

# Practice locations of longitudinal integrated clerkship graduates: a matched-cohort study

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**Introduction:** Longitudinal integrated clerkships (LICs) have been introduced as an innovative model to impart medical education. In Canada, most LIC experiences are situated in rural communities. Studies have reported equivalence in graduates from rural LICs and traditional rotation-based clerkships (RBCs) in their performance in residency, as well as in national medical licensure examinations. We sought to determine the impact of rural LICs in terms of practice location of graduates.

**Methods:** A matched cohort was developed on the basis of student background and sex to compare practice location of rural LIC and RBC graduates. We used the  $\chi^2$  test to assess the association between type of clerkship stream and practice location.

**Results:** We found an association between participation in a rural LIC and rural practice location.

**Conclusion:** Rural LIC programs play an important role in introducing students to rural medicine and may be an effective tool in responding to the shortage of rural practitioners.

**Introduction :** Les stages cliniques longitudinaux intégrés (SCLI) ont été introduits à titre de modèles de formation médicale novateurs. Au Canada, la plupart des expériences de SCLI se déroulent en milieu rural. Des études ont fait état d'une équivalence entre les diplômés ayant opté pour un SCLI en milieu rural ou l'habituel stage clinique hospitalier (SCH) pour ce qui est de leur rendement durant leur résidence et de leurs résultats aux examens nationaux menant à l'obtention du permis d'exercice. Nous avons voulu mesurer l'impact des SCLI en milieu rural sur le lieu de pratique des diplômés.

**Méthodes :** Une cohorte assortie a été formée sur la base des antécédents et du sexe des étudiants afin de comparer le lieu de pratique des diplômés selon qu'ils avaient fait un SCLI en milieu rural ou un SCH. Nous avons utilisé le test du  $\chi^2$  pour évaluer le lien entre le type de stage clinique et le lieu de pratique.

**Résultats :** Nous avons découvert un lien entre la participation à un SCLI en milieu rural et la pratique en milieu rural.

**Conclusion :** Les programmes de SCLI en milieu rural sont importants pour initier les étudiants à ce type de pratique et pourraient être un outil efficace pour répondre à la pénurie de médecins en milieu rural.

## INTRODUCTION

Longitudinal integrated clerkships (LICs) were introduced as a new educational model to impart medical training, primarily to senior undergraduate medical students. Although LICs have existed since the 1970s,<sup>1</sup> most programs have been created in the past decade. Longitudinal integrated clerkships

have been extensively described in the literature.<sup>2</sup>

In Canada and Australia, LICs have generally been implemented in rural settings, allowing students to spend most of the clerkship year at a designated site, training under the supervision of a generalist. Rural LICs have been shown to provide a robust experience to students.<sup>3</sup> Longitudinal integrated clerkships

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appear to be having a significant impact on medical education and are being recognized nationally and internationally as viable and effective alternatives to traditional rotation-based clerkships (RBCs).<sup>2</sup>

Contemporary studies have reported equivalence in the performance of graduates from rural LICs and RBCs on various platforms, including in-training evaluation reports,<sup>4</sup> Medical Council of Canada Qualifying Examination Part I,<sup>5</sup> Part II<sup>5</sup> and in residency.<sup>6</sup> Because the rural LIC is a relatively recent development in medical education, little is known about its potential impact on rural communities in terms of practice location selected by its graduates. In this study, we compared practice locations of rural LIC and RBC graduates within the discipline of family medicine.

## METHODS

### Setting

The Cumming School of Medicine at the University of Calgary has a 3-year undergraduate medical curriculum in which the clinical clerkship comprises the final year of study. Internationally, it is the only LIC offered in the final year. Beginning with the graduating class of 2009, there have been 2 clerkship streams: a traditional RBC and a rural LIC. Details of the University of Calgary program are outlined elsewhere.<sup>5</sup> The current study was part of a comprehensive 3-year evaluation of the rural LIC that studied various outcomes at both undergraduate and postgraduate levels for the classes of 2009, 2010 and 2011.

### Participants

A total of 34 students in the classes of 2009–2011 completed the rural LIC. Each student in the rural LIC was prospectively matched at the start of the clerkship (first by background and then by sex) with students from the traditional RBC stream for comparison. Background was defined by the size of the community where students graduated from high school and consisted of 3 categories (rural, regional or urban). These categories were based on the population censuses of cities and towns. Communities with a population of 25 000 or less were classified as rural, communities with a population between 25 000 and 200 000 were classified as regional and communities with a population greater than 200 000 were classified as urban.

Students are randomly selected to the rural LIC from the applicant pool, which is populated by students who self-select for the program. Consequently, a matched cohort was created to eliminate potential selection bias. Matching was done primarily by background because studies suggest individuals reared in a rural community are more likely to practise in a rural area.<sup>7–9</sup> Sex was also considered in matching because rural physicians tend to be male.<sup>10,11</sup> To increase statistical power, we chose 4 RBC controls for each rural LIC student.<sup>12</sup> Because postgraduate training varies from 2 years for family medicine to 6 years or more depending on the specialty chosen, practice locations were available only for practising physicians in the discipline of family medicine.

### Materials

We developed a database that included records of both rural LIC and RBC graduates, and we entered practice locations using information from websites of provincial colleges. Practice locations were divided into categories of rural, regional or urban. Categories were based on the same criteria used to establish student background. We reviewed official websites of towns and city councils to confirm population.

### Procedure

This prospective matched-cohort study took place over 3 years. We created our cohort of rural LIC students before the start of clerkship, and gathered career and location data on the students as the first group of rural LIC students (class of 2009) completed residency and entered practice. The practice locations were entered about 1 year after the completion of residency, beginning with the class of 2009 and ending with the class of 2011 (until Nov. 30, 2014). The University of Calgary Conjoint Health Research Ethics Board approved the study.

### Statistical analysis

We used the  $\chi^2$  test to study the association between the dependent variable of practice location (rural/regional/urban) and the independent variable of clerkship stream (rural LIC v. RBC). We carried out secondary analyses by performing 3  $\chi^2$  tests to study the various pairwise comparisons. Bonferroni correction was applied to adjust for the multiple tests. We used SAS version 9.3 for statistical analyses.

## RESULTS

The database contained records of 170 graduates. Of the 34 rural LIC participants, 12 (35.3%) had urban, 14 (41.2%) had regional and 8 (23.5%) had rural backgrounds. Of the 136 RBC participants, 48 (35.3%) had urban, 58 (42.6%) had regional and 30 (22.1%) had rural backgrounds. Nineteen (55.9%) of the rural LIC participants were women, and 77 (56.6%) of the RBC participants were women. Twenty-five (73.5%) of the 34 rural LIC graduates and 43 (31.6%) of 136 RBC graduates are practising family medicine. The results of the analysis are summarized in Table 1.

A  $3 \times 2$   $\chi^2$  test examining type of clerkship and practice locations was significant (Pearson  $\chi^2_2 = 11.85$ ,  $p = 0.003$ ). Subsequently, we performed three  $2 \times 2$  pairwise comparisons of practice location and clerkship stream. The significance level was adjusted to 0.017 ( $\alpha = 0.05/3$ ). The association between type of clerkship and rural versus urban practice location was significant (Pearson  $\chi^2_1 = 9.56$ ,  $p = 0.002$ ), whereas the association between type of clerkship and rural versus regional practice location (Pearson  $\chi^2_1 = 0.05$ ,  $p = 0.8$ ), and urban versus regional practice location (Pearson  $\chi^2_1 = 4.60$ ,  $p = 0.03$ ) were not significant.

## DISCUSSION

We found an association between type of clerkship stream and practice location. Upon completion of residency, rural LIC graduates tended to practise family medicine at a rural rather than urban site. The rural LIC graduates were trained under the supervision of generalists and completed most of their core clerkship training in a rural community. Their clerkship experience was very different from that of the RBC students, who trained primarily in urban hospitals and moved from discipline to discipline at various sites. No association was found between type of clerkship and practice at a regional versus urban or regional versus rural site.

Numerous studies<sup>4,6,13-15</sup> comparing rural LIC and RBC students have demonstrated the equivalence of performance on various outcome measures. Our results suggest that rural LIC participants who pursue family medicine may be more likely to settle in rural communities. Consequently, the impact of this type of educational experience on rural physician human resources appears to be positive. Compared with practitioners in large urban communities and academic centres, practitioners in small rural communities bear a relatively larger burden in teaching individual students. Our findings demonstrate the result of their efforts in increasing health care access in rural communities as a whole.

Funding to further expand the presence of LICs, especially in rural areas, may be an important strategy to increase the number of family medicine practitioners willing to apply their skills in rural Canada.

## Limitations

This study had limitations that should be considered. Our research cannot confirm that participation in rural LICs causes graduates to practise in rural sites. There may be other factors beyond community background and sex that could play a role in this decision (e.g., motivation or spousal influences), and these are worthy of further study.

We had a small sample of rural LIC participants from a single medical school. Furthermore, the Cumming School of Medicine has a 3-year curriculum in which the LIC is offered in the final year of medical study. Therefore, the findings may not be generalizable to 4-year curricula in which LICs occur in the penultimate year of training. Because practice location can change during a physician's career, these findings represent only the initial practice location.

## CONCLUSION

In this matched-cohort study on the practice location of rural LIC graduates, we found an association

**Table 1. Proportion of graduates from rural longitudinal integrated clerkships and rotation-based clerkships practising family medicine in rural, regional and urban locations**

Type of clerkship	Total in family medicine	Practice location; no. (%) of graduates		
		Rural	Regional	Urban
Rural LIC	25	15 (60)	7 (28)	3 (12)
RBC	43	12 (28)	8 (19)	23 (53)
Total	68	27	15	26

LIC = longitudinal integrated clerkship; RBC = rotation-based clerkship.

between type of clerkship stream and practice location. Rural LIC programs may be a significant educational tool to facilitate change in the maldistribution of physicians due to the association between practice location and clerkship type. Given that rural practitioners and communities bear a relatively larger burden than urban practitioners in teaching students, our findings demonstrate the result of these efforts in increasing health care access in rural communities as a whole.

**Competing interests:** None declared.

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