A brief history of pharmacy admissions in North America

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ABSTRACT

The move from a Bachelor of Science in Pharmacy to a Doctor of Pharmacy degree, both in the United States and in Canada, has been accompanied by a general move towards increased prepharmacy admission requirements and longer pharmacy programs. Historically, the most thoroughly researched pharmacy admissions variables include grade point average (GPA), Pharmacy College Admissions Test (PCAT), interviews and critical thinking tests. Most programs now require a combination of academic (GPA ± PCAT) and nonacademic characteristics (e.g., interviews, volunteering, critical thinking tests, essays). This review focuses on GPA and the PCAT as academic admissions measures and the interview (both traditional and the multiple mini-interview) and critical thinking tests as nonacademic measures. There is evidence that prepharmacy GPA, the PCAT and admissions interviews are correlated with academic success in a pharmacy program. Repeating a prepharmacy course is a negative predictor of academic success. The multiple mini-interview and various critical thinking tests have been studied in pharmacy admissions, but the evidence to date does not support their use for predicting success. Several areas require further research, including finding an effective measure of reasoning and critical thinking skills. The relationship between admission test scores and clinical performance also requires further study, as academic achievement in pharmacy programs has been the main measure of success to date. *Can Pharm J (Ott)* 2019;152:370-375.

Introduction

Pharmacy admissions processes across Canada and the United States have evolved significantly over the past 30 years. In Canada, admission to pharmacy programs is highly competitive. The 10 postsecondary institutions offer approximately 1400 first-year seats annually.¹ The limited number of annual admissions necessitates fair and transparent admissions processes. In fact, the Canadian Council of Accreditation for Pharmacy Programs (CCAPP) addresses the admissions process in its standards, including requirements for published admissions criteria and a recruitment effort towards a diverse pool of well-qualified applicants.² Each school offers a unique admissions process, varying in the relative weighting and assessment of academic and nonacademic criteria. Many Canadian schools have altered their admissions criteria in recent years in response to the current shift in

credentials from the baccalaureate programs to Entry-to-Practice PharmD (EPPD) programs.

Pharmacy programs across the United States were required to offer a Doctor of Pharmacy (PharmD) program after the 1992 Accreditation Council for Pharmacy Education (ACPE) decision to make the PharmD an accreditation requirement. EPPD programs in Canada were first approved in the late 2000s, and according to CCAPP, the change will be mandatory by 2020. Memorial University's EPPD program accepted its first cohort of students in the fall of 2017. Memorial University's School of Pharmacy Committee on Undergraduate Student Admissions, referred to here as the "Admissions Committee," undertook a complete review of the pharmacy admissions process during its development of the EPPD curriculum. The goal of the review was to redesign the process from the ground up.

This article provides an overview of the evolution of the pharmacy admissions landscape in Canada and the United States over the past 4 decades. The Canadian literature on pharmacy admissions is sparse; most articles have been published out of a single institution.^{3,4} This article represents a significant contribution to the current scope of Canadian pharmacy admissions literature.

Brief overview of pharmacy admissions

Academic measures

While most pharmacy schools throughout North America run independent admissions processes that differ from each other to varying degrees, trends can be seen both in how pharmacy students are selected and in how the processes have evolved over time.

Most of the pharmacy admissions literature comes from the United States, dating back to the 1970s. The research conducted at that time was predominantly concerned with predicting academic success based on various student characteristics. These characteristics included a variety of academic course scores, Pharmacy College Admission Test (PCAT) scores, personality typing and demographic characteristics.⁵⁻¹² These studies laid the foundation for pharmacy admissions for several decades, until the practice of pharmacy began to focus more on direct patient care in the 1990s and programs began to change to the PharmD.

Several studies are available that present an overview of American pharmacy admissions processes at different points in time. Chesnut and Philips reported on commonly used admissions variables in 1998¹³ and in 2000,¹⁴ based on responses to their survey, and found that the most commonly used variables at the time were grade point average (GPA), standardized tests, essays, interviews and recommendations. The variables that were found to be of “above average importance” included GPA, interview scores, written essays, Test of English as a Foreign Language (TOEFL), organizational leadership, volunteer work and professional recommendations.^{13,14} In their future projections, Chesnut and Philips¹⁴ noted that these practices were not expected to change significantly in the future. Indeed, over time, many of the components described remained foundational elements of

most admissions processes in pharmacy schools in North America.

By the turn of the millennium, approximately half of pharmacy schools in the United States were using the PCAT, 60% required students to sit for interviews and almost all required the Scholastic Aptitude Test (SAT) or American College Testing (ACT) assessment.¹⁵ As time passed, institutions began to look specifically for admissions criteria that were evidence based and correlated with both academic success as well as success in clinical performance. In 2005, Latif¹⁶ noted a trend of pharmacy schools relying mostly on GPA and PCAT scores for admission considerations and argued that because of the magnitude of the relationship between GPA and PCAT and academic performance, schools would be justified in pursuing assessment of other factors such as empathy, citizenship and clinical performance through additional tools such as questionnaires and interviews.

To date, the most thoroughly researched pharmacy admissions variables include GPA, PCAT, interviews and critical thinking tests. As in most academic settings, there is strong evidence that past academic performance predicts future academic performance, and prepharmacy GPA has been shown to be predictive of pharmacy school academic success.¹⁷⁻²² Chisholm et al.²³ built a model to predict academic ranking of first-year pharmacy students and found that math/science GPA and attainment of a prior 4-year college degree were the best predictors. In 2007, McCall et al.²⁴ also demonstrated that GPA and a composite PCAT/California Critical Thinking Skills Test (CCTST) score were predictive of not only academic success but also success on the North American Pharmacist Licensure Exam (NAPLEX). Hansen et al.²⁵ found that repeating a prepharmacy course increased the odds of academic difficulty (defined as lowest quartile) 3-fold. Academic variables commonly required for admission to American pharmacy schools include biology, chemistry, organic chemistry, microbiology, anatomy, physiology, calculus, physics, statistics, public speaking, English and various arts credits.^{26,27}

There is also a significant body of evidence regarding the predictive value of the PCAT in pharmacy school performance.^{18,19} In 1980, Sisson and Dizney²⁸ tested the PCAT to determine its predictive validity in comparison with other admissions variables, including GPA alone and GPA in combination with other variables. They

found that the PCAT functioned well to measure current knowledge and to disclose inequalities in educational backgrounds. Kelley et al.²⁹ in 2001 and Thomas and Draugalis³⁰ in 2002 published evaluations of the PCAT for pharmacy admissions, and both studies found the PCAT to be an effective predictor of first-year pharmacy GPA. In particular, Kelley et al.²⁹ found that the prepharmacy GPA and PCAT explained double the variance in first-quarter GPA compared to either variable alone and that a PCAT score below the 40th percentile predicted first-quarter GPA below 2.0.^{29,30}

Nonacademic measures

There is a paucity of literature specific to pharmacy admissions in Canada in general, with the majority published out of the University of Toronto (U of T). In 1996, Duncan-Hewitt³ described the initial process at U of T for including nonacademic criteria as representing one of the earliest movements toward the assessment of nonacademic criteria in Canada. Prior to this time, the standard practice was to assess only GPA with or without the PCAT. This significant change was in response to pharmacy practice evolution and the increasing need for clinical competence. In addition to undertaking education on psychometrics, the admissions committee at U of T at that time followed established processes for determining which published assessment tools would both meet their needs and represent quality assessments. The committee also designed and tested several tools to fit their needs where commercially available products did not exist. Items that best predicted success of students after the first year of pharmacy studies included the English essay, PCAT verbal and reading ability subscores, the affective descriptor item and the overall GPA. When the nonacademic and academic scores were compared, there was no correlation.

Admissions interviews

There is some evidence regarding the effectiveness of interviews in the admissions process, and admissions interviews of various types are widely used. The case was made in 2004 for structured interviews to replace unstructured interviews and for pharmacy schools to increase the weight given to interviews in their admissions processes. At that time, about 60% of pharmacy schools in the United States used some type of admissions

interview.³¹ In 2007, Joyner et al.¹² reported that 80% of the respondents to their survey used interviews in the PharmD admissions process. Of those, 86% did some type of interviewer training, 13% used predefined questions and 92% reported using a well-defined scoring system for applicants, demonstrating that the quality and structure of interviews vary widely among the schools that employ them.³² Kelsch and Friesner³³ reported on their interview process that assesses various attributes on a 5-point Likert scale and found that they had variable interrater reliability in their interview scoring. Several other researchers have found that the traditional admissions interview is a significant predictor of academic success, as measured by GPA.^{22,34-36}

In 2012, Cameron and MacKeigan⁴ published an article describing the use of the multiple mini-interviews (MMIs) for pharmacy admissions at U of T. The MMI was originally developed for the Faculty of Medicine at McMaster University.³⁷ At the time, the U of T pharmacy program was admitting 240 students annually and did not have an interview process. They used a nominal group technique to select and rank 8 attributes through paired comparison and recruited a cohort of 30 students to pilot the MMIs with stations of 6 or 8 minutes' duration. The students preferred the 8-minute stations while assessors preferred 6 minutes. Both the assessors and students felt that the stations had face value. Some challenges with the assessment included a small sample size due to difficulty recruiting student volunteers, a low response rate to the paired comparison (24%) and the fact that all of the student volunteers were already accepted to the pharmacy program, potentially resulting in a significant selection bias.⁴

Evidence out of the United States for the value of the MMIs has been mixed so far. Cox et al.³⁸ describe the development, implementation and evaluation of the MMIs, which consisted of 7 stations of 6 minutes each, at their institution. They found no correlation between academic and nonacademic scores, but most participants agreed that the MMIs were better than a traditional interview for assessing noncognitive attributes. Similarly, Corelli et al.³⁹ compared a traditional interview and MMIs and found that while students found the MMIs more stressful, the majority believed they were effective and should be continued. In an effort to correlate MMI results with academic achievement, Cowart et al.⁴⁰ found a weak association with mixed direction between

MMIs and GPA across the first 3 years of the PharmD. Interestingly, Heldenbrand et al.,⁴¹ in 2016, reported that a low MMI score (along with low prepharmacy GPA and low PCAT score) can help predict academic difficulty (as measured by grades of D, F or delayed progression) and assist in early identification of academically at-risk PharmD students, thus serving as a negative predictor. MMI-style interviews have been found to be acceptable by both admissions committees and prospective students and have been shown to help screen for academic difficulty, but they have not been shown to be an effective means of predicting academic success, and the relationship between interviews and clinical success does not appear to have been explored.

Behavioural event interviews were first developed in the mid-1970s but did not achieve widespread use until the 1990s. Today, behavioural event interviews are widely used and considered effective by many in assisting to predict success in a variety of occupational pursuits; however, their use in academic admissions processes is not as well established.⁴²⁻⁴⁴

Critical thinking skills and admissions selection processes

Critical thinking skills are generally accepted as being necessary in the exercise of clinical judgement for students in the health professions. However, it has proven difficult to identify a valid measure of critical thinking that contributes significant value to the admissions process. In 2001, Allen and Bond³⁴ found that the CCTST was too closely related to the PCAT to add value to the admissions process for those using the PCAT. Similarly, in 2006, Lobb et al.⁴⁵ reported that the Learning And Study Strategies Inventory (LASSI),⁴⁶ Defining Issues Test (DTI)⁴⁷ and Watson-Glaser Critical Thinking Appraisal (WGCTA)⁴⁸ were not successful in predicting academic performance beyond the GPA and PCAT results.

Several recently published articles report on the use of the Health Sciences Reasoning Test (HSRT) in pharmacy student admissions. Unfortunately, these 3 articles report contradictory findings with respect to the utility of the HSRT in pharmacy admissions.⁴⁹⁻⁵¹ Cox et al.⁵⁰ in 2013 published findings that the HSRT appeared to capture additional information compared to other metrics like the GPA and the PCAT, as they only explained 27.4% of the variance in HSRT scores. In 2014, these authors assessed the

HSRT against student success in academic and experiential courses and found a lack of moderate to strong correlations.⁵¹ In 2014, Kelsch and Friesner⁴⁹ concluded that the HSRT scores were highly correlated with PCAT scores and the removal of the HSRT from the admission consideration did not affect student rankings.

BOX 1 Brief summary of research to date

Overall, throughout the past 40 years, both the duration and preadmission requirements of pharmacy programs have been increasing, as both the United States and Canada have moved from a baccalaureate degree to entry-level Doctor of Pharmacy programs. Most programs now require a combination of academic (GPA ± PCAT) and nonacademic characteristics (e.g., interviews, volunteering, critical thinking tests, essays). While admissions processes are independent and vary by institution, due to the body of available evidence and perhaps to some extent the collaborative nature of the professional schools, most admissions programs assess similar variables when making their deliberations.

Areas for future research

The assessment of reasoning and critical thinking skills remains a significant consideration at our institution and others and represents an area of great potential in pharmacy admissions research, as admissions committees continue to search for a valid means of assessing student reasoning skills. Unfortunately, it remains an even greater challenge to identify criteria that accurately predict future clinical performance. The question of whether or not these admissions variables correlate with an individual's ability to provide effective patient-centred care remains unanswered. In 2015, McLaughlin et al.⁵² reported that undergraduate GPA, interview and PCAT scores all had weak relationships with student success in objective structured clinical examinations (OSCEs) and experiential rotations. Further research should aim to assess the relationship between various pharmacy admissions criteria and student success in clinical skill-based courses, practice experiences and OSCEs, with the eventual aim to determine criteria that go beyond the academic setting and correlate with future success as a practising pharmacist. ■

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