

# Journal of Population Therapeutics and Clinical Pharmacology

INCORPORATING FETAL ALCOHOL RESEARCH

Journal de la thérapie des populations  
et de la pharmacologie clinique

Original Research

DOI: 10.22374/1710-6222.25.1.2

## PRESCRIBING COMPETENCY OF MEDICAL STUDENTS: NATIONAL SURVEY OF MEDICAL EDUCATION LEADERS

Jiayu Liu,<sup>1</sup> Sherwin Wong,<sup>2</sup> Gary Foster,<sup>3</sup> Anne Holbrook<sup>4</sup>

<sup>1</sup>eHealth MSc Program, McMaster University, Canada.

<sup>2</sup>School of Medicine, Queen's University, Canada.

<sup>3</sup>Department of Clinical Epidemiology & Biostatistics, Department of Medicine, McMaster University, Canada.

<sup>4</sup>Division of Clinical Pharmacology & Toxicology, Department of Medicine, McMaster University, Canada.

Corresponding Author Jiayu Liu: [liuj75@mcmaster.ca](mailto:liuj75@mcmaster.ca)

Submitted: September 23, 2017. Accepted: January 2, 2018. Published: January 22, 2018.

---

### ABSTRACT

Evidence suggests that newly licensed physicians are not adequately prepared to prescribe medications safely. There is currently no national pre-licensure prescribing competency assessment required in North America. This study's purpose was to survey Canadian medical school leaders for their interest in and perceived need for a nation-wide prescribing assessment for final year medical students.

#### Method

In spring of 2015, surveys were disseminated online to medical education leaders in all 17 Canadian medical schools. The survey included questions on perceived medication prescribing competency in medical schools, and interest in integration of a national assessment into medical school curricula and licensing.

#### Results

372 (34.6 %) faculty from all 17 Canadian medical schools responded. 277 (74.5%) respondents were residency directors, 33 (8.9%) vice deans of medical education or equivalent, and 62 (16.7%) clerkship coordinators. Faculty judged 23.4% (SD 22.9%) of their own graduates' prescribing knowledge to be unsatisfactory and 131 (44.8%) felt obligated to provide close supervision to more than a third of their new residents due to prescribing concerns. 239 (73.0%) believed that an assessment process would improve

their graduates' quality, 262 (80.4%) thought it should be incorporated into their medical school curricula and 248 (76.0%) into the national licensing process. Except in regards to close supervision due to concerns, there were no significant differences between schools' responses.

### Conclusions

Amongst Canadian medical school leadership, there is a perceived inadequacy in medical student prescribing competency as well as support for a standardized prescribing competency assessment in curricula and licensing processes.

### BACKGROUND AND RATIONALE

Prescribing medication is the most common therapeutic intervention of most physicians worldwide, with 3.4 billion, 1 billion, 500 million prescriptions annually in the United States, United Kingdom and Canada respectively at a total cost approaching \$460 billion.<sup>1-6</sup> Medications are a frequent source of serious adverse events, including hospitalization and death.<sup>7-11</sup>

An ever-expanding formulary of potent medications with treatments now available for specialized circumstances combined with an increasingly aged and chronically diseased population has led to complex medication regimens being commonplace.

Since every physician regardless of speciality needs to prescribe, high quality clinical pharmacology and toxicology training for medical students is increasingly crucial. A review of malpractice complaints between 2006 and 2012 revealed that prescribing-related issues were common causes of medicolegal action against physicians.<sup>12</sup> The area is of sufficient concern that the ability to write a high quality prescription and counsel accordingly, is being developed in Canada and the United States as a required Entrustable Professional Act (EPA) which all graduates must master.<sup>13</sup> Similarly Britain's Royal Pharmaceutical Society has released a prescribing competency framework to be used not only by educators but also regulators.<sup>14</sup>

Studies have indicated that newly licensed physicians are not well prepared to prescribe.<sup>15-17</sup> These findings, along with a series of serious medication safety incidents, led UK education leaders in clinical pharmacology to institute an online prescribing assessment. More than 53,000 final year medical students have completed the exam over the last few years, with a high pass rate.<sup>18-20</sup> Student feedback was very positive

highlighting the fairness, comprehensiveness, and widely recognized need for such an assessment.<sup>18-20</sup> Early follow-up data suggest increased confidence when prescribing as a first-year resident, and increased familiarity with important prescribing resources such as the national formulary of medications.<sup>18-20</sup> However, based on literature searches using MEDLINE via OVID, CINAHL, Cochrane, and Google Scholar from 2000 to 2016, we could not find evidence that any other country has yet adopted a national prescribing competency assessment.

Clinical Pharmacology and Toxicology (CPT) is a much younger and smaller specialty in Canada compared to the UK equivalent of Clinical Pharmacology and Therapeutics.<sup>21,22</sup> This might mean that the discipline, given the fierce competition for curriculum time in medical schools, is not being adequately covered. Within the CANMEDS framework of medical education, CPT knowledge and prescribing skills competencies require every domain within the Medical Expert umbrella.<sup>23</sup> A small study at McMaster University suggested that medical students perceive CPT training to be inadequate, an issue likely not limited to one medical school.<sup>24</sup> In follow-up, researchers initiated development of the McMaster Prescribing Competency Assessment (MacPCA) for medical trainees. The validation study showed that a prototype adapted from the UK Prescribing Safety Assessment, was perceived to be clear, unambiguous and appropriate for a final year student.<sup>25</sup>

Nation-wide implementation of a prescribing competency assessment would hinge on the interest of a country's medical school leaders. This interest is likely to be related to school self-assessment of the perceived knowledge and skills gaps of their graduating medical class, unmet societal demands perhaps reflected

in complaints or medication safety incidents, and the availability of a relevant, high quality assessment tool. The previously described literature review did not yield any reports of a national clinical pharmacology or prescribing competency needs assessment.

### **Study Goals and Objectives**

The objective of this study was to gauge the opinions of Canadian medical school leaders on prescribing competency and their interest in implementation of a standardized assessment for final year medical students.

## **METHODS**

### **Ethics**

This project received an expedited review by the Research Ethics Officer of the McMaster Student Research Ethics Committee, a division of the Hamilton Integrated Research Ethics Board (HiREB).

### **Design and Setting**

The study was a cross-sectional survey carried out in the spring of 2015.

### **Study Participants**

We attempted to identify all leaders – deans of medicine, undergraduate deans of medical education, clerkship directors, and residency program directors, involved in the education of graduating class medical students at each of the 17 Canadian medical schools. Contact information including name, role and e-mail was retrieved from the medical schools' respective online faculty lists.

### **Survey**

The survey sought to gauge opinions on the need for and appropriateness of a national prescribing skills assessment as part of the pre- Medical Council of Canada licensing process. To maximize replies, we aimed for a survey that could be completed within 10 – 15 minutes. Questions were developed to gather:

1. Role in medical education
2. Opinions on the importance of standardized CPT training
3. Perception of prescribing skills amongst local medical students
4. Proportion of first-year residents requiring close supervision
5. Frequency of serious medication safety incidents

6. Potential for a prescribing competency assessment to improve the quality of Canadian medical students
7. Interest in incorporation of a prescribing competency assessment into own medical school curriculum
8. Willingness to integrate such an assessment into the Canadian medical licensing process

Each question except for Question 4 was rated on a five-point Likert scale. Question 4 responses were organized in 5 percentage categories plus a “not applicable” option for respondents who don't interact with first-year residents.

Questions were vetted for content validity, face validity and clarity by the research team with Clinical Pharmacology faculty and senior medical students.

### **Dissemination**

Dissemination of the survey as well as data collection was carried out electronically using SurveyMonkey's Select plan, chosen for its familiarity, ease of use and integration with data analysis tools.<sup>26</sup> Each eligible faculty member was sent a unique, de-identified survey ID-associated link by email. Surveys were sent between Feb 13<sup>th</sup> and April 4<sup>th</sup>, 2015; up to 11 reminders were sent out at weekly intervals to non-responders and incomplete responders.

### **Outcomes**

The primary outcome was defined *a priori* as the rate of agreement with the statement “If there was a Canadian Prescribing Skills Competency Assessment available online, I would want it incorporated into my graduating medical school class's curriculum.”

### **Statistical Analysis**

In order to perform a confidence calculation, we estimated the total sampling frame size to be 1095 faculty members. To be 95% confident in detecting a 60% level of interest in standardized testing with a margin of error of 10 percentage points, 85 responders were required.<sup>27</sup> Most analyses were descriptive; differences in responses from different medical schools were analyzed with log-linear analysis using Statistical Analysis Software by SAS Institute. The primary outcome was analyzed after Multiple Imputation to reduce the effects of incomplete answers.

## RESULTS

### *Respondent Characteristics*

Seven-hundred forty-six residency directors, 59 vice deans of medical education or equivalent, and 235 clerkship coordinators were identified. 1040 surveys were distributed, 12 of which bounced, leaving 1028. Three hundred and seventy-two (36.2%,  $n = 1028$ ) faculty responded with representation from each of 17 medical schools. Fifty-two (14.0%) surveys were incomplete. 277 (74.5%) respondents were residency directors, 33 (8.9%) vice deans of medical education or equivalent, and 62 (16.7%) clerkship coordinators. 37.1% of contacted residency directors responded, 55.9% of contacted vice deans of medical education or equivalent responded, and 26.4% of contacted clerkship coordinators responded.

Detailed responses to each questionnaire are shown in Table 1. Three-hundred forty-five (93.7%,  $n = 368$ ) respondents believed that a common threshold of prescribing competency for all Canadian medical students is important. A mean of 23.4% (SD 22.9%) of medical students were judged by their faculty to not meet satisfactory prescribing knowledge and skills at the time of their graduation. There was large variability in the comfort of faculty with the prescribing abilities of first-year residents (many of whom would be graduates of other medical schools) under their supervision, but 44.8% ( $n = 292$ ) thought that 34% to more than 50% of first-year residents required close supervision. For this question only, there was statistically significant variability amongst the medical schools ( $p = 0.04$ ). 38 (11.6%,  $n = 328$ ) respondents reported awareness of examples of major harm to patients due to one of their medical student alumni's poor prescribing skills. 239 (73.3%,  $n = 326$ ) agreed or strongly agreed that a standardized prescribing competency exam would improve the quality of medical graduates.

For our primary outcome, 262 or 80.4% of respondents were interested in incorporating an online prescribing assessment into their medical curriculum, with no significant variability between schools. This was significantly more than our threshold of 60% of respondents choosing Agree or Strongly Agree ( $p < 0.001$ ). In addition, 248 (76%,  $n = 326$ ) respondents agreed or strongly agreed that it should be a part of the licensing process in Canada.

## DISCUSSION

This study of Canadian medical school leadership's perceived need for a prescribing competency exam, is the first of its kind internationally. Our results suggest near-universal recognition of the importance of prescribing competency, evidence of concern regarding the current adequacy of training, and widespread support for a standardized prescribing competency assessment. Unfortunately, no such competency assessment currently exists in Canada.

The survey does have limitations. First, the survey response rate (34.6%), although compatible with other surveys of busy physicians, was relatively low but did include responders from each school.<sup>28–30</sup> Second, there may be a tendency for those who are more interested in the implementation of a standardized prescribing competency exam to respond to the survey, thus resulting in an overestimation of interest. Third, the survey software used allows participants to leave some questions incomplete, leading to imperfect response rates for some questions. In an attempt to minimize this bias, we kept the survey length to a minimum, with an expected completion time of approximately 10 minutes. Finally, a survey is only able to measure perceived rather than actual prescribing competence. Our findings support the initiatives in the UK where pre-licensure assessment is mandatory and must be successfully passed to proceed to licensing exams. The current work in North America on Entrustable Professional Activities does not emphasize the importance of prescribing, therefore is unlikely to improve competency amongst graduates.<sup>13</sup> We are currently creating a Canadian prescribing competency framework with competencies mapped to CANMED roles and piloting a version of the Prescribing Safety Assessment in Ontario medical schools.<sup>31</sup>

## CONCLUSION

While acknowledging the potential respondent bias, we believe there is concern amongst medical education leaders about the prescribing competency of many graduating medical students and incoming residents. In addition, there is considerable support for a standardized prescribing competency assessment of medical students. This survey supports our current efforts to advance prescribing competency nation-wide.

**TABLE 1** Participant Responses

	<b>Very Unimportant</b>	<b>Not Important</b>	<b>Neutral</b>	<b>Important</b>	<b>Very Important</b>
Q1: How important is it for graduating medical students in Canada, no matter what specialty training they will undertake, to meet a common threshold of prescribing competence ( <i>n</i> = 368).	13 (3.5%)	2(0.5%)	8 (2.2%)	105 (28.5%)	240 (65.2%)
Q2: Thinking of the graduating medical students at your school over the last 3 years, please rate the distribution of their prescribing knowledge and skills at the time of graduation ( <i>n</i> = 294).	<b>Unsatisfactory</b> 7.2% (SD 14.6%)	<b>Needs Improvement</b> 16.2% (SD 17.6%)	<b>Satisfactory</b> 42.7% (SD 26.0%)	<b>Very Good</b> 26.9% (SD 25.1%)	<b>Outstanding</b> 7.0% (SD 11.4%)
Q3: Thinking of the early Post Graduate Year 1 residents you have encountered in the past 3 years (who could be graduates of other medical schools), how many of them required close supervision to be sure that their prescribing was safe? ( <i>n</i> = 292†).	<b>None</b> 3 (1.0%)	<b>Fewer than 10%</b> 79 (27.1%)	<b>11 to 33%</b> 79 (27.1%)	<b>34 to 50%</b> 60 (20.5%)	<b>More than 50%</b> 71 (24.3%)
Q4: Are you aware of any critical patient safety incidents, official complaints or disciplinary actions about any graduate of your medical school within the past 3 years, related to poor prescribing? ( <i>n</i> = 328)	<b>No</b> 290 (88.4%)				
Q5: A standardized testing of prescribing skills competency across the country prior to the Licentiate of the Medical Council of Canada Part 1 exam would improve the quality of graduating medical students in Canada ( <i>n</i> = 326).	<b>Strongly Disagree</b> 6 (1.8%)	<b>Disagree</b> 16 (4.9%)	<b>Neutral</b> 65 (19.9%)	<b>Agree</b> 199 (61.0%)	<b>Strongly Agree</b> 40 (12.3%)
Q6: If there was a Canadian Prescribing Skills Competency Assessment available online, I would want it incorporated into my graduating medical school class's curriculum ( <i>n</i> = 326).	<b>Strongly Disagree</b> 1 (0.3%)	<b>Disagree</b> 2 (0.6%)	<b>Neutral</b> 61 (18.7%)	<b>Agree</b> 193 (59.2%)	<b>Strongly Agree</b> 69 (21.2%)
Q7: A standardized test of prescribing knowledge and skills should be a formal part of the licensing process of Canadian medical school students ( <i>n</i> = 326).	<b>Strongly Disagree</b> 2 (0.6%)	<b>Disagree</b> 17 (5.2%)	<b>Neutral</b> 59 (18.1%)	<b>Agree</b> 194 (59.5%)	<b>Strongly Agree</b> 54 (16.6%)

† 36 (11%) faculty rated this question as 'N/A' because they do not supervise residents.

## ACKNOWLEDGEMENTS

The authors wish to acknowledge the contributions of the Division of Clinical Pharmacology and Toxicology of McMaster University for their input on the development and validation of the survey. There was no external funding for this study.

## REFERENCES

- Canadian Institute for Health Information. Prescribed Drug Spending in Canada, 2012: A Focus on Public Drug Programs. Ottawa: Author; 2014. Available at: [https://secure.cihi.ca/free\\_products/Prescribed\\_Drug\\_Spending\\_in\\_Canada\\_EN.pdf](https://secure.cihi.ca/free_products/Prescribed_Drug_Spending_in_Canada_EN.pdf).
- Health Canada. Prescription Drug List. Ottawa: Author; 2015. Available at: [http://www.hc-sc.gc.ca/dhp-mps/prodpharma/pdl-ord/pdl\\_list\\_fin\\_ord-eng.php](http://www.hc-sc.gc.ca/dhp-mps/prodpharma/pdl-ord/pdl_list_fin_ord-eng.php).
- Snow T. NHS expenditure on prescribed medicines up by 7.6%, with 15.1% increase in hospital sector. *Pharmaceutic J* 2014. Available at: <http://www.pharmaceutical-journal.com/news-and-analysis/nhs-expenditure-on-prescribed-medicines-up-by-76-with-151-increase-in-hospital-sector/20067182.article>.
- Street-Porter J. We need to wean ourselves off prescription drugs. *Independent*; 2015. Available at: <http://www.independent.co.uk/voices/comment/with-one-billion-prescriptions-written-every-year-it-s-time-to-wean-ourselves-off-the-drugs-10254599.html>.
- Sifferlin A. Americans spent a record amount on medicine in 2014. *TIME*; 2015. Available at: <http://time.com/3819889/medicine-spending/>.
- Berkrot B. U.S. prescription drug spending to hit \$400 billion a year by 2020: IMS. *Reuters*; 2016. Available at: <http://www.reuters.com/article/us-health-usa-drugspending-idUSKCN0XB08Q>.
- Baker G, Norton P, Flintoft V et al. The Canadian Adverse Events Study: the incidence of adverse events among hospital patients in Canada. *CMAJ* 2004;170(11):1678–86.
- Lazarou J, Pomeranz B, Corey P. Incidence of adverse drug reactions in hospitalized patients: a meta-analysis of prospective studies. *Survey Anesthesiol* 1999;43(1):53–54.
- Gurwitz J, Field T, Avorn J, et al. Incidence and preventability of adverse drug events in nursing homes. *Am J Med* 2000;109(2):87–94.
- Sultana J, Cutroneo P, Trifirò G. Clinical and economic burden of adverse drug reactions. *J Pharmacol Pharmacotherap* 2013;4(5):73–77.
- Bouvy J, De Bruin M, Koopmanschap M. Epidemiology of Adverse Drug Reactions in Europe: A Review of Recent Observational Studies. *Drug Safety* 2015;38(5):437–53.
- The Canadian Medical Protective Association. Medication management, quality healthcare - Safety of care. CMPA; 2015. Available at: <https://www.cmpa-acpm.ca/-/medication-management-quality-healthcare>.
- Association of American Medical Colleges. Core Entrustable Professional Activities for Entering Residency: Faculty and Learners' Guide. Association of American Medical Colleges; 2014. Available at: <https://members.aamc.org/eweb/upload/Core%20EPA%20Faculty%20and%20Learner%20Guide.pdf>.
- Royal Pharmaceutical Society. A Competency Framework for all Prescribers. Royal Pharmaceutical Society; 2016. Available at: <https://www.rpharms.com/Portals/0/RPS%20document%20library/Open%20access/Professional%20standards/Prescribing%20competency%20framework/prescribing-competency-framework.pdf>.
- Young H. Lack of pharmacological training causes overuse and misuse of drugs. *CMAJ* 2007;178(3):276–76.
- Ryan C, Ross, S Davey, P et al. Prevalence and causes of prescription errors: The Prescribing Outcomes for Trainee Doctors Engaged in Clinical Training (PROTECT) Study. *PLoS ONE*. 2014;9(1):e79802
- Dornan T, Ashcroft D, Heathfield H et al. An in-depth investigation into causes of prescribing errors by foundation trainees in relation to their medical education: EQUIP study. *General Medical Council*, 2009. Available at: [https://www.gmc-uk.org/FINAL\\_Report\\_prevalence\\_and\\_causes\\_of\\_prescribing\\_errors.pdf\\_28935150.pdf](https://www.gmc-uk.org/FINAL_Report_prevalence_and_causes_of_prescribing_errors.pdf_28935150.pdf).
- Mucklow J, Bollington L, Maxwell S. Assessing prescribing competence. *Br J Clin Pharmacol* 2012;74(4):632–39.
- Maxwell S, Cameron I, Webb D. Prescribing safety: ensuring that new graduates are prepared. *The Lancet*; 2015. Available at: [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(14\)62339-4/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)62339-4/fulltext).
- Sayburn A. Preparing to prescribe: Lessons from the prescribing safety assessment. *Student BMJ*; 2015. Available at: <http://student.bmj.com/student/view-article.html?id=sbmj.h316>.
- Royal College of Physicians and Surgeons of Canada. Clinical Pharmacology and Toxicology: Program Directors. Royal College of Physicians and Surgeons of Canada, 2017. Available at: <http://www.royalcollege.ca/rcsite/documents/arps/clin-pharmacology-e>.

22. British Pharmacological Society. Clinical Pharmacology: A Dynamic Medical Specialty Essential for UK Healthcare. British Pharmacological Society; 2015. Available at: <https://www.bps.ac.uk/BPSMemberPortal/media/BPSWebsite/Clinical-Pharmacology-A-dynamic-medical-speciality-essential-for-UK-Healthcare.pdf>.
23. Frank J, Snell L, Sherbino J. The Draft CanMEDS 2015 Physician Competency Framework. Royal College of Physicians and Surgeons of Canada, 2015. Available at: [http://www.royalcollege.ca/portal/page/portal/rc/common/documents/canmeds/framework/canmeds2015\\_framework\\_series\\_IV\\_e.pdf](http://www.royalcollege.ca/portal/page/portal/rc/common/documents/canmeds/framework/canmeds2015_framework_series_IV_e.pdf).
24. Qayyum F, Wright M, Lee M, Leung C, Sada A, Holbrook A. Medical student opinions on their training in clinical pharmacology and therapeutics. *McMaster Univers Med J* 2015;9(1):4–8.
25. Wu V, Chan O, Maxwell S, et al. Development and validation of the McMaster Prescribing Competency Assessment for Medical Trainees (MacPCA). *J Popul Therapeut Clin Pharmacol* 2015;22(2):173–78.
26. SurveyMonkey Plans and Pricing. SurveyMonkey, 2015. Available at: <https://www.surveymonkey.com/pricing/>.
27. Raosoft. Sample Size Calculator by Raosoft, Inc. Raosoft, 2015. Available at: <http://www.raosoft.com/samplesize.html>.
28. Shih T, Fan X. Comparing response rates in e-mail and paper surveys: A meta-analysis. *Ed Res Rev* 2009;4(1):26–40.
29. Grava-Gubins I, Scott S. Effects of various methodologic strategies Survey response rates among Canadian physicians and physicians-in-training. *Can Fam Phys* 2008;54(10):1424–30.
30. National Physician Survey. Response Rates. NPS; 2014. Available at: <http://nationalphysiciansurvey.ca/surveys/2014-survey/response-rates/>.
31. The Royal College of Physicians and Surgeons of Canada. CanMEDS Framework. The Royal College of Physicians and Surgeons of Canada; 2017. Available at: <http://www.royalcollege.ca/rcsite/canmeds/canmeds-framework-e>.