RESEARCH ARTICLE / ARTICLE DE RECHERCHE

Mobile Device Use in Pharmacy: A Multi-institutional Study of Pharmacy Students and Faculty in Canada[1]

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Abstract: Although there are studies that explore the use of mobile devices by physicians and pharmacists, there has not been a study to date that examines the prevalence and usage patterns of mobile devices amongst pharmacy students and faculty. This is the first pan-Canadian study that examines the prevalence and patterns of use of mobile devices by pharmacy faculty and students at Anglophone and Francophone universities. Unlike previous studies, this study also included interviews with participants to collect richer data than can be gathered with an online survey alone.

Introduction

The integration of mobile devices into clinical practice is increasingly prevalent within the health sciences, and these tools are rapidly becoming main points of access for finding patient care information [1, 2]. The earliest mobile devices, which largely consisted of handheld computers or personal digital assistants (PDAs), gained widespread popularity in the clinical environment throughout the 1990s [3–8]. These devices were used to perform a multitude of tasks, such as finding bedside answers to clinical questions, performing calculations, and documenting patient interventions [1, 5, 8]. PDAs offered numerous benefits to patient care and were widely adopted by pharmacists, particularly in the hospital setting [4].

More recently, internet-enabled mobile devices such as smartphones and tablets have become mainstays of evidence-informed, point of care practice [2, 9–11]. A 2011 U.S. survey of medical residents and fellows reported that over 85% of respondents were using some type of smartphone and that 56% were using apps in their clinical work [12]. Another 2011 U.S. survey of pharmacy students and faculty reported that 77% of respondents owned smartphones, with 63% using their devices to access drug information [13]. Tablet use, however, appears to have lagged behind smartphones, perhaps because of their more recent introduction to the market. Only 40% of recently surveyed academic physicians and trainees reported using tablets in one study, with only half that number reporting use in a clinical setting [14]. Even fewer pharmacy faculty (30%) and pharmacy students (14%) reported using tablets in clinical practice [13]. It is reasonable to assume, given past trends, that these proportions will have increased since those surveys were completed. Smartphone ownership by Canadian adults has grown from 33% in 2012 to 56% in 2013 [15], and statistics reported by Pew Research Center in the United States closely mirror this trend [16]. Many surveys have identified the types of devices owned by survey participants. A recent study of pharmacy students examined their actual preferences when provided with three different sizes of device for use in answering clinical questions. The students overwhelmingly preferred the iPad mini over iPads or iPhones, as it provides a nice balance of size, weight, and screen size [17].

The presence of mobile devices in health care has created a new information landscape that brings its own unique challenges to libraries. Downloadable applications, or apps, the programs that run on smartphones and tablets, have become increasingly specialized and complex. Apps offer a distinct advantage over older technology because of their ability to run independently of web-based browser access on a mobile platform [18]. Many health resources of varying quality are available for handheld devices, and some lament the lack of attention given to examining the content of these apps for quality and reliability [12, 19, 20]. While some resources have been made freely available,

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others must be purchased by individuals and some have been institutionally licensed by libraries. Bushhousen et al. [10] noted a desire from patrons to have libraries serve as a clearinghouse of vetted smartphone applications and services, but there are several challenges involved in providing mobile device and application support to library users. These include: limited availability of products that can be institutionally licensed for mobile devices, the often complex authentication processes involved in accessing those products, the large number of mobile software platforms that require support, as well as the often very high annual costs for subscribing to these products [21].

A number of studies have explored the use of handheld computers and PDAs by pharmacists [3, 4, 6–8, 18], but there is an absence of published reports investigating mobile device and app use by pharmacy faculty and pharmacy students. The literature suggests that there are generally high rates of handheld use among physicians and residents, extensive use of the internet by clinicians in their daily practice [2], and widespread adoption of a similar core set of apps such as PubMed, UpToDate, and several drug information apps such as Lexicomp and Epocrates. Unfortunately, several recent studies investigating the use of mobile devices in medicine do not convey an understanding of the prevalence and usage patterns within a pharmacy context [2, 9–12, 14, 20, 21].

A recent Canadian study of medical trainees, graduate students, and faculty members also looked at barriers to using mobile devices in study and practice [9]. Availability of wireless access was reported as the main barrier, followed by lack of knowledge about what resources were available and lack of an understanding of how to use them. The study then went on to explore library-specific barriers, and the authors noted that only 43% of participants knew that their libraries offered mobile resources to users. Barriers to accessing library resources were largely related to finding and retrieving full-text journal articles, and authentication for licensed resources. The authors concluded that medical information seekers turn to the library for reliable mobile resources, but that libraries must work to remove barriers and connect users to sought-after resources [9].

Hanrahan and Cole's study [13] of pharmacy students and faculty focused on assessing drug information resource use and access preferences. Respondents were asked about their preferred device for accessing drug information, and students overwhelmingly preferred the use of a laptop (77%) over a smartphone (17%), whereas faculty preferred laptops (40%), desktops (27%), and smartphones (27%). Both groups reported preferring electronic access to drug information and generally valued electronic over print resources [13]. While the Hanrahan and Cole [13] study highlights device and resource preferences in pharmacy, it does not specifically address the service implications that were addressed in Boruff and Storie's article [9]. It is hoped that this study will address this gap in the literature.

The purpose of this project is to explore patterns of use and preference for mobile resources among pharmacy students and faculty. The research questions addressed were:

1. Under what circumstances do pharmacy students and faculty use their mobile devices for finding information?
2. What types of resources are pharmacy students and faculty using on their mobile devices when answering pharmacy-related questions?
3. What barriers prohibit pharmacy students and faculty from using their mobile devices in their studies and work?

Methods

Participating sites included seven of ten Canadian Schools of Pharmacy: University of Alberta, University of Saskatchewan, University of Manitoba, University of Waterloo, Université de Montréal, Dalhousie University, and Memorial University. The target study population included students and faculty currently affiliated with the seven institutions. Research methods developed by Boruff and Storie [9] were adapted for the pharmacy population, and their work guided development of the survey and overall methodology, with pretesting taking place to assess functionality and usability. The selection of a survey as the primary method of gathering data made the most sense given the number of potential research participants and their disparate geographic locations. Development of the survey was led by two pharmacy liaison librarians with input from the research team, and the survey was made available online using Opinio software. As one participating institution was French speaking, the survey was translated into French for distribution at that site.

Ethics approval was received from each institutional research ethics board. Email invitations with a link to the online survey were sent to email lists targeting the study population. A link to the survey was also made available on some library subject guides and other websites. The survey included 20 questions and was designed to take 10–15 minutes to complete (Supplementary File 1[3]). To inform participants of the nature of the study, the introduction to the survey indicated that the survey was "being distributed at several Canadian Pharmacy schools to discover how pharmacy students and faculty are using mobile devices and which resources are most preferred." Participants were also informed that their insight would be used to help improve mobile-related services and resources available through their university library. The survey remained open for a three-week period at each institution during the months of February to April 2013, and collected data were stored on a password protected server at Dalhousie University. Several reminder emails were distributed by the local researcher at each institution. Descriptive statistics were generated by the Opinio survey software, and cross-tabulation analysis was conducted using SPSS to compare results across groups within the study population.

When completing the survey, participants could volunteer for a follow-up interview by following a link and

[3]Supplementary Files 1 and 2 are available through the journal website at http://ejournals.library.ualberta.ca/index.php/jchla/rt/suppFiles/24401/0.

submitting their email address. The research team felt that it was important to offer participants the opportunity to expand upon the data they provided in the survey as well as to have the opportunity to address unforeseen issues and areas that required further exploration. It was clearly stated that all email addresses would be kept separate from survey responses. Individuals who identified a willingness to be interviewed were emailed a follow-up letter explaining the interview process, and asked to provide a phone number where they could be contacted at an agreed upon date and time. Verbal consent from the participant was required for the interview to proceed. The interview included four exploratory questions, was designed to take 20–25 minutes, and could take place in person or via telephone. Interviews were conducted from May to June 2013 and also during fall 2013. The interviews were conducted in either English or French based on participant preference, and they were conducted by a bilingual staff member at the University of Saskatchewan's Social Sciences Research Laboratories (SSRL). The audio recordings were transcribed, anonymized, and the resulting transcripts provided to the researchers.

Results – survey

A total of 488 individuals responded to the survey out of an estimated population size of 3300 individuals, for an overall response rate of approximately 15%. The number of respondents by status and institution are shown in Table 1. The proportions for responses by institution generally reflected the respective sizes of the schools. The University of Waterloo was an exception to this trend and experienced a lower response rate; it was hypothesized that this was due to a different academic calendar compared with the other schools.

The survey questions focused on how, why, and how often the pharmacy students and faculty use their mobile devices to find drug or health information. The survey did not consider how the participants were using their mobile device(s) for other purposes. The majority of respondents reported owning a mobile device (463/n = 488, 95%). Fourth-year students (n = 75, 100%) and faculty members (n = 41, 100%) were the most likely to own a device and first-year students were the least likely (86/n = 95, 91%). Respondents who did not own a device were not asked to continue with the remainder of the survey. Apple products were the most commonly owned devices with 82.3% owning an iPhone or iPod touch (381, n = 463) and 30% owning an iPad (139, n = 463). Android was the second most commonly preferred platform at 27.0% (125, n = 463). Many respondents owned multiple devices.

When asked about the most common health information seeking task performed on their mobile devices accessing Wikipedia was by far the most frequently cited regularly accomplished task (159/n = 346, 46%). Regular use was defined as several times a week or more. This was followed by taking notes and accessing other websites (both at 39%, 135/n = 348), accessing point of care tools like Dynamed (112/n = 341, 33%), accessing clinical guidelines (95/n = 345, 28%), searching for articles (78/n = 347, 22%), reading textbooks (67/n = 346, 19%), and lastly searching for books (63/n = 348, 18%). Findings showed that 81% of mobile device owners (375, n = 463) use their device to look for health or drug information, with first-year students exhibiting the lowest proportion (59/n = 86, 68.6%) using their device for this task and fourth years (66/n = 75) the highest at 88%.

The most frequently cited drug information seeking activities (Table 2) included searching for side effects (61.9%), drug dosages (60.2%), and interactions (58.3%). Looking for natural product information ranked seventh at only 19.9% overall. Fourth-year and graduate students searched for most categories of drug information in greater proportions than did the other pharmacy groups. Searching for drug identification information was the only category of information that was searched for more regularly by first-year students than fourth years, suggesting that students become more knowledgeable in this area over the course of their program.

Our second research question related to resources used to answer pharmacy-related questions. Lexicomp (187/n = 343, 54.5%) and Micromedex (142/n = 344, 41.3%) were the most regularly used drug information resources, with regular use once again defined as several times a week or more. Natural Medicines Comprehensive Database (42/n = 339, 12.4%) and Natural Standard (27/n = 339, 8%), two separate products at the time the survey was conducted, ranked sixth and seventh, respectively (Figure 1). Note that not all institutions license each of the aforementioned products, resulting in some of the variations in use. For instance, at the time of the survey, although Lexicomp was available at all of the institutions that participated in the study, the downloadable app was not necessarily provided as part of the library's subscription. Not all institutions licensed Micromedex, but a free abridged version of its app was available at that time.

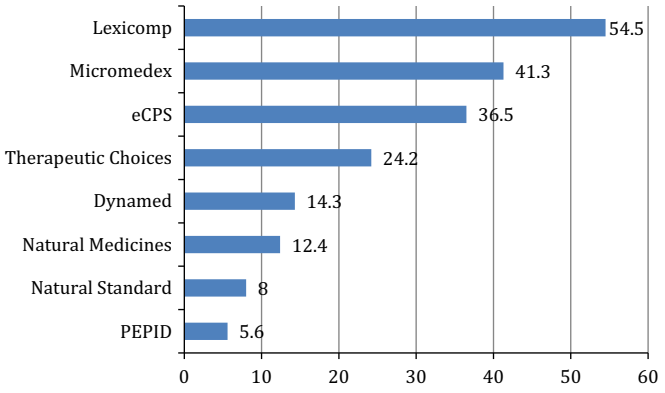
Table 1. Survey respondents by status and institution.

Institution	First year	Second year	Third year	Fourth year	Grad student	Faculty	Other	Total (%)
Dalhousie	8	22	15	5	2	4	0	56 (11.5)
Memorial	11	10	5	5	0	2	1	34 (7.0)
Montréal	41	30	47	26	10	11	7	172 (35.2)
Alberta	18	35	22	12	4	11	1	103 (21.1)
Manitoba	5	4	5	7	1	7	3	32 (6.6)
Saskatchewan	8	14	15	8	3	2	0	50 (10.2)
Waterloo	4	2	15	12	3	4	1	41 (8.4)
Total (%)	95 (19)	117 (24)	124 (25)	75 (15)	23 (5)	41 (8)	13 (3)	488

Table 2. Regularly searched drug information categories.

	First year, $n = 55$ (%)	Second year, $n = 98$ (%)	Third year, $n = 92$ (%)	Fourth year, $n = 66$ (%)	Graduate, $n = 16$ (%)	Faculty, $n = 33$ (%)	Other, $n = 7$ (%)	Total average, $n = 367$ (%)
Side effects	22 (40.0)	61 (62.2)	57 (62.0)	52 (78.8)	13 (81.3)	17 (51.5)	5 (71.4)	227 (61.9)
Drug dosage	20 (36.4)	59 (60.2)	52 (56.5)	52 (78.8)	13 (81.3)	20 (60.6)	5 (71.4)	221 (60.2)
Interactions	17 (30.9)	57 (58.2)	52 (56.5)	51 (77.3)	12 (75.0)	19 (57.6)	6 (85.7)	214 (58.3)
New drugs	15 (27.3)	31 (31.6)	30 (32.6)	30 (45.5)	10 (62.5)	6 (18.2)	4 (57.1)	126 (34.3)
Calculations	10 (18.2)	23 (23.5)	24 (26.1)	29 (43.9)	9 (56.3)	9 (27.3)	5 (71.4)	109 (29.7)
Identification	18 (32.7)	35 (35.7)	19 (20.7)	11 (16.7)	2 (12.9)	4 (12.1)	3 (42.9)	92 (25.1)
Natural products	8 (14.5)	18 (18.4)	20 (21.7)	18 (27.3)	3 (18.8)	5 (15.2)	1 (14.3)	73 (19.9)
Formulary status	10 (18.2)	12 (12.2)	12 (13.0)	12 (18.2)	7 (43.8)	4 (12.1)	1 (14.3)	58 (15.8)

Fig. 1. Regularly used resources (by percent).



Only 28.3% (96, $n = 339$) of participants overall had purchased any apps for their devices. Most had purchased between one and four apps (83/$n = 96$, 86.5%), whereas 11.5% (11, $n = 96$) had purchased between five and ten, and only 2.1% (2, $n = 96$) had purchased more than ten. Proportions varied by group, with first-year students being the least likely to have purchased apps (7/$n = 45$, 15.6%) and increasing steadily by category to faculty being the most likely (15/$n = 31$, 48.4%).

When asked what they like most about accessing health information on their mobile devices, participants almost unanimously commented on their convenience. Quick and easy access to multiple resources on a single portable device means individuals are able to obtain quick answers anytime, anywhere. Participants expressed many dislikes: the cost of apps, the small screen size and correspondingly small font that make reading long text difficult, the storage space required for medical apps, the lack of downloadable apps for many resources thus requiring internet access, the cumbersome process of having to access databases via the library website when apps are unavailable, the lack of adaptive versions of some resources, and the conciseness of the information presented resulting in incomplete answers to questions.

Only 51.3% (174, $n = 339$) of users were aware that their library provided access to health information resources for mobile devices. Awareness grew in each year of the undergraduate pharmacy program, with awareness increasing to 62.3% among fourth years (38, $n = 61$) from only 46.7% among first years (21, $n = 45$). Awareness also varied by university, ranging from 31.1% at l'Université de Montréal (33, $n = 106$) to a high of 82.6% at the University of Manitoba (19, $n = 23$). Of participants that were aware, 89.5% (154, $n = 172$) had accessed the library provided sources. Like awareness, use also increased from 80.1% among first years (17, $n = 21$) to 100% among fourth-year undergraduates ($n = 38$). When asked to name which resources they had used, by far the most commonly cited source was Lexicomp, followed by Micromedex, e-CPS, and Dynamed. The biggest barrier to use of mobile health resources is a lack of awareness about available resources. Other principle barriers can be viewed in Table 3.

Participants typically obtain support in using their mobile devices from friends and colleagues. Only 44 respondents ($n = 388$, 11.3%) had asked the library for assistance, yet many more see a larger role for the library in this context. Of this group, 65.1% would like the library to offer more how-to guides on using mobile resources (267, $n = 410$), 47.6% would appreciate workshops on using specific apps (195, $n = 410$), and 34.4% would like to be able to drop in to the library for troubleshooting assistance (141, $n = 410$).

Results – interviews

Eight telephone interviews were conducted by a bilingual interviewer from the University of Saskatchewan's Social Science Research Laboratory. The eight volunteers included undergraduate ($n = 5$) and graduate students ($n = 1$) as well as faculty ($n = 2$), and were geographically representative of the study having come from five of the seven participating institutions. The interviews focused on four main topics: (1) the participants' reasons for using mobile devices; (2) perceived barriers to mobile device use; (3) the participants' criteria for selecting and using new apps; and (4) the participants' feelings about using mobile devices when interacting with patients (Supplementary File 2[3]) The qualitative data collected were analyzed using thematic analysis to identify and summarize common themes and issues arising in interviews with the participants [22].

Being able to access information quickly was one of the main reasons participants used a mobile device. One person commented, "it's very fast, and I always have an

Table 3. Barriers to use.

Barrier	First year (%)	Second year (%)	Third year (%)	Fourth year (%)	Graduate students (%)	Faculty member (%)	Other (%)	Total (%)
Knowing what information resources are available	34 (64.15)	70 (76.92)	66 (65.35)	36 (57.14)	8 (44.44)	22 (62.86)	2 (28.57)	238 (64.67)
No wireless access	18 (33.96)	37 (40.66)	66 (65.35)	45 (71.43)	6 (33.33)	21 (60.00)	3 (42.86)	196 (53.26)
Info resources not available for your device	17 (32.08)	32 (35.16)	40 (39.60)	14 (22.22)	4 (22.22)	10 (28.57)	2 (28.57)	119 (32.34)
Lack of time	14 (26.42)	26 (28.57)	18 (17.82)	19 (30.16)	3 (16.67)	18 (51.43)	1 (14.29)	99 (26.90)
Understanding how to use the info resources	18 (33.96)	25 (27.47)	16 (15.84)	10 (15.87)	4 (22.22)	6 (17.14)	0 (0.00)	79 (21.47)
Complicated installation process	10 (18.87)	20 (21.98)	23 (22.77)	12 (19.05)	2 (11.11)	10 (28.57)	1 (14.29)	78 (21.20)
Technology problems	13 (24.53)	17 (18.68)	19 (18.81)	13 (20.63)	4 (22.22)	7 (20.00)	1 (14.29)	74 (20.11)
Do not have permission to install software	4 (7.55)	12 (13.19)	10 (9.90)	4 (6.35)	0 (0.00)	1 (2.86)	0 (0.00)	31 (8.42)
Other (e.g., cost)	7 (13.21)	7 (7.69)	15 (14.85)	2 (3.17)	3 (16.67)	0 (0.00)	0 (0.00)	34 (9.24)

internet connection so I can always find exactly what I'm looking for." Another mentioned being satisfied with the amount of time it took to find answers, "most of the time. Not always, but generally speaking…" Another frequently mentioned reason was convenience: "I basically use it on an as-needed basis for quick access to any answers that I needed." Another person liked the portability of mobile devices, saying "technology and smart phones and applications are totally invaluable. They are wonderful resources, and I don't know what I would do without them." Another benefit of mobile devices was that "the information is succinct. You don't have to read long paragraphs or large texts to find an answer. It's often just point-form or short responses." One pharmacy student mentioned the convenience of having health sciences apps available to students and faculty listed on the subject page authored by the pharmacy librarian.

Interview participants also identified barriers to using mobile devices. For example, not having access to wireless services in some areas and the speed of downloading information even if one does have wireless access were identified. One person expressed frustration at their university's policy of not allowing access to mobile devices during exams: "in an exam setting, you're not allowed to use cell phones or telephones or anything like that. So that's kind of a limitation of the app. It's not the app's fault, of course, but that's one thing that I don't like." Another frequently mentioned barrier was the design or user-friendliness of some apps. One student observed, "I think that most of these applications are like a database, so they organize the data well, but they don't present it as well as they could…I don't think they put as much effort into the user interface as some other applications out there." Others spoke about the design of apps and the effect of this on use. One person reflected: "Is it easy to use? I've downloaded some apps and I can't figure out how to use them. I'll give up pretty fast." Another said, "I think to some degree though you have to be familiar with the programs you are using." Someone else commented, "I don't think the average person could pick it up and make use of it." It became apparent that good app design is a key factor leading to popularity of an app. Another barrier to acquiring new apps was cost. One participant was "willing to pay for an application if I knew it was something I could use" and another remarked, "I tend to go for the free apps. I don't really want to have to pay for them, because I usually have access to them for free through the school, so I wouldn't want to have to pay for them on my own."

All participants commented on their criteria for selecting and acquiring new apps. Of the group, four indicated cost as a factor. Participants preferred free apps, and indicated that "price is an important consideration," and that they will purchase an app "if it's likely it will be used." Not surprisingly, four participants shared their appreciation of being able to trial an app before committing to a full purchase. Most participants considered the source or credibility of the app developer when considering a purchase: "if I can recognize who makes it, great…or if it's recognized through one of the regulatory bodies for pharmacy, then I usually trust it." College and colleague recommendations and app reviews also figure prominently in participants' decisions to acquire new apps. Participants are looking for ease of use, the ability to search for information within the app, and an integrated index to information: "one thing I do like about the drug information apps is that when they have a bit of an index at the beginning to allow you to sort of break down your search a bit, so maybe by system, then you can go into by drug class, and then maybe individual drugs. I find that quite helpful." They also find the inclusion of Canadian data and units of measurement helpful: "a big thing I quite enjoy is when units of measurement are available in Canadian [i.e., metric] versus American [i.e., imperial]." Interview data indicated that cost, source, recommendations, and design are the key factors that are considered by pharmacy students and faculty when considering acquiring a new app.

An interesting discovery that arose during the interviews was the topic of professionalism and whether or not it is appropriate or acceptable to consult one's mobile device

when in consultation with a patient. Interview participants were divided on the issue. Four participants felt that patients might assume they were simply checking their email or texting during the consultation, and that consulting a mobile device in front of a patient was both rude and unprofessional: "I feel like it's disrespectful, so I never whip it out in front of a patient, unless you give them a warning and say "let me look it up right now on a resource that I have on my phone." As well, one student "hesitate[s] to take out my phone in front of a patient. I am often behind the counter. I put my phone under the counter so I can be sure the patient doesn't see it." The other half of the participants feel that as long as one explains to the patient that one is going to look up information on a mobile device before taking it out, "they'd be put more at ease to know that, ok, you're just double checking your thoughts." Providing the patient with some context about intent and purpose prior to consulting one's mobile device seems to be a reasonable approach for finding patient-related information when conversing with patients.

Discussion

This is the first pan-Canadian study that examines the prevalence and patterns of use of mobile devices by pharmacy faculty and students at Anglophone and Francophone universities. Unlike previous studies, this study also included interviews with participants to collect richer data than can be gathered with an online survey alone.

Ownership of mobile devices by health care professionals and students is growing rapidly. Dasgupta's 2010 study of pharmacists revealed that less than half (49.1%, 145/295) owned a PDA [4]. Two years later, a survey of medical students, residents and faculty, reported a 92.6% (1120/1210) rate of ownership [9]. Our study also revealed almost universal ownership at 95%; of particular note, all fourth-year pharmacy students and pharmacy faculty reported owning a mobile device. First-year students were the least likely to own a mobile device, but the proportion was already at 91%; one might conclude that the longer one is in the pharmacy field, the more one takes advantage of the benefits of owning a mobile device. Associated costs may be more of a concern for students in earlier years.

Our study reaffirms that health professionals value mobile devices for retrieving information on drugs. Boruff and Storie's study [9] revealed that finding drug information was the primary reason for which medical students, graduate students and faculty used their mobile devices, whereas McCallum [6] noted that pharmacists primarily consulted their PDAs for checking drug interaction data. In a health sciences centre, accessing drug information resources was the most frequent answer to the question "what work-related tasks would you like to be able to perform?" [10]. Our study provides a more in-depth look at the types of drug information sought by pharmacy students and faculty. The most popular type of drug information sought was drug side effects. We noted that, with the exception of drug identification, which was ranked most highly by second-year students, searching for all types of drug information (side effects, drug dosage, interactions, new drugs, calculations, natural products, and formulary status) increased from students in the first year of the pharmacy program to graduate school. Pharmacy faculty accessed their mobile devices less often than the other groups for different types of drug information. This may be a result of more experience, but may also relate to their reduced frequency of need for answering drug-related questions due to academic and research responsibilities. The observed use pattern seems to negate earlier studies that found that younger pharmacists used their mobile devices more often [6, 9]. Our study determined that pharmacy students increasingly rely upon their mobile devices to access drug information throughout their program. This may relate to their curricular experiences, with needs increasing as the amount of time spent on clinical placement also increases.

Lexicomp and Micromedex were the two most commonly used products, a finding similar to McCallum's study of Nova Scotia pharmacists [6], and Hanrahan's study of pharmacy students and faculty [13]. One explanation as to why these two products ranked so highly is that both resources are comprehensive and provide information regarding all the most often sought after categories of drug information. They were both also available in some form, even if limited, at all of the institutions participating in this study. A second reason for Lexicomp's popularity might be its high usability as confirmed in Kupferberg's study [23], identifying Lexicomp Online as the favourite drug information resource by a 12 person panel composed of pharmacy faculty, students, and medical librarians. These resources provide rapid access to succinct drug information, which for many respondents was their biggest advantage. Students raised concerns about the brevity of the information provided, which they thought could result in information that lacks important background context, and possible comprehensiveness. This concern was raised most often by second year students.

In our study, resources that were least used received the most negative comments, which related to badly designed user interfaces, the lack of a mobile-specific interface, or difficulty accessing the resource. One participant commented: "some of the apps are difficult to use (eCPS), some also require you to sign up for an irrelevant service (Dynamed)." Others noted that websites have not been optimized for mobile access, and they had difficulty locating links leading to information on resources for mobile devices on their libraries' websites.

Unlike previous studies, which identified the main barriers to using mobile devices to be technical issues such as problems with authentication to library resources, lack of availability of a wireless connection, or frustration with technical issues such as small screen size, [6, 9]; we heard that the most significant barrier to use was not knowing what resources are available (64.67%). Although 81% of the survey respondents used their mobile devices to access drug and health information, only half of the study participants knew that libraries provided access to health and drug information apps for mobile devices. This proportion is slightly higher than that found in Boruff and Storie's Canadian study [9], in which only 43% of medical trainees, graduate students, and faculty members

knew the library offered apps. This reinforces the importance for libraries to feature access to these licensed apps prominently on the library website. Many libraries in our study already had guides to health sciences mobile apps as part of their library system's website, but students may not have been aware of these guides nor were they able to locate them easily, leading to underuse of the apps. It is essential to make patrons aware of resources for mobile devices by increasing their visibility on library websites and highlighting them in bibliographic instruction sessions. Clarifying what library support is available for mobile devices would be advantageous, because while most survey respondents indicated they went to colleagues and friends for app advice, they felt that it would be beneficial for the library to offer additional support and training. These service implications are similar to those addressed by Boruff and Storie [9].

The topic of professionalism arose in both the survey and interview stages of this project. More than one participant identified that using a mobile device in clinical settings, in front of patients, may be misinterpreted as unprofessional behaviour. Interview respondents identified that the issue could be addressed by explaining to patients in advance that they were going to look up clinical information to assist in developing the patient's personal care plan.

The most commonly used apps on mobile devices were those that had an online database equivalent for their user-friendly mobile apps. This information is a reminder to both libraries and database vendors to pay more attention to app design. The frequent mention of the lack of user friendliness as a barrier to using apps suggests that it is not enough to have excellent content, it is equally important to ensure that the user interface facilitates, rather than impedes, access to information.

The findings of this study capture the prevalence and types of mobile device use by pharmacy students and faculty in a Canadian context. One limitation to the study was the low survey response rate, which is typical with this type of study. We still received close to 500 responses from across all schools, in proportions relative to the size of each institution, and the response rate was higher than that achieved in the Boruff and Storie study [9] on which this project was based. While this response rate limits our ability to make generalizations, the data collected have value as they expand our knowledge of the issue in a Canadian-specific context and provides informed direction for libraries. A response bias is likely, since heavy users of mobile devices and apps are more likely to have responded to the survey. A further consideration was that not all libraries license the same resources resulting in some variation in use. We would also have been interested in interviewing more participants to gain richer data, but despite email reminders just eight people agreed to be interviewed.

An area of future research that was clearly identified in this study was usability issues with many of the apps employed by pharmacy students and faculty. It is possible that incorporating user input while in the design process of pharmacy-related apps might lead to better usability. Much research could be done to test the efficacy of design of pharmacy apps with input from pharmacy students, faculty, and practicing pharmacists.

Conclusion

This first Canadian-wide survey of pharmacy students and faculty highlighted some interesting and useful points for health sciences librarians. As pharmacy students progress through their program, a greater percentage of the students own and use mobile devices. Students and faculty use their mobile devices often to gather drug and health information, including checking Wikipedia and searching for drug side effects. The frequent use of Wikipedia as a health information source is of concern due to the manner in which its content is created, and this can be used by health librarians to open a conversation about both research starting points and the quality of health information found on the internet. This project also provided insight into what devices and apps university library clients are using, where additional needs exist, and what we as librarians can do to facilitate access for our users. Since many students commented that they were not aware of all of the relevant apps available to them, pharmacy librarians could do more to promote apps that are accessible and offer support to ensure that patrons can install and use them. The promotion of apps could be done at library orientation sessions and on the subject or research guides that pharmacy librarians often create for their patrons. The concern about the issue of professionalism when a pharmacy student or faculty member uses a mobile device while with a client is an interesting one and important for the pharmacy profession to address.

Some areas of challenge will include working with vendors to improve app usability as well as access in the face of declining collections budgets. As pharmacy student and faculty reliance on mobile devices and resources increases, we must also endeavor to market our mobile offerings and services more effectively so that users become aware that their libraries provide access to these types of resources and that library staff are able to provide assistance when needed.

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