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## Influence of Distributed Medical Education on Pre-Clerkship Elective Use and Utility

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## Influence of Distributed Medical Education on Pre-Clerkship Elective Use and Utility

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### Abstract

#### Purpose

To explore differences in optional pre-clerkship elective (OPCE) use and utility between main and regional campuses at McMaster University's Michael G. DeGroot School of Medicine, in 4 main areas: ease of access to OPCEs, volume and breadth of OPCEs, helpfulness in choosing future specialties, and utility for clerkship preparation.

#### Methods

An anonymous and voluntary survey was distributed in early 2020 to McMaster University Michael G. DeGroot School of Medicine's medical students across all 3 years of study. Data were analyzed for any significant differences between main and regional campuses, and post-hoc sensitivity analyses were used to account for non-response and self-selection bias.

#### Results

Regional campus students felt significantly less frustration around OPCE availability (2.88 vs 4.16,  $p < 0.001$ , scale 1(least) – 5(most)) and significantly greater ease of OPCE scheduling than students at the main campus (3.50 vs 2.24,  $p < 0.001$ , scale 1(least) – 5(most)). Regional campus students explored significantly fewer specialties (5.19 vs 6.19,  $p = 0.049$ ) and there was no significant difference in the total number of OPCE hours undertaken, nor hours spent with a single specialty. Overall, students in both campuses endorsed pressure to take OPCEs and mixed benefits of OPCEs for clerkship preparation. Students also found OPCEs to be an important part of choosing a specialty independent of campus.

#### Conclusion

Regional medical campuses at McMaster University offer generally equal opportunities for OPCE volume and breadth as main campuses, but with significantly lower barriers and frustrations around scheduling and availabilities.

#### Conflicts of interest

There are no conflicts of interest to report.

### Introduction

Medical education in Canada is a continually evolving landscape. With a growing impetus to introduce new strategies in medical education to better service the needs of the population, there is also increased recognition of the stresses and pressures of physician training and selection of an eventual specialty.<sup>1-3</sup> At McMaster University's Michael G. DeGroot School of Medicine, one approach has been a focus on early clinical exposure. While early mandatory pre-clerkship clinical experiences exist, they are limited mainly to an 18-hour family medicine experience. Instead, pre-clerks are encouraged to pursue optional pre-clerkship electives (OPCEs), optional clinical experiences with physicians or other healthcare professionals that often form the bulk of early clinical exposure. Students choose and schedule OPCEs on their own time, depending on preceptor and specialty availabilities, with no hard limit on the number of OPCEs that

can be done. OPCEs can range from simple observerships and shadowing to more experiential hands-on learning, depending on student comfort levels and preceptor preferences. As such, OPCEs can be a valuable opportunity to practice newly acquired knowledge and skills, and to explore different careers within medicine beyond family medicine,<sup>4-6</sup> especially within McMaster's accelerated 3 year program. Similar elective opportunities in other institutions have demonstrated the benefit of structured, hands-on pre-clerkship electives in developing early clinical skills, comfort with inpatient environments, and readiness for clerkship.<sup>4-6</sup> In addition to an emphasis on OPCEs, McMaster is part of a growing number of medical schools utilizing distributed medical education (DME). In Canada alone, more than a third of medical schools already distribute their programs. McMaster uses a 'hub and spoke' DME model, with its main campus located in the city of Hamilton, near large academic

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teaching hospitals. Its regional campuses are in the regions of Waterloo and Niagara, separate from large urban teaching hospitals, and host a much smaller number of students per year.

A growing literature supports the DME model. Medical training placed apart from traditional urban academic centers puts learners in unique environments and can offer closer contact with preceptors, more hands-on experience, and exposure to clinical cases.<sup>3,7-9</sup> Establishing more community-based campuses expands the otherwise limited clinical capacity for learners, with the relatively small regional class sizes reducing competition to secure clinical experience opportunities for regional students.<sup>8,10,11</sup> Moreover, DME promotes retention and recruitment of physicians to host communities, helping address the disparity between locations of practice and underserved populations.<sup>10,12-14</sup>

With DME however, the degree of accessibility and variety of specialties offered for OPCEs at each campus is inevitably different, and whether the benefits of DME translate to the use and utility of OPCEs has not been previously studied. We thus aimed to explore differences in OPCE use and utility between main and regional campuses at McMaster with respect to 4 main areas: ease of access to OPCEs, volume and breadth of OPCEs, helpfulness in choosing future specialties, and utility for clerkship preparation. Our objective was to shed light on whether DME provides a different and noninferior learning experience through OPCEs. We hypothesized that students at regional campuses would have easier access to OPCEs.

## Methods

### Survey distribution

We conducted a cross-sectional study using data from a survey provided to medical students in all 3 years of study at McMaster University (Table 1). The survey was an anonymous and voluntary online Google form, and was distributed to all students at the Waterloo Regional Campus through email on February 11, 2020. The survey was further distributed to all students at the Hamilton and Niagara campuses on March 10, 2020 via Facebook. The survey was closed April 10, and participant responses were anonymized with no personal information stored. This study was approved by the Hamilton Integrated Research Ethics Board (#11096-C).

### Data management and analyses

Data were visualized and analyzed using R 3.6.3, with a significance level of 0.05. Descriptive statistics for regional and main campus results were generated using R software. Mann–Whitney–Wilcoxon tests were applied to assess for significant differences between campuses. A post-hoc sensitivity analysis was performed to account for non-response and self-selection. In this analysis, participant data were weighted by campus and class year to match the distribution of the general population of medical students at McMaster. Results from the sensitivity analysis were

compared to the original analysis, with results significant in both analyses being considered robust.

**Table 1. Questions used on the survey.** Questions are abbreviated into short form within the results section.

|                                |   |
|--------------------------------|---|
| <b>Demographics</b>            | What class are you?<br>What campus are you?   |
| <b>OPCE volume and breadth</b> | Roughly how many OPCE hours have you completed in total?<br>Roughly how many different specialties have you completed OPCEs in?<br>Roughly, what is the highest amount of OPCE hours you have spent with one preceptor/specialty?   |
| <b>Likert-scale questions*</b> | How important do you think OPCEs are in preparing you for clerkship?<br>How important do you think OPCEs are or have been in choosing/considering a specialty?<br>How important do you think OPCEs are or have been to you when choosing/considering a specialty, when compared to clerkship?<br>How easy was/is it to schedule OPCEs in pre-clerkship?<br>Have you felt frustrated with OPCE availability?<br>Have you felt pressured to take OPCEs? |

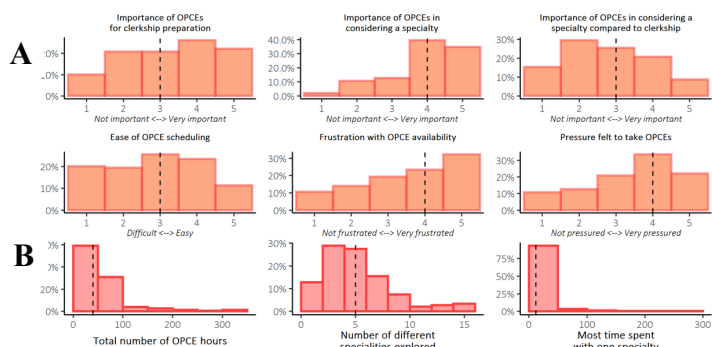
## Results

### Aggregate results

A total of 149 students participated in the survey, which corresponds to a response rate of 24%: most respondents were from Hamilton campus students in the class of 2022 (Table 2). Overall, students perceived OPCEs to be an important experience when deciding a specialty; however, when compared to clerkship experiences, students found OPCEs to be slightly less important. Students did not have strong opinions on whether OPCEs contributed to clerkship readiness, nor on the ease of OPCE scheduling. However, students felt strong frustration with OPCE availability, along with a high pressure to take OPCEs (Figure 1A). The median total time participating in OPCEs was 40 hours, the median number of specialties explored was 5, and the median maximum time spent with one specialty was 12 hours (Table 2). Sensitivity analysis corroborated all aggregate results (Table S1).

**Table 2. Sample characteristics (n=149) and aggregated OPCE volume and breadth results.**

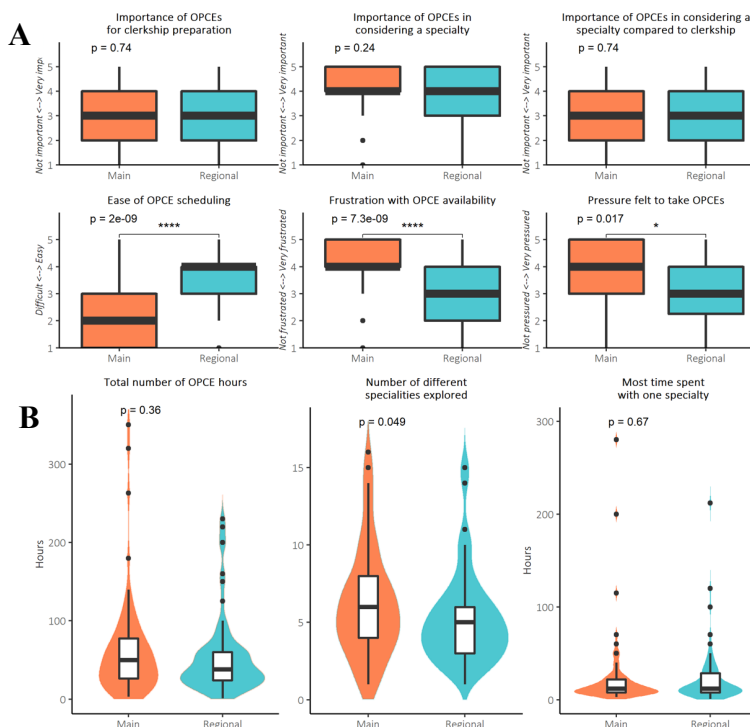
| Variables  | Number of Students |
|--|--------------------|
| <b>Demographics</b>                                  |                    |
| Class year   |                    |
| 2020   | 19 (13%)           |
| 2021   | 49 (33%)           |
| 2022   | 81 (54%)           |
| Campus   |                    |
| Hamilton (main campus)                               | 75 (50%)           |
| Regional   | 74 (50%)           |
| WRC  | 57 (38%)           |
| NRC  | 17 (11%)           |
| <b>Survey Questions* (median, Q1 – Q3)</b>           |                    |
| Median OPCE hours                                    | 40 (24 – 67)       |
| Median number of specialties explored                | 5 (3 – 7)          |
| Longest time (median hours) spent with one specialty | 12 (8 – 24)        |



**Figure 1. Aggregate answers to survey questions.** A) Distributions of Likert-scale question responses (%). B) Distributions of OPCE volume and breadth (%). Dotted lines represent the median.

**Stratified by Campus**

Primary analysis found that students in the regional campuses felt significantly less pressure to take OPCEs than Hamilton (3.20 vs 3.67,  $p = 0.017$ , scale 1 (least) – 5 (most)), significantly less frustration around OPCE availability (2.88 vs 4.16,  $p < 0.001$ ), and significantly greater ease of OPCE scheduling (3.50 vs 2.24,  $p < 0.001$ ). There were no significant differences in the total OPCE hours between campuses, or maximum time spent with one specialty. However, regional campus students explored significantly less specialties than Hamilton (5.19 vs 6.19,  $p = 0.049$ ) (Figure 2). Subsequent sensitivity analysis corroborated all findings with one exception: regional campuses did not feel significantly less pressure to take OPCEs ( $p = 0.059$ ) with the weighted data (Figures S1, S2).



**Figure 2. Differences between main and regional campus distributions.** Significant differences between group distributions were determined by Mann–Whitney–Wilcoxon tests. A) Boxplots of Likert-scale question distributions stratified by regional campus. B) Violinplots of OPCE volume and breadth stratified by campus. Medians, interquartile ranges, and whiskers are presented using boxplots. Each boxplot lies within a coloured distribution, with the width of the shaded area estimating the proportion of data located there. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ , \*\*\*\* $p < 0.0001$ .

**Discussion**

We report that regional campuses felt significantly less pressure to do OPCEs, significantly less frustration around OPCE availability, and significantly greater ease of OPCE scheduling than students at the main campus. Moreover, regional campuses offered generally equal opportunities for OPCE volume and breadth as main campuses, suggesting a noninferior experience at regional campuses. Our findings help to characterize the impact of DME on OPCEs and support the benefits of DME in Canada previously reported in the literature.

Our findings corroborate the benefits of DME in the literature, such as greater clinical capacity and lower competition at regional sites.<sup>3,7–9</sup> Smaller regional class sizes at McMaster reduce the administrative burden on regional staff and the relative oversaturation of learners at the main traditional campus. However, while regional differences in frustration and scheduling were considered robust, our sensitivity analysis cast some doubt on the finding of less pressure at regional sites.

Despite lower geographic access to large teaching hospitals, regional campuses did not show significant differences in total OPCE hours or maximum hours spent with one specialty. Independent of campus, students also found OPCEs important for considering specialties—though not as important as clerkship—reaffirming the benefits of early clinical exposure, especially in the condensed 3 year program provided by McMaster. While regional campuses did report significantly fewer specialties explored, the absolute differences between medians was by one less specialty. However, students in the main campus likely have greater access to OPCEs in specialized tertiary care, that may be rarer in the outside community.<sup>10</sup>

Students reported mixed utility of OPCEs for clerkship preparation independent of campus, in contrast to prior studies.<sup>4–6</sup> This discrepancy is likely from the greater heterogeneity of OPCEs at McMaster, in contrast with the more structured experiences in the literature. OPCEs at McMaster are not uniform and standardized; preceptors may be from any specialty, and learners may be exposed to a

broad spectrum of experiences subject to situational factors present at the clinical placement. The lack of standardized structure in McMaster's OPCEs is a limitation of the generalizability of our results to programs with differently structured OPCEs.

### Limitations

Due to our study design being a voluntary survey, weaknesses of our study include potential non-response bias and selection bias. Our sample had unequal representation among campuses and student years, particularly among the graduating year and students in the Niagara campus, which may skew our primary analysis. Therefore, a post-hoc sensitivity analysis was performed to determine the robustness of our initial assessment, by weighting our sample by campus and year. The results of the primary analysis were generally consistent with our sensitivity analysis, suggesting that our results are robust.

Future studies can build on this work by better optimizing the distribution strategy for surveys, in order to better capture underrepresented groups within the cohort and gain a greater sample size. Adding variables such as gender and age to the survey can strengthen the robustness of results and including postal code data would also help to identify student groups residing someplace other than the community of their assigned campus. Additionally, knowing how many OPCEs were taken outside of the geographical area of a student's assigned campus should be queried. We recommended that the administration of this survey be repeated in the future to ensure longitudinal follow-up of the included cohort and assess the outcomes of OPCEs on specialty selection.

### Conclusion

Although students overall reported mixed helpfulness of OPCEs for clerkship preparation, regional students found OPCEs easier to schedule and with less frustration around availability. In addition, regional campuses generally had equal opportunities for OPCE volume and breadth as main campus students, though with slightly less variety of specialties, suggesting a noninferior experience at regional campuses. Overall, our data increase our understanding of the impact of DME and further contribute to the accumulating evidence of its benefits on medical education.

### Acknowledgements

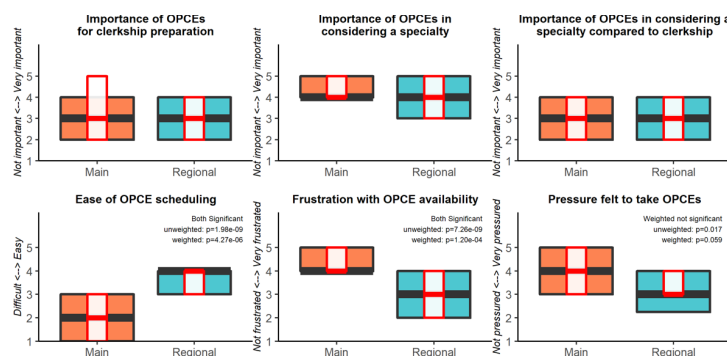
The authors would like to kindly thank the following individuals for their support and guidance in assisting with this project: Graham Campbell, Dr. Sharon Bal, Dr. Kathleen Nolan, Dr. Jason Profetto, and Jenny Zhu.

## Appendix

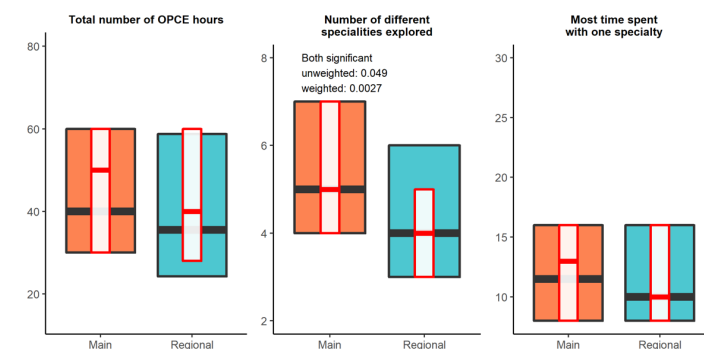
**Table S1. Sensitivity analysis of aggregate responses.**

Unweighted and weighted median and spread (Q1 – Q3) of survey questions were compared.

| Survey Questions* (median, Q1 – Q3)                                  | Unweighted   | Weighted     |
|--|--------------|--------------|
| Total OPCE hours   | 40 (24 – 67) | 50 (24 – 70) |
| Number of specialties explored                                       | 5 (3 – 7)    | 6 (4 – 8)    |
| Most time (hours) spent with one specialty                           | 12 (8 – 24)  | 14 (8 – 24)  |
| Importance of OPCEs for clerkship preparation                        | 3 (2 – 4)    | 3 (2 – 4.5)  |
| Importance of OPCEs in considering a specialty                       | 4 (3 – 5)    | 4 (4 – 5)    |
| Importance of OPCEs in considering a specialty compared to clerkship | 3 (2 – 4)    | 3 (2 – 4)    |
| Ease of OPCE scheduling  | 3 (2 – 4)    | 3 (2 – 4)    |
| Frustration with OPCE availability                                   | 4 (3 – 5)    | 4 (3 – 5)    |
| Pressure felt to take OPCEs  | 4 (3 – 4)    | 4 (3 – 5)    |



**Figure S1. Sensitivity analysis of Likert-scale question results by campus.** Wider, coloured boxplots represent unweighted data, and internal thin red boxplots represent weighted data. Unweighted and weighted Mann–Whitney–Wilcoxon tests were compared and any differences in results (significant vs not significant) were noted.



**Figure S2. Sensitivity analysis of OPCE volume and breadth results by campus.** Wider, coloured boxplots represent unweighted data, and internal thin red boxplots represent weighted data. Unweighted and weighted Mann–Whitney–Wilcoxon tests were compared and any differences in results (significant vs not significant) are annotated.

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