Predicting Family Medicine Specialty Certification Status Using Standardized Measures for a Sample of International Medical Graduates Engaged in a Practice-ready Assessment Pathway to Provisional Licensure

André F. De Champlain, Cindy Streefkerk, Fang Tian, Marguerite Roy, Sirius Qin

Medical Council of Canada

Carlos Brailovsky, Paul Rainsberry, Tim Allen

College of Family Physicians of Canada

Stephen Slade

Canadian Post-M.D. Education Registry

Canada, like Australia, the UK and the United States, relies on an important cadre of internationally trained physicians to better serve the health care needs of a growing and culturally diverse population, especially in under-serviced areas.[1-4] Data from the 2014 Canadian Medical Association Masterfile indicates that 23.2% of the approximately 75,000 practicing physicians in Canada were trained abroad, with the largest number of international medical graduates (IMGs) concentrated in Saskatchewan (54.0%) and Newfoundland & Labrador (40.6%).[5]

Since the report of the IMG Task Force in 2004, it has been recognized that Canada has a fragmented approach to assessing and integrating IMGs.[6] This is further compounded by the fact that many listed medical schools around the world have curricula and/or monitoring processes that are unknown to Medical Regulatory Authorities (MRAs) in Canada. Consequently, MRAs rely on Canadian assessment processes to provide sufficient information about a candidate to determine their readiness to enter clinical practice in Canada. There is consensus that point in time assessments of medical knowledge and clinical skills are not sufficient to permit direct entry into practice and that those prospective medical practitioners should be objectively observed in a realistic clinical environment.

Pathways to Licensure in Canada for International Medical Graduates

Currently, IMGs can avail themselves of three general routes for entry into practice in Canada. All of these pathways are based on a screen of their credentials and include: (1) Obtaining licensure directly through a determination that their credentials are equivalent to Canadian standards (i.e., IMG specialty certification credentials are accredited by the College of Family Physicians of Canada [CFPC] or the Royal College of Physicians and Surgeons of Canada [RCPSC]); (2) Completing Canadian postgraduate training based on the determination that the IMG does not possess sufficient postgraduate training and; (3) Entering some form of - in

practice assessment program for IMGs, as the IMG has completed acceptable postgraduate training and/or has been a practicing physician outside of Canada. The latter route is referred to as *Practice Ready Assessment* (PRA) and is the focus of the present investigation.

Practice-ready Assessment in Canada

In Canada, PRA is used to determine whether an IMG has the requisite competencies to enter medical practice. “Practice ready” is an indication to a MRA that an IMG is qualified to enter medical practice in the capacity of a most responsible physician (MRP) under a provisional medical license, with the clear proviso that supervision and summative assessments constitute a significant component to meet the final requirements for full medical licensure.

In 2013, approximately 300 IMG physicians were assessed through existing PRA programs which are currently offered in family medicine and/or other specialties across seven jurisdictions. The tools used in PRA include both a point-in-time assessment, such as the Medical Council of Canada’s Evaluating Examination, and a series of over-time workplace-based assessments, such as multisource feedback, chart review, mini-clinical evaluation exercise, field notes and direct observation of procedural skills in an effort to determine whether an IMG is qualified to enter medical practice as a MRP with a provisional medical license.

While these PRA programs were developed relatively independently across jurisdictions, there are enough commonalities amongst the processes to form a basis for a pan-Canadian PRA strategy. In fact, pan-Canadian PRA is seen as a natural evolution of the processes that have been created in each jurisdiction to meet health human resource needs. The future PRA to make a practice-ready decision must be fair, transparent, sustainable, consistent and comparable across the country. Furthermore, the public should expect to receive the same standard of care regardless of where the IMG might have completed their PRA.

Practice Ready Assessment Experiences throughout the World

Other PRA programs have reported somewhat mixed results with regard to the IMG's readiness to enter the workforce. However, these differences could be explained by differences between program structures and a failure to recognize the array of challenges faced by IMGs. The Collège des Médecins du Québec (CMQ), the regulatory authority in that Canadian province, conducted a retrospective study which compared IMG and CMG pass rates on both the CMQ as well as the College of Family Physician of Canada's (CFPC) certification examinations.[7] Regardless of the examination, pass rates were significantly lower for IMGs, despite residency program orientation and support for those candidates.[7] Similarly, a study conducted in Israel, aimed at evaluating predictors of PRA program success for IMGs educated in the former USSR, reported that the latter physicians were significantly lagging behind Israeli trained doctors in a number of competencies, including medical knowledge, research capability, diagnostic skills and doctor-patient relationship.[8]

On the other hand, a workplace-based PRA program aimed at integrating IMGs into Australian medical practice has been successfully piloted and implemented over the past few years.[9] Two pathways for registering as practicing physicians in that country are available to IMGs. The more traditional route entails passing both a multiple-choice examination and an objective structured clinical skills examination (OSCE), both administered by the Australian Medical Council. However, an alternative workplace-based pathway, which is founded on a six-month assessment process in a clinical setting and includes mini-clinical evaluation exercises (Mini-CEXs), case-based discussions (CBDs), multisource feedback as well as in-training assessments, is also available.[9] A preliminary study indicated that all participating IMGs successfully completed the program based on a number of pre-determined criteria.[9] Though the cost of the latter program for an individual candidate is high (about AUD $16,000), the program has been successful in producing a large number of physicians deemed competent for entry into

the Australian medical workforce.[10] A pilot program conducted with IMGs in the area of pain management and palliative medicine in the United States similarly concluded that a 4-week course composed of both an educational component and weekly assessments positively impacted levels of concern, knowledge and self-assessed competence with a cohort of 21 IMGs.[11] A follow-up study conducted by MacLellan *et al*. concluded that IMGs who completed a clerkship pathway, i.e., who completed the final two years of the MD degree in Québec prior to undertaking their post-graduate training, performed as well as Canadian Medical Graduates on the certification examination in Family Medicine.[12] The authors surmise that the clinical exposure gained by IMGs as a result of adding two years' worth of undergraduate medical education prior to residency allowed these candidates to "learn and consolidate clinical medical skills in the appropriate structured environment" (p. 667).

The disparity in the results reported by some of these IMG practice ready efforts underscore a number of key issues which are critical to the success of any such program. First, the importance of acculturating the IMG to both their new medical and social *milieus* cannot be understated.[13] Wong and Lohfeld[3] identified the themes of loss, disorientation and adaptation as those typically experienced by IMGs as they transition to medical practice in Canada. In fact, several IMG PRA programs have strongly underscored the need for mentorship to ensure that the candidate can successfully integrate not only in Canadian medical practice but also the community at large.[14-16]

A second critical factor to increase the likelihood of success of any PRA program for IMGs is a strong screening process to ensure the selection of those candidates who are most apt to effectively complete PRA as well as function as a most responsible physician in the community. Findings from several studies indicate that success on specialty board written examinations for those IMG candidates who have completed a PRA-like process is highest for those programs that implemented strong selection processes.[7,8,17] In fact, past studies suggest that

supplementary teaching hours as well as orientation, while helpful, cannot make up for serious lags in both affective and cognitive domains for those programs that implement little to no screening.[7,8]

Purpose

The purpose of the present study was to assess the usefulness of Medical Council of Canada examination scores as well as a number of educational/socio-demographic variables in predicting both scores and pass/fail standing on each component of the CFPC's Family Medicine certification examination by performing a retrospective analysis on a sample of IMGs who had successfully completed a PRA program in Canada. Additionally, we modeled time to passing each component of the CFPC examination as a function of the same predictors using a survival data analysis model. The outcomes of this study could provide valuable evidence to guide the selection of appropriate screening tools for all PRA programs to ultimately ensure that candidates' likelihood of success, both in PRA and as MRPs, is maximized.

Method

Sample

Our data set included a sample of 132 candidates who had successfully completed a PRA program between 2007 and 2011 and attempted the CFPC's certification examination in Family Medicine by the end of 2012. Unique identification numbers were sent to the Canadian Post-M.D. Education Registry (CAPER) who provided us with aggregate-level, de-identified data for our sample of 132 PRA candidates. CAPER was established in 1986 through the cooperation of a number of Canadian organizations (including the MCC and the CFPC) and collects data for all residents and fellows from all 17 Canadian Faculties of Medicine. The PRA programs, the MCC and CFPC provided CAPER with data for these 132 candidates in an anonymous fashion.

CAPER merged and de-identified the data across all sources. This study was approved by the Ottawa Hospital Research Ethics Board.

Our sample included 81 male PRA candidates (61.4%) and 51 (38.6%) female candidates. Forty-five candidates (34.1%) reported completing their MD degree in English whereas 87 candidates (65.9%) reported a language other than English. The mean age of candidates at entry into PRA was 40.86 years with a standard deviation equal to 6.66 years. Finally, the mean number of years from obtaining the MD degree to entering a PRA program was equal to 16.15 years with a standard deviation of 6.49 years. The demographic makeup of our sample strongly resembles similar IMG cohorts who have completed postgraduate medical education in Canada.[18]

Variables

The independent variables or predictors in our statistical models included: (1) the most recent score on the Medical Council of Canada's Evaluating Examination (MCCEE); (2) the most recent score on the Medical Council of Canada's Qualifying Examination Part I (MCCQE Part I); (3) gender; (4) age in years of the candidate at the start of the PRA process; (5) years since obtaining the MD degree at the start of the PRA process and; (6) language in which the MD degree was completed, i.e., English or Other. The outcomes or dependent variables in our models included: (1) the most recent score on the CFPC's Simulated Office Orals (SOOs) component of the Certification Examination in Family Medicine; (2) the most recent score on the Short-Answer Management Problems (SAMPs) component of the Family Medicine Certification Examination; (3) pass/fail status on the most recent attempt of SOOs and; (4) pass/fail status on the most recent attempt of SAMPs.

The MCCEE is a four-hour, computer-based examination offered in both English and French at more than 500 centers in 80 countries worldwide. IMGs must take the MCCEE as a prerequisite

for eligibility to the Medical Council of Canada Qualifying Examinations. The MCCEE is composed of 180 single-best answer multiple-choice questions (MCQs) and is a general assessment of the candidate's basic medical knowledge in the principal disciplines of medicine. The MCCQE Part I is a one-day, computer-based test that assesses the competence of candidates who have obtained their medical degree for entry into supervised clinical practice in postgraduate training programs. It is one of the requirements for enrollment into the Canadian Medical Registry as a licentiate of the Medical Council of Canada (LMCC). The MCCQE Part I is administered in 2 multi-week windows at over a dozen dedicated secure sites across Canada. The first part of the MCCQE Part I is composed of 196 single-best answer computer-delivered MCQs (3.5 hours) whereas the second part includes about 60 clinical decision-making cases (CDMs) (4.0 hours).

The CFPC's Certification Examination in Family Medicine includes five SOOs which assess both the definition and management of health problems in a patient-centered approach. A physician examiner acts both as patient and examiner in the SOOs component. The exam also includes 30-40 SAMPs which measure a candidate's problem solving skills and knowledge in the context of a clinical situation.

Analyses

Separate logistic regression analyses were run to predict pass/fail status on the CFPC SOOs and SAMPs components as a function of the PRA candidate's most recent MCCEE and MCCQE Part I scores, gender, age in years at the start of the PRA process, years since obtaining the MD degree at the start of the PRA process and language in which the MD degree was completed. Similarly, two separate multiple linear regression models were fit to our PRA dataset to predict the score on each of the CFPC Certification Examination in Family Medicine component as a function of the same predictors.

One novel analysis technique employed in the present research entailed modeling whether the number of attempts required for passing each component of the CFPC Certification Examination was a significant predictor of pass/fail stratus. More specifically, given the discrete nature of the outcome variable (candidates only have 2 opportunities per year to attempt the CFPC certification examination as it was only administered twice a year), we applied a logit-linear survival model to assess whether the number of attempts needed to pass each component significantly accounted for pass/fail status on each of the family medicine certification examination components in addition to our other predictors.

Results

Predicting the Odds of Passing Each CFPC Exam Component

Table 1 provides the results from the final logistic regression models for predicting pass/fail status on the SAMPs component of the CFPC certification examination. Results of the logistic regression analyses for predicting SOOs pass/fail are not provided as none of the independent variables significantly predicted the odds of passing this component of the CFPC certification examination.

The model obtained with the SAMPs component significantly accounted for pass/fail status$L^2(3)= 24.03$, $p<0.0001$. Specifically, gender, the most recent MCCQE Part I score and age at entry into PRA, significantly predicted the odds of passing this component. The odds of passing the SAMPs component for male PRA candidates was 0.194 times what it was for corresponding female candidates. With each increase of one point on the MCCQE Part I (scores range from 50-950), the odds of passing the SAMPs component increased by 1.020. Finally, the odds of passing the CFPC SAMPs component decreased by 0.917 with each increase of one year in age of the candidate.

Predicting Scores on Each CFPC Exam Component

Table 2 provides the results from the final multiple linear regression models that were fit to our PRA data set to separately predict scores on the SOOs and SAMPs components of the CFPC certification examination. As was the case with the logistic regression analysis, the model that was run for the SOOs component, while statistically significant, was very weak and accounted for only 6% of the variance in SOOs scores($F(3,128)=9.08$; $p<0.01$) . On average, female candidates outperformed their male counterparts by about 3.3% (N.B.: Both the SOOs and SAMPs scores in this study were reported on a percent-correct scale).

Findings obtained for the SAMPs component mirror results reported in the previous logistic regression analysis. This regression model accounted for a significant proportion (38%) of variance of SAMPs scores, $F(3,128)=27.91$; $p<0.0001$. Female PRA candidates outperformed male candidates by about 2.57%; an increase of one point in MCCQE Part I score was associated with an increase of 0.04% on the SAMPs component and; finally, SAMPs scores decreased by 0.17% with each increase of one year in age for the PRA candidate.

Predicting Number of Attempts Needed to Pass Each CFPC Exam Component

Table 3 provides the results of logit-linear survival models that were separately estimated for each CFPC exam component to assess whether the number of attempts was associated with passing or failing each component, in addition to the other predictors in the model. With respect to the SOOs component, both gender and the number of attempts significantly predicted pass/fail status, $L^2(7)=37.90$, $p<0.0001$. As previously reported, female candidates were significantly more likely to pass the SAMPs component than their male counterparts. Also, for those first-time repeating candidates, the odds of passing the SOOs component on the 2nd attempt is 3.3 times higher than on the initial attempt.

Finally, with regard to the SAMPs component, only gender and the most recent MCCQE Part I score significantly predicted pass/fail status; $L^2(4)=37.55$, $p<0.0001$. Unlike the SOOs component, repeating the SAMPs does not significantly increasing the odds of passing. Male PRA candidates were 0.360 times as likely to pass the SAMPs component as their female counterparts; the odds of passing the SAMPs component increased by 1.018 with each increase of one score point on the MCCQE Part I exam.

Discussion

Physicians trained abroad have, and will continue, to play a critical role in the Canadian medical landscape by meeting the health care needs of a significant proportion of the Canadian populace. Due to the diversity of IMGs, it is critical that fair, transparent, sustainable and consistent assessment practices be put in place across the country. A patient should expect comparable quality of care from a provisionally-licensed physician who has gone through PRA as they would expect to receive from a fully-licensed physician, irrespective of the province or territory.

The present study was aimed at providing evidence to support and inform a critical phase of the PRA process to all programs that is screening, in the hopes of better informing a pan-Canadian strategy that will ultimately be beneficial to IMGs, MRAs and the Canadian public in the most cost-effective manner. Admitting candidates who have a high likelihood of not only completing the PRA program but functioning as a fully licensed and certified physician in the community is a prime consideration for all jurisdictions.

Given the emphasis on primary care needs, our investigation focused on the extent to which a set of standardized examination and socio-demographic variables was helpful in predicting performance on a family medicine certification examination for a sample of PRA candidates. The use of standardized examination scores as predictors in our study seemed warranted in

light of past research which showed that performance on licensing and certification exams was significantly related to a number of indices of preventive care as well as acute and chronic disease management in a primary setting, four to seven years into practice.[19]

Our findings demonstrated little to no relationship between our predictors and scores on the performance component of a family medicine certification exam (the SOOs component). These results were not entirely unpredictable given that the MCCEE and MCCQE Part I examinations tap heavily into cognitive abilities as opposed to communication and other important affective competencies. Findings suggest that an objective structured clinical examination (OSCE) might be a better predictor of performance on the SOOs component given the similarities in targeted domains. An investigation aimed at assessing whether performance on the National Assessment Collaboration (NAC) Examination (an OSCE designed for IMGs seeking entry into post-graduate training in Canada) can further inform the PRA process is currently underway.

However, findings clearly supported the assertion that a number of common variables can significantly predict performance on a problem solving in clinical context component of the family medicine certification examination. Younger, female PRA candidates who do well on the MCCQE Part I exam tend to score significantly higher on the SAMPs component of the CFPC certification exam than their older, male counterparts with lower scores on the MCCQE Part I exam. These results mirror those reported with other IMG cohorts in Canada and the USA.[18,20]

Of particular importance is the strong relationship that existed between the most recent score on the MCCQE Part I and performance on the SAMPs component of the family medicine certification examination. While the MCCEE was a not significant predictor of the latter outcome, it is important to underscore that PRA candidates are currently admitted on the basis of performance on that predictor. Consequently, a restriction of range effect noted for MCCEE

scores in all likelihood accounted for its weak predictive power in our models. This does not, in any fashion, discredit the current use of the latter exam as part of the PRA screening toolkit.

From a practical standpoint, our findings suggest that the MCCQE Part I should be uniformly adopted by all Canadian PRA programs as a valuable, additional screening measure. Results from the SAMPs logistic regression model, for example, show that the odds that a PRA candidate passes the CFPC SAMPs component increases by 2% for each increase of 1 point on the MCCQE Part I score. Similarly, an increase of one point on the MCCQE Part I results in a 0.04% increase on the SAMPs score.

To illustrate, consider two thirty year-old male candidates applying for a PRA Canadian program, with respective MCCQE Part I scores of 290 and 490 (the pass mark is 390). The odds of passing the PRA program are respectively equal to 0.20 and 0.90 for each applicant. Similarly, their SAMPs scores would be respectively predicted as 60.7% and 68.7% which constitutes more than a full SD difference. Given the high cost and competiveness associated with the PRA route, we feel that the latter information used judiciously and concurrently with other markers, could significantly contribute to the establishment of a defensible and cost-effective pan-Canadian PRA process and ultimately ensure patient safety.

Modeling the number of attempts required to pass each component of the family medicine certification exam is the unique contribution of this research. One can imagine comparing the following two candidates who both successfully completed the CFPC components: candidate A passed on their first attempt whereas it took four attempts for candidate B to meet the pass/fail standard. The latter information might be critical to consider in a highly competitive decision making process. Our findings suggest that repeating the CFPC certification examination is beneficial solely for the SOOs component. One might conjecture that given the unique nature of the SOOs, a greater level of familiarity towards what might constitute a novel testing modality for

the PRA IMG and increased preparation on the part of the candidate on their 2nd attempt significantly improves performance. However, retaking the SAMPs component of the exam does not lead to similar score increases.

Though encouraging, our results need to be interpreted in light of a number of caveats. First, our findings are based on a modest PRA sample. Therefore, future studies should aim to corroborate or refute the results reported in this paper. Second, our analyses were conducted separately for each component of the CFPC certification examination. In reality, the standard is conjunctive in nature, i.e., candidates need to successfully pass both the clinical (SOOs) and SAMPs components, in addition to completing an accredited family medicine residency. However, given the unique formative and diagnostic nature of PRA, we felt it more congruent to the overall philosophy of the process to adopt a similar tailored emphasis by focusing on the usefulness of our models in predicting each distinct set of competencies (i.e. SOOs and SAMPs).

Despite these limitations, we feel that our findings provide solid empirical evidence to further the development of a pan-Canadian PRA strategy, most notably at the intake phase. Our future efforts will be centered on validating the use of a comparable toolkit of workplace-based assessments, which are at the heart of the PRA process, in an effort to provide standards that can be adopted by all programs across the country. This greater level of standardization at all phases of PRA will ultimately contribute to a fair, comparable and equitable process for candidates, MRAs and members of the public.

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Table 1

Final Logistic Regression Results: Predicting SAMPs Pass/Fail Status as a Function of Gender, Most Recent MCCQE Part I Score and Age at Start of PRA

Predictors	β	Type I Error	Odds Ratio (exp β)
Intercept	-2.85	0.43	-----
Gender	-1.64	0.02	0.194
MCCQE Part I Score	0.02	0.01	1.020
Age at Start of PRA	-0.09	0.04	0.917
Model Fit	$L^2(3) = 24.03$, $p<0.0001$		

Table 2

Final Multiple Regression Results: Predicting SOOs and SAMPs Scores as a Function of Gender, Most Recent MCCQE Part I Score and Age at Start of PRA

	Simulated Office Orals (SOOs)			Short-answer Management Problems (SAMPs)		
Predictors	β	*t*-value	Type I Error	β	*t*-value	Type I Error
Intercept	61.27	71.57	0.01	56.76	15.72	0.01
Gender	-3.29	-3.01	0.01	-2.57	-3.19	0.01
MCCQE Part I Score	0.02	1.95	0.06	0.04	7.49	0.01
Age at Start of PRA	-0.33	0.23	0.16	-0.17	-2.84	0.01
Model Fit	$F(3,128) = 9.08$, $p<0.01$ Adjusted $R^2 = 0.06$			$F(3,128) = 27.91$, $p<0.01$ Adjusted $R^2 = 0.38$		

Table 3

Final Survival Model Results: Predicting SOOs and SAMPs Pass/Fail Status as a Function of Gender, Most Recent MCCQE Part I Score, Age at Start of PRA and Number of Attempts

	Simulated Office Orals (SOOs)			Short-answer Management Problems (SAMPs)		
Predictors	β	X^2-value	Type I Error	β	X^2-value	Type I Error
Intercept	5.26	2.40	0.12	-4.94	7.68	0.01
Gender	-2.61	11.45	0.01	-1.02	5.86	0.02
MCCQE Part I Score	0.00	0.78	0.38	0.02	11.88	0.01
Number of Attempts (2 vs. 1)	1.19	4.18	0.04	-0.41	0.91	0.34
Model Fit	L^2 (7)=37.90; p>0.01			L^2 (4)=37.55; p<0.01		