

SHORT COMMUNICATION

Postgraduate specialty training in northeastern Ontario and subsequent practice location

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A B S T R A C T

Introduction: Physician specialists are under-represented in communities in northern Ontario, even in larger communities of approximately 100 000 population. The positive association between postgraduate training in northern or rural areas and eventual practice in these locations has been well documented in the literature, but only for family medicine/general practice. Few, if any, studies have explored the association for other specialties. The objective of this study was to determine if there was an association between northern training and northern practice location for physicians who were enrolled in the Northeastern Ontario Postgraduate Specialty (NOPS) program, which offers placements in northeastern Ontario in specialties such as anesthesiology, internal medicine and surgery.

Methods: A national medical human resources database provided the 31 December 2006 practice location of all 50 participants in the NOPS program since its inception in 2000 until 2006. Program records provided data on participants' specialty rotations in northeastern Ontario, including number, location, and duration of rotations. Non-NOPS participants ($n=50$) were randomly selected for comparison, matched one for one to the NOPS group on sex, year of birth, language, medical school, year of graduation from medical school, age at the time of graduation, and specialty. Hierarchical log-linear models and χ^2 tests were used to assess differences between NOPS and non-NOPS participants in geographic location and population size of practice community. Chi-square tests were used to analyze the relationship between the duration of northeastern rotations and practice location of NOPS participants.

Results: The NOPS and the matched non-NOPS groups did not differ significantly for age or age at graduation from medical school (paired t -tests, $p>0.80$) and matched exactly for sex, medical school location and specialty group. Forty-six percent of NOPS participants were female and 80% came from Ontario residency programs. Seventy-two percent of the program participants were enrolled in medical specialties (the remainder were in surgical specialties) and this differed significantly by sex: 83% of females vs 63% of males ($\chi^2=4.76$, $df=1$, $p=0.03$). A majority completed residency training at 31-35 years of age. Fifty percent of NOPS participants obtained medical degrees from Ontario universities, 34% from other Canadian universities and 16% from other



universities. Significantly more NOPS participants than non-participants were located in northeastern Ontario (9 vs 0), significantly fewer were in other provinces (13 vs 22) and identical numbers were located in southern Ontario (28 vs 28) ($\chi^2=11.61$, $df=2$, $p<0.01$). Significantly more NOPS participants than non-participants were practicing in communities of 10 000-99 999 people (15 vs 4), approximately equal numbers in communities of 100 000-499 999 (9 vs 11) and non-significantly fewer were practicing in areas of 500 000 or more (26 vs 35) ($\chi^2=7.90$, $df=2$, $p=0.02$), though this interaction was not significant in the hierarchical log-linear model. The NOPS participants located in northeastern Ontario were more likely to have longer northeastern rotations (>4 weeks) than those located in southern Ontario ($\chi^2=7.81$, $df=2$, $p=0.02$). However, a longer northeastern rotation was no guarantee of a northeastern practice location because roughly equal numbers of participants with longer rotations were spread throughout the 3 geographic practice locations. Conversely, a shorter rotation was strongly associated with a southern Ontario practice location (18/25). The NOPS participants located in communities of $\geq 500\ 000$ people were more likely to have shorter rotations than longer rotations, but this difference was only marginally statistically significant ($\chi^2=5.13$, $df=2$, $p=0.08$).

Conclusions: The study found that specialists who participated in NOPS postgraduate specialty training in northeastern Ontario were more likely to practice in northeastern Ontario than non-participants. There was also a strong association between the duration of training in the northeast and northeastern practice and avoidance of practice in metropolitan areas. It is not clear yet whether longer northeastern rotations encourage northeastern practice or whether this reflects an existing disposition; it is clear, however, that specialists with longest specialty training rotations in the northeast were more likely to practice in the northeast. The results from this study provide the first empirical evidence of positive association between postgraduate specialty training in the northeast and eventual practice in northeastern Ontario and smaller cities.

Key words: Canada, postgraduate specialty medical education; practice location; northeastern Ontario.

Introduction

The Northeastern Ontario Postgraduate Specialty (NOPS) program, initially offered by the Northeast Ontario Medical Education Corporation and now offered by the Northern Ontario School of Medicine (NOSM), provides 2–24 week rotations in northeastern Ontario in anesthesiology, internal medicine, psychiatry, surgery, and other specialties to residents with a view to encouraging eventual practice in northern cities or smaller sized cities.

Although the positive association between exposure to rural and remote practice during postgraduate training and eventual practice in rural areas has been well documented in the literature on family physicians/general practitioners¹⁻¹¹ few, if any, studies have examined this association for other specialties. Publications that deal with these specialties either advocate implementation of rural specialty training programs, recommend improvements or describe existing programs¹²⁻¹⁸. These publications do not provide

evidence linking rural or northern training and eventual practice location. This study addressed this gap in the literature and explored the association between practice location and northern education for specialties other than family medicine/general practice.

Methods

The NOSM administrative records provided the number, location and duration of residents' rotations in northeast Ontario from program inception in 2000 to 2006. Scott's Medical Database (SMDB) held by the Canadian Institute for Health Information (CIHI) provided the practice location at 31 December 2006 for 50 NOPS participants and matched specialists (described below). The SMDB practice location was checked against that of the College of Physicians and Surgeons of Ontario (CPSO) online directory (<http://www.cpso.on.ca/docsearch/>) for NOPS participants.



A comparison group of non-NOPS participants was selected by matching one for one on sex, year of birth, language, location of medical school, year of medical school graduation, age at graduation from medical school and specialty. If no exact matches were found, then criteria were relaxed to be ± 1 year for age or graduation year and medical versus surgical specialties. The study received research ethics approval from Laurentian University and CIHI.

Chi-square tests were used to analyze demographic characteristics as well as the relationship between the duration of northeastern Ontario rotations and practice location. Adjusted standardized residuals were used to identify cells with significant deviation from expected¹⁹. Paired *t*-tests were used to compare age in 2006 and age at graduation for NOPS and non-NOPS participants (Wilcoxon Signed Ranks tests gave similar results). Hierarchical log-linear models and χ^2 tests were used to assess differences between NOPS and non-NOPS participants in geographic location and population size of practice community. Analyses were performed with PASW v17 (formerly SPSS; Predictive Analytic Software; Chicago, IL, USA; <http://www.spss.com/>).

Results

All 50 NOPS participants were matched after six iterations. Exact matches were obtained for 12 participants, with 18 additional matches using specialty group. Allowing age and year of graduation to vary ± 1 added 11 and 9 matches for specialty and specialty group, respectively.

Paired *t*-tests indicated that NOPS and the matched non-NOPS program groups were not significantly different for age in 2006 ($M=36.2$, $SD=5.6$ vs $M=36.3$, $SD=5.3$, $t=-0.09$, $df=43$, $p=0.93$) and age at graduation from medical school (both groups with means of 27.2 years). Program groups matched exactly for sex, medical school location and specialty group.

Demographics of Northeastern Ontario Postgraduate Specialty program participants

Forty-six percent of NOPS participants were female and 80% came from Ontario residency programs. Seventy-two percent of participants were enrolled in medical specialties (the remainder were in surgical specialties) and this differed significantly by gender: 83% of females vs 63% of males ($\chi^2=4.76$, $df=1$, $p=0.03$). Fifty-eight percent completed residency training at 31-35 years of age. Fifty percent of NOPS participants obtained undergraduate medical degrees from Ontario universities, 34% from other Canadian universities and 16% from other universities.

Northeastern Ontario Postgraduate Specialty program participation and outcomes

A hierarchical log-linear model was developed for NOPS participation (yes or no), practice location (Northeastern Ontario, Southern Ontario or other location) and community population size (10 000-99 999, 100 000-499 999 or $\geq 500 000$ people). A sample size of 100 provided expected frequencies in excess of 5 and no cell was an outlier after the model was fitted²⁰. Backwards elimination of non-significant effects resulted in a model with all first order (main) effects and two of the three two-way associations. A likelihood ratio of 5.55, $df=5$, $p=0.35$ indicated a good fit of the model. Structural zeros were used to take into account that communities of $\geq 200 000$ people do not exist in northern Ontario. The final model shows that NOPS participation was associated with practice location, but not with community size, whereas practice location was associated with community size. The lack of a significant three-way interaction suggests that the results of χ^2 tests can be used to assess significance of two-way interactions.

Significantly more NOPS participants than non-participants were practicing in northeastern Ontario (9 vs 0), identical numbers were practicing in southern Ontario (28 vs 28) and non-significantly fewer participants were in other provinces (13 vs 22) ($\chi^2=11.3$, $df=2$, $p<0.01$) (Table 1). Significantly more NOPS participants than non-participants were



practicing in communities of 10 000-99 999 people (15 vs 4), roughly equal numbers in communities of 100 000-499 999 people (9 vs 11) and non-significantly fewer were practicing in communities of 500 000 people or more (26 vs 35) ($\chi^2=7.90$, $df=2$, $p=0.02$), though this interaction between program and community size was not significant in the hierarchical log-linear model.

There were no significant associations between specialty group (medical vs surgical) and practice location or community size or between gender and practice location (χ^2 tests, $p>0.34$). However, proportionally more female surgeons (7/8) than males (8/20) practiced in metropolitan areas than in communities of other sizes (Fisher's Exact Test, 2-sided, $p=0.04$).

Excluding those participants who were out of Canada or were not registered for medical practice in 2006 left 29 NOPS participants and their matches – all of whom were assumed to be in active Canadian medical practice. Model and test results were very similar for the full or partial data sets and thus the findings seemed robust.

Rotation details and association with outcomes

Most northeastern rotations were completed during the third (28%) or fourth (34%) residency year. Twenty percent of NOPS participants did more than one northeastern rotation. Fifty percent of the residents had a total northeastern rotation of 4 weeks or less, 30% had 6-12 weeks and 20% had 20-104 weeks. Overall, there was a mean of 15 (median=5) weeks per resident. Most participants did their rotations in the major northeastern Ontario cities of Sudbury (42%), North Bay (38%) or Sault Ste Marie (16%).

Eight of nine NOPS participants practicing in northeastern Ontario had longer rotations (>4 weeks) compared with 10 of 28 who were practicing in southern Ontario ($\chi^2=7.81$, $df=2$, $p=0.02$) (Table 2). However, a longer rotation was no guarantee of a northeastern practice location because approximately equal numbers of participants with longer rotations were spread throughout the 3 geographic

locations. In contrast, a shorter rotation was strongly associated with a southern Ontario practice location (18/25). There was no association between duration and practice location in another province. The NOPS participants practicing in communities of 500 000 or more people were less likely to have longer rotations (17/26) than shorter rotations, but this difference was only marginally significant ($\chi^2=5.13$, $df=2$, $p=0.08$) and differences were less pronounced for communities of 10 000-99 999 or 100 000-499 999 people.

Discussion

This study provided evidence of a positive association between postgraduate specialty training in northeastern Ontario and eventual practice in northeastern Ontario communities or smaller communities (population <100 000). The study also found a strong association between longer duration of postgraduate specialty training in the northeast and northeastern practice and, to a lesser extent, between longer duration and practice in smaller communities.

The study could not rule out the influence of other factors. For instance, the study did not account for possible exposure to northern and rural medical practice through participation in other programs. The study also did not account for other factors that might be associated with northern practice (eg northern or rural background)⁸. For some specialists, NOPS participation might be a consequence of their earlier decision to practice in the north, while for others participation may have encouraged them to practice in the north.

There are some limitations associated with SMDB data. For instance, location in the SMDB is based on physician's mailing address (home, hospital or office) and may not reflect actual practice location. However, results are likely robust given that only 6% were home addresses. Excluding specialists who were located out of Canada or were not registered with the regulatory college did not substantially change the main findings, though sometimes statistical significance was reduced due to lower sample size.



Table 1: Northeastern Ontario Postgraduate Specialty (NOPS) and non-NOPS participants according to location at 31 December 2006[†] and population size of community

| Location | Community population | | | | | | Total | |
|----------------------|----------------------|----------|-----------------|----------|-----------------------|----------|-------|----------|
| | 10 000-99 999 | | 100 000-499 999 | | ≥500 000 [‡] | | | |
| | NOPS | non-NOPS | NOPS | non-NOPS | NOPS | non-NOPS | NOPS | non-NOPS |
| Northeastern Ontario | 7 | 0 | 2 | 0 | – | – | 9 | 0 |
| Southern Ontario | 5 | 1 | 4 | 8 | 19 | 19 | 28 | 28 |
| Other provinces | 3 | 3 | 3 | 3 | 7 | 16 | 13 | 22 |
| Total | 15 | 4 | 9 | 11 | 26 | 35 | 50 | 50 |

NOPS, Northeastern Ontario Postgraduate Specialty.

[†] A mean and median of 2.5 years after completion of residency training.

[‡] Northern Ontario has no communities with >200 000 population.

Table 2: Duration of Northeastern Ontario Postgraduate Specialty rotations and practice location at 31 December 2006

| Location | Duration (weeks) [†] | | Total | No. weeks (Mean) |
|----------------------|-------------------------------|----|-------|------------------|
| | ≤ 4 | >4 | | |
| Northeastern Ontario | 1 | 8 | 9 | 38 |
| Southern Ontario | 18 | 10 | 28 | 9 |
| Other provinces | 6 | 7 | 13 | 13 |
| Total | 25 | 25 | 50 | |

[†] Residents could participate in one or more rotations of 2-24 weeks.

The inability to match 54% of NOPS participants exactly on specialty is a limitation because some specialties may require a bigger population base to ensure a viable practice and this would preclude practice in smaller cities and possibly in the north altogether. While this may temper our NOPS versus non-NOPS comparisons, it does not affect our findings of a positive association between NOPS rotation duration and practice location.

Conclusion

Our study found a strong positive association between participation in the NOPS program and a northeastern Ontario practice location. It is not clear whether longer northern rotations encourage northern practice or whether this reflects an existing disposition towards northern practice. It is clear, however, that those specialists who had

the longest northeastern rotations were more likely to set up practice in the northeast and, to some extent, in smaller cities.

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