Ray et al. (2018) observed that students with early experience

in emergency medicine made earlier decisions to pursue the specialty. The authors suggest that by gaining an understanding of the specialty earlier in medical school, students are better able to identify a career path to suit their lifestyle⁷. The findings from our independently developed survey, as well as the CaRMS-related TEQ, indicate an association between the opportunity to make this decision sooner and less anxiety during the transition to clerkship and beyond. This is consistent with the positive impact of early electives on medical student stress and anxiety as described by Slavin et al³.

While our findings regarding a decline in student anxiety following PREP are in line with past literature, the significant decline in CaRMS-related hope at the end of PREP was not anticipated. When the CaRMS-related hope subscale is analyzed by item, it appears that this finding is attributable to a change in attitude to the statement “I start preparing for CaRMS with great hope and anticipation”. Prior to PREP, the mean response was “agree” on a Likert-scale, while at the end of PREP, the mean response declined to “disagree”; mean response to the other hope-related items was unchanged. It is possible that this change is related to the amount of career and CaRMS-focused seminars that were delivered during PREP. For many participants, this was their first exposure to the full extent of the application, match, and interview process, and may have left students feeling more overwhelmed than hopeful. Importantly, the TEQ did not indicate a corresponding increase in hopelessness or anger regarding the CaRMS process. Enjoyment and pride were also unchanged, as neither emotions were specifically targeted by our intervention.

This study has a few limitations. Primarily, we implemented the program at a single Canadian medical institution. As such, there may be unique participant characteristics that are not fully generalizable to other classes or institutions. Additionally, the administra-

Table 1. Average pre- and post-PREP anxiety regarding future clinical education and career decisions.

Item on Clerkship and Residency Selection Anxiety score	Pre-Program Response, mean	Post-Program Response, mean	p-value
I am worried that I do not have the skills necessary to perform at the level required for my next year of training	3.39	2.93	0.009
I am concerned that I have not had exposure to enough specialties to make a career decision	3.97	3	<0.001
I do not feel that I have had enough time pre-clerkship to expose myself to enough specialties	4.03	3.2	<0.001
I feel anxious about making career decisions due to lack of information about the specialty	3.69	3.11	0.001
I am worried I will not find a medical specialty that I am interested in before I need to apply for CaRMs	2.82	2.53	0.082
I am worried that I will not have exposure to lesser known medical specialties that will not be in our clerkship rotations	3.83	3.04	<0.001

Table 2. Average pre- and post- PREP scores on the Test Emotions Questionnaire (TEQ) subscales.

TEQ Score	Pre-Program Response, mean	Post-Program Response, mean	p-value
Overall	3.39	2.93	0.009
Enjoyment	3.97	3	<0.001
Anxiety	4.03	3.2	<0.001
Hope	3.69	3.11	0.001
Hopelessness	2.82	2.53	0.082
Anger	3.83	3.04	<0.001

tive and logistic constraints of implementing this type of programming meant only 40 students were able to participate in the program yearly. This limits the ability to assess how the program could affect an entire class of medical students, although this may be feasible at institutions that have the desire and the capacity. Additionally, data could not be collected from non-PREP participants in the class to provide a comparison group for those who participated. Moreover, it is possible that the use of Likert-style questions reduced the ability to capture the full degree of stress and anxiety of the participant sample, as a 5-point scale provides limited potential responses for those that fall in-between options. For example, participants who partially agreed or partially disagreed may have selected neutral options. Student performance anxiety was low at baseline, which could indicate that this sample was generally confident in their abilities or were unwilling to admit it in the context of having classmates analyze their responses. It is also possible that the low-performance anxiety could be attributed to Dalhousie Medicine offering pre-clerkship electives in the first two years of medical school. As such, results from other institutions may differ. Lastly, the TEQ was only implemented for the second year of the program and thus data on only one year's cohort of 40 students was available for assessment.

Overall, the findings of this study are important in showing that PREP is an effective tool for helping pre-clerkship medical students explore various specialty options before entering clerkship. By the end of the two weeks, students gained sufficient exposure to feel less stressed about finding a specialty of interest. It is important to determine whether the immediate effects of PREP remain short-term or continue into clerkship and the residency application process. As such, future studies should aim to follow up with students who participated in the program and include a comparison group of students who do not participate. Data from future years of running the program and expansion of PREP to other medical schools is also warranted. Fur-

ther research will help support the incorporation of PREP across universities in North America.

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