Guirguis LM, Hughes CA, Makowsky MJ, Sadowski CA, Schindel TJ, Yuksel N, Faruquee CF. Development and validation of a survey instrument to measure factors that influence pharmacist adoption of prescribing in Alberta, Canada. Pharmacy Practice 2018 Jan-Mar;16(1):1068.

https://doi.org/10.18549/PharmPract.2018.01.1068

Original Research

Development and validation of a survey instrument to measure factors that influence pharmacist adoption of prescribing in Alberta, Canada

Lisa M. GUIRGUIS, Christine A. HUGHES, Mark J. MAKOWSKY, Cheryl A. SADOWSKI, Theresa J. SCHINDEL, Nese YUKSEL, Chowdhury F. FARUQUEE.

Received (first version): 6-Jul-2017 Accepted: 13-Jan-2018 Published online: 16-Mar-2018

Abstract

Objective: Study objectives were to develop a questionnaire to assess factors influencing pharmacists' adoption of prescribing (i.e., continuing, adapting or initiating therapy), describe use of pre-incentive and mixed mode survey, and establish survey psychometric properties.

Methods: Questions were developed based on prior qualitative research and Diffusion of Innovation theory. Expert review, cognitive testing, survey pilot, and main survey were used to test the questionnaire. Six content experts reviewed the questionnaire to establish face and content validity. Ten pharmacists from diverse practice settings were purposefully recruited for a cognitive interview to verify question readability. Content analysis was used to analyze the results. A pre-survey introduction letter with a monetary incentive was mailed via post to 100 (i.e. pilot) and 700 (i.e., main survey) randomly selected pharmacists. This was followed by an e-mail with a personalized link to the online questionnaire, e-mail reminders, and a telephone reminder if required. The psychometric properties of scales were evaluated with an exploratory factor analysis and Cronbach's alpha. Scale responses were described.

Results: Engagement of six experts and ten pharmacists clarified definitions (e.g., prescribing), terminology, recall periods, and response options for the 34-item response scale. Fifty-six pharmacists completed the online pilot survey. Based on this data, ambiguous questions and routing issues were addressed. Three hundred and seventy-eight pharmacists completed the online main survey for a response rate of 54.6%. The factors analysis resulted in 27 questions in eight scales: (1) self-efficacy, (2) support from practice environment, (3) support from interprofessional relationship, (4) impact on professionalism, (5) impact on patient care), (6) prescribing beliefs, (7) technical use of electronic health record (EHR) and (8) patient care use of the EHR. Prescribing beliefs and technical use of the EHR scales had low reliability while the remaining six scales had strong evidence for reliability and validity.

Conclusion: Through a multi-stage process, a survey instrument was developed to capture pharmacists' perceptions of prescribing influences. This questionnaire may support future research to develop interventions to enhance adoption of prescribing and enhance direct patient care by pharmacists.

Keywords

Pharmacists; Drug Prescriptions; Prescription Drugs; Pharmaceutical Services; Professional Role; Validation Studies as Topic; Psychometrics; Surveys and Questionnaires; Canada

INTRODUCTION

The scope of pharmacist practice is expanding across the world. Pharmacist prescribing has taken root in the United States[1], United Kingdom (UK)[2], and Canada.[3] Each jurisdiction has a unique model and pharmacists may not have a shared understanding of what constitutes prescribing. For example, recommending non-prescription medications, continuing existing medications, and dose adjustments may be considered prescribing in some contexts and not others.[4] Pharmacy practice researchers are striving to understand the uptake and application of prescribing privileges in the real world of practicing pharmacists.

In Alberta, Canada, three types of pharmacist prescribing were defined 1) adapting a prescription (i.e., adapting an existing prescription or extending a prescription for continuity of care, 2) prescribing in an emergency, and 3) additional prescribing authority (APA) (i.e., prescribing a new medication for initial therapy or to manage ongoing conditions). To obtain APA, pharmacists must complete a detailed application of actual patient cases which are assessed by peers. Alberta is an ideal province to study the extent of prescribing in pharmacy practice. No other jurisdiction in Canada has the range of prescribing privileges currently available to Alberta pharmacists.[3] The Alberta model is unique as qualified pharmacists, with APA, have independent prescribing authority. Albertan pharmacists do not require a written agreement with a

Lisa M. GUIRGUIS. BScPharm, MSc, PhD, Associate Professor. Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta. Edmonton, Alberta (Canada). lisa.guirguis@ualberta.ca
Christine A. HUGHES. BScPharm, PharmD, FCSHP, Professor. Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta. Edmonton, Alberta (Canada). christine.hughes@ualberta.ca
Mark J. MAKOWSKY. BSP, PharmD, Associate Professor. Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta. Edmonton, Alberta (Canada). makowsky@ualberta.ca
Cheryl A. SADOWSKI. BSc(Pharm), PharmD, FCSHP, Professor. Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta. Edmonton, Alberta (Canada). cherylas@ualberta.ca
Theresa J. SCHINDEL. BSP, MCE, FCSHP, Associate Clinical Professor. Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta. Edmonton, Alberta (Canada). tschin@ualberta.ca
Nese YUKSEL. BScPharm, PharmD, FCSHP, NCMP, Professor. Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta. Edmonton, Alberta (Canada). yuksel@ualberta.ca
Chowdhury F. FARUQUEE. BPharm, MPharm, MBA. Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta. Edmonton, Alberta (Canada). ffchowdh@ualberta.ca

physician to prescribe as in the US model.[1] Furthermore, pharmacists do not require additional training with a physician partner as in the UK model.[2]

Our research group used qualitative methods to describe pharmacists' adoption of prescribing in Alberta and characterized their prescribing practices as focused on product, diseases, and patients.[5] Qualitative methods, alongside the Diffusion of Innovation theory[6], were used to study pharmacists' adoption of prescribing. Adoption was influenced by physician relationships, practice setting, how prescribing fit with previous practice behaviours as well as pharmacists' own self-efficacy toward prescribing, beliefs about patients' responsibility for prescribing, and focus on patient care.

Survey research methodologies are suitable to gather large-scale descriptions of pharmacists' prescribing behaviours and build on prior qualitative research. Survey findings would inform researchers, policy makers, and educators about the uptake of prescribing and allow for the development of interventions to enhance the adoption of pharmacist prescribing and direct patient care by pharmacists. While surveys have been used in the UK to evaluate training programs around prescribing[7], these surveys were not applicable to Alberta as both the prescribing and practice models differ. No survey instrument exists that captures pharmacist prescribing in Alberta, so we aimed to address this gap.

Our research objectives were to:

1) Develop a questionnaire to measure factors that influence pharmacists' adoption of prescribing

2) Describe use of pre-incentive and mixed mode survey

2) Establish the initial psychometric properties of the survey instrument

METHODS

The survey instrument was developed and then refined in three stages. Based on the Diffusion of Innovation theory[6], prior literature[7-9], and data gathered from prior qualitative work[5,10], a survey instrument was developed to assess pharmacists' adoption of prescribing. Diffusion of Innovation is a multifaceted model and was selected to characterize the social processes behind pharmacists' adoption of prescribing. The questions were refined through 1) expert review for face validity, 2) cognitive interviews, and 3) small-scale survey distribution before the main survey was conducted. Evidence for validity was established with expert review and cognitive interviews. Exploratory factor analysis and evidence for reliability were established by examining internal consistency reliabilities with small and large-scale samples. This study was approved by the Health Ethics Research Board Panel B, University of Alberta.

Survey Development

This paper focuses on survey items that affect pharmacists' adoption of prescribing, specifically use of electronic health records (EHR), self-efficacy toward prescribing, supporting factors, impact on practice and prescribing beliefs, which are grounded in the Diffusion of Innovation Theory for health service organizations.[6] Details of pharmacist prescribing behaviours have been previously published.[11]

To establish content and face validity, researchers identified six expert pharmacists via known contacts and invited them to review the questions for accuracy and completeness. Experts from Alberta, other jurisdictions in Canada, as well as the UK had experience with either the Alberta or other prescribing models. An information letter to explain the research purpose and the draft survey instrument were emailed to expert pharmacists. Experts were asked to provide written feedback about the clarity, quality, and scope of the instrument. The research team reviewed the feedback and made subsequent revisions to the instrument.

Cognitive Interview

Ten pharmacists from a variety of settings (i.e., community pharmacy, hospital, primary care or ambulatory team practice, and long-term care) were purposefully recruited to allow for a variety of respondents. A research assistant conducted face-to-face cognitive interviews at a convenient location. Individuals who participated in the expert review or cognitive interviews received a 50 CAD gift card for their time. Researchers used structured probes to uncover how respondents interpreted questions to verify the understanding and readability. Example probes included: "Tell me in your own words what this question is asking," "How did you decide on your answer to this question?" and "What does [survey concept] mean to you?" Interviews were audio recorded and transcribed verbatim. The research assistant and two members of the research team conducted a qualitative content analysis which was used to revise the questions.

Pilot Survey

The survey instrument was pilot tested in a random sample of 100 practicing pharmacists who were registered with the Alberta College of Pharmacists (i.e., the provincial regulatory authority) and who provided contact information for research purposes including mailing, telephone, and e-mail. This sample size was considered sufficiently large to gauge the response rate. Prior survey work in North America has found low response rates, so a novel mixed-mode (post, email, and telephone) strategy with a pre-incentive was used to increase response rates.[12]

Pharmacists were mailed a pre-survey notification letter which informed participants they had been randomly selected to share opinions on prescribing whether they were prescribing or not as well as an incentive of a 5 CAD coffee card for a national coffee chain to enhance response. Survey links were e-mailed three weeks later with three reminders in two weeks. Interviewers telephoned pharmacists who did not respond after two reminders to encourage participation in the online survey and asked ten questions to those who indicated they were not going to participate in the online survey. These questions established the type and frequency of pharmacist prescribing providing insight into the non-responder sub-group.

Table 1. Pharmacist Responses for Self-efficacy and Impact on Practice Items (Main Survey)

	N	Mean	SD	Scale Mean (SD)
Self-Efficacy Beliefs* How sure are you that you could:				
perform a patient assessment to prescribe?	324	3.10	1.12	Prescribing Self-efficacy 2.66 (0.66)
prescribe in a clinical area that you are familiar with?	323	3.35	1.04	
prescribe in a clinical area that you are not familiar with?	326	1.65	0.90	
adapt a prescription for patients starting a new therapy?	323	2.61	1.19	
initiate new therapy for a patient?	323	2.13	1.13	
accept responsibility for medication management?	325	3.10	1.11	
Valid N (listwise)	318			
Impact on Practice** To what extent has prescribing impacted the following for you,				
Job satisfaction?	324	3.87	0.74	Professionalism 3.72 (0.39)
Professional image?	323	4.02	0.63	
Quality of physician relationship?	324	3.27	0.69	
Time spent with patient?	324	3.82	0.62	Patient Care 3.95 (0.11)
Time spent assessing patients?	325	4.02	0.59	
Quality of patient care?	325	4.00	0.59	
Overall workload?	325	4.18	0.60	Removed
Personal financial reimbursement?	324	3.02	0.42	
Need for continuing professional development?	325	4.10	0.64	
Valid N (listwise)	321			

*Response options: 1=Not sure at all, 2=Slightly sure, 3=Somewhat sure, 4=Rather sure, 5=Quite sure, 6=Very sure, 7=Extremely sure
** Response options: 1=Greatly decreased, 2=Decreased. 3=Same, 4=Increased, 5=Greatly increased

Main Survey

The main survey was conducted in a sample of 700 practicing pharmacists who were registered with the Alberta College of Pharmacists. At the time of the survey, there were approximately 3,885 practicing pharmacists in Alberta. Assuming a 5% margin of error and a 95% confidence interval, at least 350 pharmacists in our sample were required.[13] With a mixed-mode approach, 60% response rate was anticipated and therefore 667 pharmacists were contacted to be confident of achieving at least 400 completed surveys.

As in the pilot, pharmacists were mailed a pre-survey notification letter and incentive of a 5 CAD coffee gift card. Survey links were e-mailed two weeks later with five reminders over seven weeks. Interviewers telephoned pharmacists who did not respond after three reminders in a four-day period which was the same as the small-scale survey.

Data Analysis

The main learnings from expert review and cognitive interview data were summarized. Response rates were calculated by dividing the number of people who participated by the number selected in the eligible sample. Descriptive analyses were used to characterize results. Variables were plotted and examined for normal distributions. In order to test the construct validity of the hypothesized scales, an exploratory factor analysis was conducted. Factor analysis reduced the number of items by grouping the related items and identifying the unrelated items for removal. Principal axis factoring was used, and factors with Eigenvalue's greater than one were chosen.[14] To facilitate the interpretation, Oblimin rotation was applied when the correlation between factors was >0.32.[14] A Kaiser-Meyer Olkin greater than six was used to measure data adequacy for dimension reduction.[14] Before running a factor analysis, a correlations matrix of survey items was used to identify and remove highly correlated (>0.90) or weakly correlated (<0.30) items from the analysis.[14] Items loaded on a factor if their loading was greater than 0.40 and no greater than 0.40 on another factor.[14] Internal consistency of the scales was calculated using Cronbach's alpha statistic and an alpha value greater than 0.70 was considered as adequately reliable.[15]

RESULTS

Survey Development

A survey instrument was designed to assess pharmacist prescribing behaviours and factors which influenced adoption of prescribing.

The survey questions were drawn from findings in our prior qualitative work[5,10] and published surveys. The survey instrument developed by Latter *et al*. provided insight on how to measure benefits of prescribing.[7] Questions on the technical and social benefits as well as perceived compatibility of prescribing were adapted from Westrick's survey on pharmacists' adoption of immunization services.[8] Pronk *et al*. used Roger's Diffusion of Innovation Theory to look at specific attributes of a pharmacy service innovation and six questions scale on observability, compatibility, trialability, relative advantage and complexity were added.[9] New questions were developed around self-efficacy, physician relationships, EHR use, patients' responsibility for ensuring continuity of care and legitimizing prior practices.[10]

The survey instrument started with practice descriptors including pharmacists' use of EHRs then pharmacists were routed to site-specific questions for community, hospital, primary care network, and continuing care which were designed to characterize the level of care provided at the practice sites. The second section captured pharmacists' prescribing behaviours which have been described in the

Table 2. Pharmacist Responses to Support and Prescribing Belief Items (Main Survey)

	N	Mean	SD	Scale Mean (SD)
Support* To what extent do the following factors affect your prescribing activities:				
Pharmacy staffing at my practice location?	325	3.10	1.32	Practice Environment 3.56 (0.28)
Access to patient information?	326	3.83	1.27	
My practice environment?	323	3.55	1.30	
Patient expectations?	323	3.59	1.12	
Employer's expectations?	322	3.71	1.14	
Relationships with physicians?	325	3.34	1.17	Interprofessional Relationships 3.41 (0.10)
Relationships with other health care professionals?	325	3.47	0.99	
My education and training?	323	3.94	1.24	Removed
Requirement to document patient care?	323	2.95	1.26	
Valid N (listwise)	312			
Prescribing Beliefs**				
Patients are responsible for ensuring they have a sufficient supply of medications?	373	5.28	1.01	Prescribing Beliefs 5.09 (0.71)
Pharmacist prescribing increases pharmacists' professional liability?	375	5.68	1.09	
Pharmacists should only extend refills once?	375	4.30	1.42	
Pharmacist prescribing is an extension of the role that pharmacists already fulfill?	376	5.38	1.10	Removed
Pharmacist prescribing helps patients avoid physician follow-up?	376	3.56	1.39	
Valid N (listwise)	371			

*Response options: 1=Strong barrier, 2=Weak barrier, 3=Not a factor, 4= Weak support. 5=Strong support
** Response options: 1=Completes disagree, 2=Strongly disagree, 3=Disagree, 4=Neither disagree nor agree, 5=Agree, 6=Strongly agree, 7=Completely agree

literature. These results have been reported.[11] All pharmacists who had prescribed in the last month were asked about the barriers and supports for prescribing, the impact of prescribing on professional activities, and self-efficacy toward prescribing. The third section addressed pharmacists' beliefs about prescribing. The fourth and last part captured pharmacists' demographics, training, and the presence of other prescribers, as well as time spent with patients versus technical duties. Pharmacists who did not provide patient care did not complete the second section. The questions described in this manuscript are in Table 1, Table 2 and Table 3. The final complete survey instrument with additional descriptive questions is available upon request.

Expert Review

Six pharmacy experts from the UK and Canada reviewed the initial draft survey instrument and provided feedback from a policy perspective with attention to terminology, response burden, and sequence of questions. Experts agreed the survey captured a wide range of factors that impacted prescribing and suggested changes to response scales. For example, behaviour and belief questions were converted from a seven to five point scale and the "very poor" to "very good fit" scale was converted to a "strong barrier" to "strong support" scale. Additional feedback was gathered on questionnaire flow, wording, and length. A detailed description of changes for each question is available in online Appendix 1.

Cognitive Interviews

Ten pharmacists (three from community practice, three from hospital practice, two in primary care or ambulatory team practice, and two from continuing care) participated in cognitive interviews for survey feedback. Overall, they took on the role of interpreting the questions as a pharmacist who would work in their current setting. They were not expected to interpret the survey instrument or provide feedback on settings other than their own. This resulted in clarified terminology, expanded response options, verified understanding of intended constructs, standardized recall periods, and removed or revised unclear response options and questions. The Alberta College of Pharmacists' (i.e., provincial regulatory association) categories of prescribing (e.g., adapt, provide emergency supply, or initiate/manage therapy) was repeated throughout the instrument to ensure consistency and clarity. Questions on the innovation from Pronk *et al.*[9], adopter receptivity to change[8], and influences on "not prescribing" were removed, as they were problematic for respondents. Belief response scales were reverted to 7-point scales to allow for more options. Finally, the survey

Table 3. Pharmacist Responses to purpose of using EHR* (Main Survey)

	N	Mean	SD	Scale Mean (SD)
Use of EHR** (Netcare) To look up:				
Demographic information including personal health care numbers (number from Alberta Health card)	333	3.83	1.22	Technical Use 3.90 (0.11)
Double doctoring or multiple pharmacies	332	3.98	0.96	
Medical history such as diagnostic tests and discharge or admission history	335	3.52	1.28	Patient Care 3.88 (0.32)
Lab values	337	3.98	1.12	
Medication history/allergies/refills including Pharmaceutical Information Network	337	4.13	0.90	
Valid N (listwise)	323			

*Response options: 1=Not at all, 2=Rarely, I use another system, 3=Rarely, 4= Occasionally, 5=Routinely
**Electronic Health Record

Table 4. Factor Analysis of Main Survey

Construct	Number of items	Kaiser–Meyer–Olkin	Number of Removed items*	Factors having >1 Eigenvalue	Scales and number of loaded items	Explained variance (%)	Cronbach's alpha
Self-efficacy	6	0.85	0	1	Prescribing Self-Efficacy(6)	65	0.89
Support from Practice	9	0.85	2	2	Practice Environment (5) Interprofessional Relationships (2)	41 10	0.78 0.85
Impact on Practice	9	0.74	3	2	Professionalism (3) Patient Care (3)	49 22	0.76 0.78
Prescribing beliefs	5	0.61	2	1	Prescribing Beliefs (3)	33	0.58
Use of EHR**	5	0.67	0	2	Technical Use (2) Patient Care (3)	27 43	0.51 0.80

Further details of the factors analysis are available in Appendix 2.
* Removed due to due to weak correlation (<0.3) with other scale items
**Electronic Health Record

was routed to ensure pharmacists who did not provide patient care did not answer questions on self-efficacy. Further details are available in online Appendix 1.

Pilot Survey

The pre-incentive letter was sent to 100 pharmacists. Two pharmacists were deemed ineligible (self-reported ineligibility to participate due to retirement and health reasons). Fifty-six pharmacists completed the online survey instrument and 52 pharmacists provided direct patient care. The response rate for this pilot study was 57.1%. The telephone reminder prompted up to 14 pharmacists (25% of final respondents) to complete the survey; the telephone survey was retained in the main survey. Based on the research team's review of the pilot data, the research team refined ambiguous questions and identified question routing issues based on respondent characteristics. To ensure all scales had sufficient items, three questions were added to support for prescribing (i.e., education and training, requirement to document, and employers' expectations) and two response items were added to the prescribing belief scale (i.e., avoid physician and extend one refill only). Upon inspection of responses, three redundant items were removed from the impact on practice (i.e., time with physicians, time and quality of relationships with other health care professionals) and one item was removed from prescribing beliefs (i.e., physician's responsibility for medication supply). Time for documentation was moved from an "impact" to a "support" question.

Main Survey

Of the 700 pharmacists who were invited on April 19, 2013, eight were deemed ineligible (e.g., not renewing their practice license) for a total of 692 eligible pharmacists. The majority of pharmacists (n=307, 81% of total respondents) responded after the third e-mail reminder (Figure 1). To increase the completion rate, a telephone call was made to the 385 non-respondents and the nine pharmacists who had incomplete surveys. Contact was made by the second call attempt for the majority of the pharmacists (n=331; 84.0% of telephone calls). Twenty-four pharmacists requested the email invitation be sent to them again including five who provided an alternate email address. From the start of the telephone reminders to the end of the data collection, pharmacists completed seventy-one surveys online. Almost one-third of those 71 online surveys were completed by pharmacists who had indicated during the telephone reminder that they would be willing to participate (n=46/71; 64.8%). Overall, three hundred and seventy-eight pharmacists completed the online survey instrument for a response rate of 54.6%. Pharmacists were predominately female (71.2%), full time (67.5%), working in a community pharmacy (76.7%), and working in larger urban centres (57.3%); 14% earned their initial pharmacy degree outside of Canada.[14]

During the telephone reminder, 40 (46.5%) of the 86 pharmacists who did not intend to do the online survey agreed to answer ten questions on their prescribing in the telephone reminder interview. Of the 40 of 86 pharmacists who did not intend to do the online survey instrument but completed the brief telephone questions, one had APA (2.5%) and 34 (85%) prescribed in the last year in comparison with 6.3% and 93% of online respondents respectively.[9] These pharmacists used prescribing in multiple ways with 34 (100%) prescribing for continuity of care and 30 (82.4%) prescribing to adapt therapy which again were similar to the main survey with 93.4% and 80.6% respectively.[9]

Factor Analysis

Exploratory factor analysis of self-efficacy belief, support from practice, impact on practice, prescribing belief scales and EHR use resulted in eight factors (Table 4). Details on the components, eigenvalues factor loadings and matrix structure can be found in Appendix 2. Six questions on self-efficacy belief scale were loaded on one factor with Cronbach's alpha >0.70 and represented pharmacists' self-efficacy toward prescribing. Two reliable factors from nine questions on support from practice were identified-practice environment (i.e., five questions) and interprofessional relationships (i.e., two questions). Two items were dropped as they had low factor loadings and conceptually did not fit with the other practice environment items. There were nine questions about the impact on practice, and three questions were excluded due to weak correlation with other scale questions. The remaining questions were loaded on two factors - professionalism and patient care having three questions each. Two out of five questions on prescribing belief were correlated weakly with other questions (<0.30). The remaining three questions were loaded on one factor representing prescribing beliefs (Cronbach's alpha=0.58). (Table 4) The five questions on use of EHR were loaded on

https://doi.org/10.18549/PharmPract.2018.01.1068

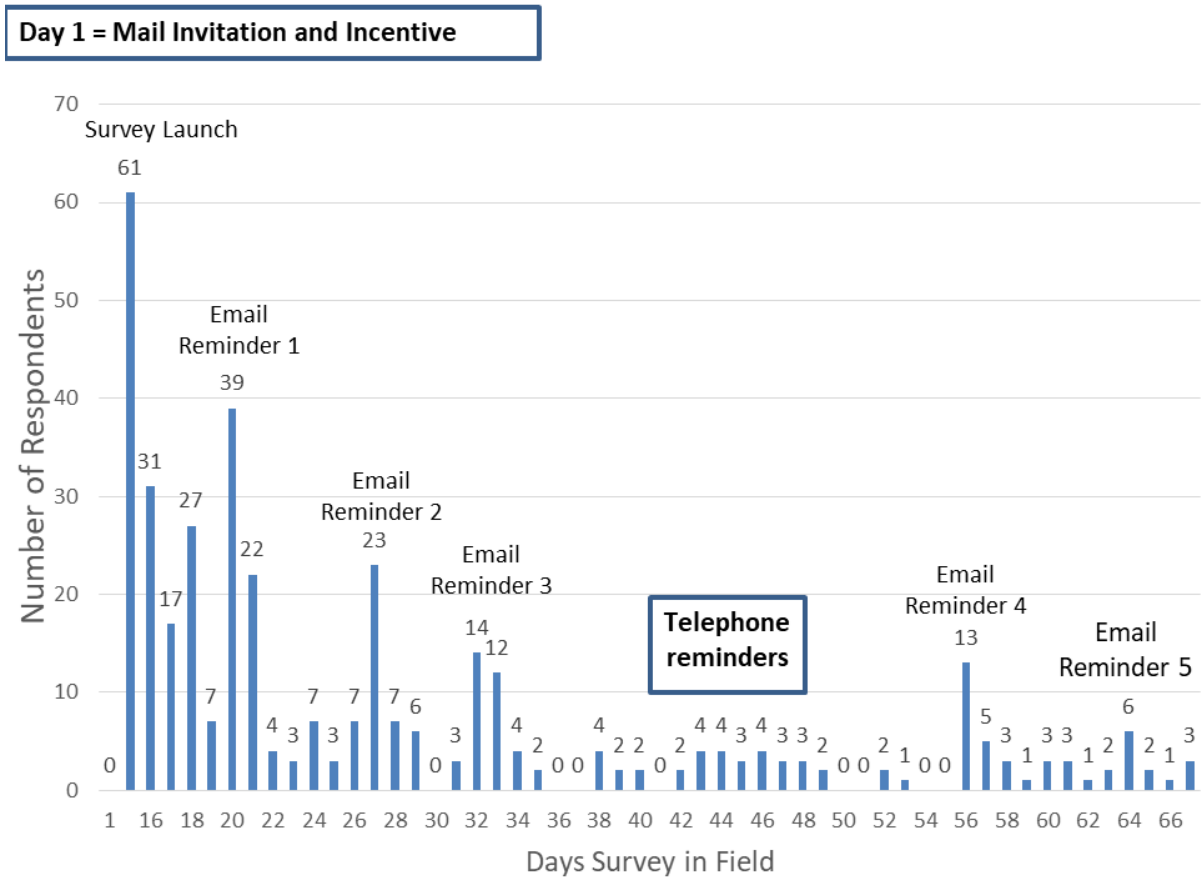

Figure 1. Number of Completed Online Survey by Days in Field and Data Collection Procedure

two factors technical (Cronbach's alpha=0.51) and patient care (Cronbach's alpha=0.80).

Description of Scales

Pharmacists' self-efficacy toward prescribing was moderate, with a mean of 2.66 and a standard deviation of 0.66 on a five-point scale. Looking at questions on the impact of prescribing on practice, pharmacists reported prescribing increased both patient care (mean=3.95, SD=0.11) and professionalism (mean=3.72, SD=0.39). Both practice environment (mean=3.56, SD=0.28) and interprofessional relationships (mean=3.41, SD=0.10) had a mean score between no impact and weak support for pharmacists' adoption of prescribing. Respondents with and without a patient care practice (n=378) scored a mean of 5.09 and a standard deviation of 0.71 on the prescribing beliefs on a seven-point scale meaning overall they agree with reasons to avoid prescribing. Pharmacists reported using the EHR occasionally for both technical (3.90 SD=0.11) and patient care (3.88 SD=0.32) purposes.

DISCUSSION

A survey instrument was developed to explore factors impacting pharmacists' adoption of prescribing. The instrument had 27 questions with eight scales: self-efficacy, support from practice (i.e., practice environment and interprofessional relationship), impact on practice (i.e., professionalism and patient care), prescribing beliefs, and use of the EHR (i.e., technical and patient care). Prescribing beliefs and use of the EHR for patient care had limited evidence for validity and reliability while the remaining six scales had strong evidence for reliability and validity. The prescribing beliefs scale items only predicted 33% of the variance; whereas other scales explained between 57% and 70% of scale variance.

Prior qualitative research on the use of prescribing in Alberta allowed for the selection of meaningful constructs to measure factors impacting prescribing and language to richly describe how pharmacists came to understand and incorporate prescribing into patient care.[5,10] First, the practice environment shaped patient care which in turn shaped pharmacists' use of prescribing. Prescribing itself did not drive practice change.[5] Thus, questions related to support in the practice setting, use of the EHR, and benefits in the environment were included. Second, prescribing belief questions on the importance of the patients' responsibility to ensuring a sufficient supply of medications as well as the belief that pharmacists should only extend refills once came directly from the pharmacist interviews.

Expert stakeholder feedback ensured the range of factors which influences practice were operationalized. Pharmacist cognitive interviews provided evidence for face validity as well as the understandability and readability of the questions. Confusion over the definition of prescribing during the cognitive interview reflected the findings that pharmacists had a diverse and context-specific definition of prescribing.[4,16] Consequently, the definition of prescribing was repeated throughout the survey instrument.

Low response rates for surveys of health care professionals are common.[17,18] Recent response rates for pharmacist surveys in Canada have been reported at 10%,19 13%,20 and 23%.21 Our higher response rate of 57% and low level of dropouts may be explained using social exchange theory which posits that pharmacists will weigh the rewards, costs, and their trust toward the researchers when deciding to participate in a survey.[12,18] Rewards were provided in the form of a monetary incentive, asking for pharmacist opinions whether they prescribe or not, and informing pharmacists that they were randomly selected to participate.[22] The costs to pharmacists were reduced by e-mailing personalized links, ensuring responders were not contacted for follow-up, and tailoring questions to respondents (i.e., practice setting and prescribing status) to reduce questions not applicable to a respondent. The incentive and invitation letter were provided in advance via post to increase trust. Finally, the use of both telephone and e-mail reminders served to increase the response rate. Available information from non-responders who agreed to complete a brief telephone survey found similar prescribing behaviours.

The item analysis generated evidence for scale validity and reliability. Exploratory factor analysis allowed for the removal of items with weak scale ties and confirmed the structure of the scales; thus providing evidence for construct validity. The prescribing beliefs and use of the EHR for patient care had insufficient validity and will require future addition of items or revisions of existing questions. For example, the item “Pharmacists should only extend refills once” had lower loading on prescribing beliefs’ scale and may be dropped if further analyses confirm an inadequate fit. The remaining six scales had strong evidence for reliability and validity.

With careful attention to survey instrument design as well as funding for participant incentives, survey research can produce a reasonable response rate. The proliferation of online survey tools has made surveys an accessible research tool and given a false illusion that conducting survey research is straightforward. Careful consideration of questionnaire development, design, psychometric properties, and recruitment is time-consuming, yet has remained critical to ensure representative results.

As these are original scales for nascent prescribing activities, direct comparisons are not available. Pharmacists’ self-efficacy was moderate and similar to that of pharmacists’ adoption of new smoking cessation services.[23] Pharmacists reported feeling that prescribing increased both professionalism and patient care in their practice with similar findings in qualitative research.[24,25] Practice environment and physician relationships are common barriers to prescribing.[4,26] Yet, pharmacists reported between no impact and weak support which was more positive than anticipated. Pharmacists in this study had up to six years to experience prescribing and may have found ways to collaborate with physicians or conversely physicians may have become accustomed to pharmacist prescribing. Pharmacists’ use of the EHR appeared in line with our prior work on pharmacists’ adoption of this system.[27]

A questionnaire was developed to measure factors which may influence pharmacists’ adoption of prescribing including self-efficacy, impact on practice, supports, and potential prescribing beliefs. As prescribing models in Canada, the UK, US, and other countries vary, this tool may need adaption to local needs.

Our survey instrument may aid in conducting research to understand how pharmacists have integrated prescribing into practice and serve as a catalyst to support the widespread uptake of pharmacists’ use of prescribing. By identifying factors which influence adoption of prescribing, it may enable future research and interventions aimed at increasing adoption as a means of enhancing direct patient care by pharmacists and patient outcomes. Results may also be useful in assessing pharmacy education curriculum changes that are necessary to prepare students to incorporate prescribing into their practice.

Limitations

This study has several limitations which should be considered when extrapolating these results. Pharmacists in Alberta have a broad range of prescribing activities which allowed for the efficient study of m but this may limit generalizability to other jurisdictions. The prescribing beliefs scale has low reliability, and further research is needed to develop this scale. The incentive was not randomized; thus the response rate cannot be directly attributed to the incentive. Finally, these findings are from a 2013 survey, so while the tool is applicable, the findings represent adoption of prescribing at that time.

CONCLUSIONS

Engagement of stakeholders, experts, and pharmacists contributed to the creation of a 27-item measure of factors impacting pharmacists’ prescribing: self-efficacy toward prescribing, prescribing beliefs, support from practice, use of the EHR and benefits to practice. A high response rate was achieved with the use of a pre-survey incentive and online survey administration results in efficient tailoring of the survey navigation for each participant. The prescribing beliefs and use of the EHR had some evidence for validity and reliability while the remaining six scales had strong evidence for reliability and validity. This survey instrument may help researchers, policy makers, and educators understand what influences the uptake of prescribing and allow for the development of interventions to enhance adoption of prescribing and direct patient care by pharmacists.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

FUNDING

Funding was provided by the Canadian Foundation for Pharmacy: Innovation Fund and the Alberta College of Pharmacists.

References

1. Hill JD, Hill JM, Gentile NJ. A review of state pharmacist collaborative practice laws. Am J Health Syst Pharm. 2016;73(18):1467-1472. doi: 10.2146/ajhp160269
2. Cope LC, Abuzour AS, Tully MP. Nonmedical prescribing: where are we now? Ther Adv Drug Saf. 2016;7(4):165-172. doi: 10.1177/2042098616646726
3. Law MR, Ma T, Fisher J, Sketris IS. Independent pharmacist prescribing in Canada. Can Pharm J (Ott). 2012;145(1):17-23. doi: 10.3821/1913-701X-145.1.17
4. Weiss MC, Sutton J. The changing nature of prescribing: Pharmacists as prescribers and challenges to medical dominance. Sociol Health Illn. 2009;31(3):406-421. doi: 10.1111/j.1467-9566.2008.01142.x
5. Makowsky MJ, Guirguis LM, Hughes CA, Sadowski CA, Yuksel N. Factors influencing pharmacists' adoption of prescribing: Qualitative application of the diffusion of innovations theory. Implement Sci. 2013;8:109. doi: 10.1186/1748-5908-8-109
6. Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in service organizations: Systematic review and recommendations. Milbank Q. 2004;82(4):581-629. doi: 10.1111/j.0887-378X.2004.00325.x
7. Latter S, Maben J, Myall M, Young A. Evaluating nurse prescribers' education and continuing professional development for independent prescribing practice: Findings from a national survey in England. Nurse Educ Today. 2007;27(7):685-696. doi: 10.1016/j.nedt.2006.10.002
8. Westrick SC, Mount JK. Impact of perceived innovation characteristics on adoption of pharmacy-based in-house immunization services. Int J Pharm Pract. 2009;17(1):39-46. doi: 10.1211/ijpp.17.1.0006
9. Pronk MC, Blom LT, Jonkers R, Rogers EM, Bakker A, de Blaey KJ.. Patient oriented activities in Dutch community pharmacy: Diffusion of innovations. Pharm World Sci. 2002;24(4):154-161.
10. Guirguis LM, Makowsky MJ, Hughes CA, Sadowski CA, Yuksel N. How have pharmacists in different practice settings integrated prescribing privileges into practice in alberta? A qualitative exploration. J Clin Pharm Ther. 2014;39(4):390-398. doi: 10.1111/jcpt.12165
11. Guirguis LM, Hughes CA, Makowsky MJ. Sadowski CA, Schindel TJ, Yuksel N. Survey of pharmacist prescribing practices in Alberta. Am J Health Syst Pharm. 2017;74(2):62-69. doi: 10.2146/ajhp150349
12. Dillman DA, Christian LM, Smyth JD. Internet, mail, and mixed-mode surveys. 3rd ed. Hoboken, NJ: Wiley; 2009.
13. Sample size calculations for the modular grant application process outcome evaluation study. Available at: https://grants.nih.gov/grants/funding/modular/eval/sample_mgap.doc (accessed Oct 3, 2017).
14. Tabachnick BG, Fidell LS. Using multivariate statistics. 6th ed. Boston: Pearson/Allyn and Bacon; 2013.
15. Bland JM, Altman DG Statistics notes: Cronbach's alpha. Br Med J. 1997;314(7080):572.
16. Hughes CA, Makowsky M, Sadowski CA, Schindel TJ, Yuksel N, Guirguis LM. What prescribing means to pharmacists: A qualitative exploration of practising pharmacists in Alberta. Int J Pharm Pract. 2014;22(4):283-291.
17. Cook JV, Dickinson HO, Eccles MP. Response rates in postal surveys of healthcare professionals between 1996 and 2005: An observational study. BMC Health Serv Res. 2009;9:160. doi: 10.1186/1472-6963-9-160
18. Burke M, Hodgins M. Is 'dear colleague' enough? improving response rates in surveys of healthcare professionals. Nurse Res. 2015;23(1):8-15. doi: 10.7748/nr.23.1.8.e1339
19. Schindel TJ, Yuksel N, Breault R, Daniels J, Varnhagen S, Hughes CA. Perceptions of pharmacists' roles in an era of expanding scopes of practice. Res Social Adm Pharm. 2017;13(1):148-161. doi: 10.1016/j.sapharm.2016.02.007
20. Patel T, Chang F, Mohammed HT, Raman-Wilms L, Jurcic J, Khan A, Sproule B. Knowledge, perceptions and attitudes toward chronic pain and its management: A cross-sectional survey of frontline pharmacists in Ontario, Canada. PLoS One. 2016;11(6):e0157151. doi: 10.1371/journal.pone.0157151
21. Tsao NW, Lynd LD, Gastonguay L, Li K, Nakagawa B, Marra CA. Factors associated with pharmacists' perceptions of their working conditions and safety and effectiveness of patient care. Can Pharm J (Ott). 2016;149(1):18-27. doi: 10.1177/1715163515617777
22. Pit SW, Vo T, Pyakurel S. The effectiveness of recruitment strategies on general practitioner's survey response rates - a systematic review. BMC Med Res Methodol. 2014;14:76. doi: 10.1186/1471-2288-14-76
23. Martin BA, Bruskiewitz RH, Chewning BA. Effect of a tobacco cessation continuing professional education program on pharmacists' confidence, skills, and practice-change behaviors. J Am Pharm Assoc (2003). 2010;50(1):9-16. doi: 10.1331/JAPhA.2010.09034
24. Tann J, Blenkinsopp A, Grime J, Evans A. The great boundary crossing: Perceptions on training pharmacists as supplementary prescribers in the UK. Health Educ J. 2010;69(2):183-191. doi: 10.1177/0017896910363300
25. Stewart DC, George J, Bond CM, Diack HL, McCaig DJ, Cunningham S. Views of pharmacist prescribers, doctors and patients on pharmacist prescribing implementation. Int J Pharm Pract. 2009;17(2):89-94. doi: 10.1211/ijpp.17.02.0003
26. Lloyd F, Parsons C, Hughes CM. 'It's showed me the skills that he has': Pharmacists' and mentors' views on pharmacist supplementary prescribing. Int J Pharm Pract. 2010;18(1):29-36. doi: 10.1211/ijpp.18.01.0006
27. Hughes CA, Guirguis LM, Wong T, Ng K, Ing L, Fisher K. Influence of pharmacy practice on community pharmacists' integration of medication and lab value information from electronic health records. J Am Pharm Assoc (2003). 2011;51(5):591-598. doi: 10.1331/JAPhA.2011.10085