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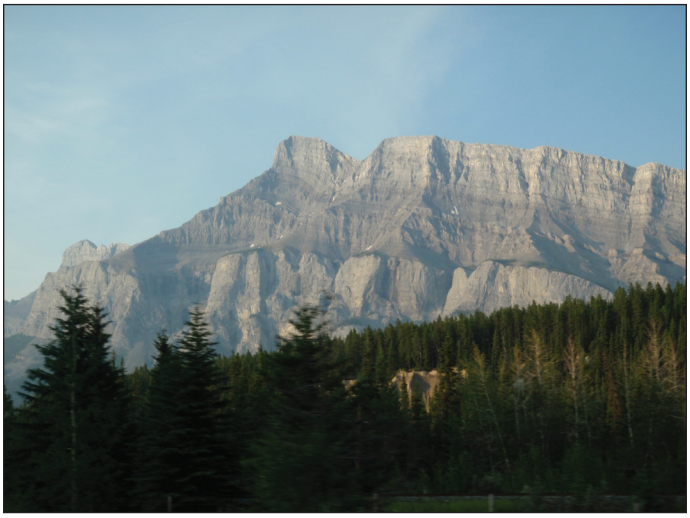

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Research Conducted by Hospital Pharmacists: Integral Component of Daily Practice or Unrealistic Expectation?

James E Tisdale

In bygone eras, the role of the hospital pharmacist in research was generally limited to coordinating the distribution of investigational drugs for clinical studies.[1] In recent years, however, many hospital pharmacists have engaged in research more directly, as principal investigators or co-investigators on pharmacokinetic or drug interaction studies, practice-based research, stability and compatibility studies, and other types of investigations, including randomized clinical trials. This journal is devoted largely to publishing the results of research generated by hospital pharmacists. However, research is time-consuming, requires skills not generally taught in faculties of pharmacy, and, in many hospital pharmacy departments, is not directly rewarded or incentivized.

Is it important for hospital pharmacists to conduct research, or participate in research studies? Hospital pharmacists are already quite busy taking care of patients and participating in teaching and administrative activities. Why not leave research to academicians? Is it realistic for hospital pharmacists to participate in research in a meaningful way? Do hospital pharmacists want to participate in research at all?

In the current issue of the *Canadian Journal of Hospital Pharmacy* (*CJHP*), Lee and others[2] report the results of a survey study that characterized the involvement of hospital pharmacists in clinical pharmacy research and identified perceived barriers to conducting research. Nearly 90% of the hospital pharmacists surveyed expressed interest in conducting research, and more than three-quarters of the respondents reported having participated in research already, in a median of 3 projects within the preceding 5 years. The majority of research projects conducted by respondents to this survey were medical record reviews and surveys, rather than investigator-initiated prospective observational or interventional studies. The most common research-related activities performed by study participants were data analysis and presentation of research results. Survey respondents indicated confidence in performing research-related activities such as literature evaluation and hypothesis generation; in contrast, more than 80% identified statistical analysis as a weakness. The primary motivating factor for participation in research was personal interest, though roughly half of the respondents indicated that research was also a component of their job requirements.

The respondents identified some major barriers to conducting research. Not surprisingly, lack of dedicated time for research and competing workload priorities were cited by about 90% of study participants. Interestingly, participants did not identify lack of formal research training as a weakness or barrier to conducting research, except in the area of statistical analysis.

Limitations of the study include biases typical of survey research; notably, a relatively high proportion of the survey respondents claimed prior research experience, which may not be true of the general population of hospital pharmacists. Nonetheless, the study results are informative: many hospital pharmacists are keenly interested in participating in research, but lack the time to do so and have competing priorities. Information is limited regarding the proportion of other hospital-based non-academic health care professionals (physicians, nurses, others) actively participating in research, but it would not be surprising to learn that their degree of participation, their motivations, and their barriers are similar to those of hospital pharmacists.

As to the question of whether it is important for hospital pharmacists to participate in research, several pharmacy and other health care organizations have expressed the view that research is indeed an integral component of pharmacy practice. More than 25 years ago, the American Society of Hospital Pharmacists (now the American Society of Health-System

Pharmacists) issued a statement encouraging pharmacists in organized health care settings to increase their involvement in various types of research, including clinical investigations, health services research, development and testing of new drug dosage forms and new methods and systems of drug preparation and administration, and operations research, such as time-and-motion studies and the evaluation of new and existing pharmacy programs and services (i.e., practice-based research).[3] The American College of Clinical Pharmacy (ACCP) believes that research and scholarship are primary components of the standards of practice for clinical pharmacists.[4] A 2006 policy statement from the American Public Health Association expresses "the need and opportunity for public health and pharmacy professions to work in collaboration to conduct valuable research."[5] In the United States, the National Association of Boards of Pharmacy includes "drug or drug-related research" in its definition of the practice of pharmacy, and the Council on Credentialing in Pharmacy lists "participating in research activities" as a domain of pharmacy practice.[6] The Canadian Society of Hospital Pharmacists (CSHP) states clearly that the organization "embraces and recognizes research as an integral component of pharmacy practice and encourages members to support, participate and initiate research activities."[7] Other editorials in the *CJHP* have called for increasing involvement of Canadian hospital pharmacists in research and publication.[8,9] There seems to be no question that research is considered a fundamental component of the practice of hospital pharmacy.

How, then, to overcome the barriers to research faced by hospital pharmacists? The issues of time allocation and competing priorities are not easily surmountable. In an ideal world, hospital pharmacy departments would provide protected research time for pharmacists, but this may not be feasible. However, incentives for hospital pharmacists to participate in research could be created by hospital pharmacy departments through merit salary programs or professional development programs in which participation in research is one of the criteria considered for salary increases and/or promotion. In addition, hospital pharmacy departments could incentivize research by providing travel funds to pharmacists who are presenting research at national meetings. Hospital pharmacists with a keen interest in research could partner with more experienced investigators to assist with ongoing or planned research studies; this may lead to positive consequences such as spinning off a component of the study for the pharmacist to manage, continued future collaborations with the investigators, and expanded experience with research that might lead to independent investigations. In addition, health-systems and/or professional organizations could develop mentored research training programs or send pharmacists to participate in existing programs, such as those developed by the ACCP.[10]

The survey study reported by Lee and others[2] underscores the desire of hospital pharmacists to participate in research and reveals their motivations and some perceived barriers. Opportunities exist for pharmacists to participate in a broad variety of clinically important research. Hospital pharmacists' interest in participating in research is welcome, and bodes well for the future of hospital pharmacist–directed research.

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La recherche réalisée par les pharmaciens d'hôpitaux : une composante indispensable de la pratique quotidienne ou une attente irréaliste?

par James E. Tisdale

Jadis, le rôle des pharmaciens d'hôpitaux en recherche se limitait généralement à coordonner la distribution de médicaments de recherche aux fins d'études cliniques[1]. Cependant, au cours des dernières années, bon nombre de pharmaciens d'hôpitaux ont pris part à la recherche de manière plus directe : en tant qu'investigateurs principaux ou co-investigateurs d'études sur la pharmacocinétique ou les interactions médicamenteuses, de recherches fondées sur la pratique, d'études de compatibilité et de stabilité et d'autres types d'investigations, dont les essais cliniques à répartition aléatoire. Le présent journal sert en grande partie à publier les résultats de recherches produits par les pharmaciens d'hôpitaux. Mais la recherche exige du temps, des habiletés qui ne sont pas généralement enseignées dans les facultés de pharmacie et, dans bien des services de pharmacie d'hôpitaux, elle n'est pas directement récompensée ou encouragée.

Mais, est-il important pour les pharmaciens d'hôpitaux de faire de la recherche ou de prendre part à des études? Ils sont déjà très occupés à prendre soin des patients et à participer à l'enseignement et aux tâches administratives. Pourquoi ne pas laisser la recherche aux universitaires? Est-ce raisonnable de demander aux pharmaciens d'hôpitaux un apport significatif à la recherche? D'ailleurs, souhaitent-ils en faire?

Dans ce numéro du *Journal canadien de la pharmacie hospitalière* (JCPH), Lee et collab.[2] présentent les résultats d'une étude par sondage qui dressent le portrait de la participation des pharmaciens d'hôpitaux en recherche sur la pharmacie clinique et qui recensent les éléments perçus comme des obstacles à s'engager en recherche. Près de 90 % des pharmaciens d'hôpitaux sondés ont manifesté leur intérêt à faire de la recherche et plus des trois quarts des répondants ont indiqué avoir déjà pris part à des recherches, la médiane étant de trois projets au cours des cinq années précédentes. La majorité des projets de recherche réalisés par les répondants étaient des analyses de dossiers médicaux et des sondages plutôt que des études prospectives observationnelles ou interventionnelles entreprises par les chercheurs. Les activités liées à la recherche le plus fréquemment réalisées par les participants à l'étude étaient l'analyse des données et la présentation de résultats de recherche. Les répondants ont affirmé se sentir confiants pour évaluer la littérature et générer des hypothèses en vue de recherches. Par contre, plus de 80 % ont signalé l'analyse statistique comme un point faible. Le principal facteur de motivation à participer à la recherche était l'intérêt personnel, mais environ la moitié des répondants ont indiqué que la recherche était aussi une exigence de leur travail.

Les répondants ont déterminé quelques importants obstacles à s'engager en recherche. Sans grande surprise, les priorités concurrentes du travail et le manque de temps réservé à la recherche ont été soulignés par près de 90 % des participants à l'étude. Fait intéressant, ils n'ont pas indiqué que l'absence de formation en recherche était une faiblesse ou un obstacle, sauf dans le domaine de l'analyse statistique.

Parmi les limites de l'étude, on compte des biais typiques aux études par sondages; notamment, une proportion relativement importante de répondants affirmaient avoir déjà fait de la recherche, ce qui pourrait ne pas être vrai pour les pharmaciens hospitaliers en général. Néanmoins, les résultats de l'étude sont instructifs : bon nombre de pharmaciens d'hôpitaux souhaitent ardemment réaliser de la recherche, mais ils n'ont pas le temps suffisant pour le faire et se butent à des priorités concurrentes. Il n'y a que peu de données sur la proportion des autres professionnels de la santé (personnel médical et infirmier ou autre) travaillant en hôpital et ne relevant pas d'une université qui sont actifs en recherche, mais il ne serait pas étonnant d'apprendre que leur degré de participation, leurs motivations et les obstacles qu'ils rencontrent sont semblables à ceux des pharmaciens d'hôpitaux.

Pour ce qui est de savoir s'il est important pour les pharmaciens d'hôpitaux de faire de la recherche, plusieurs organismes de pharmacie et d'autres soins de santé ont affirmé que la recherche est en effet un élément indispensable de la pratique de la pharmacie. Il y a plus de 25 ans, l'American Society

of Hospital Pharmacists (maintenant appelée l'American Society of Health-System Pharmacists) a publié une déclaration encourageant les pharmaciens au sein des établissements de santé à participer davantage à divers types de recherche, dont la recherche clinique, la recherche sur les services en santé, le développement et l'évaluation de nouvelles formes pharmaceutiques et de nouvelles méthodes et nouveaux systèmes de préparation et d'administration des médicaments, et la recherche opérationnelle comme les études des temps et mouvements et l'évaluation de programmes et de services de pharmacie présents et nouveaux (c'est-à-dire la recherche fondée sur la pratique)[3]. Selon l'American College of Clinical Pharmacy (ACCP), les travaux de recherche et d'érudition sont des éléments principaux des normes de pratique pour les pharmaciens cliniciens[4]. Dans une déclaration diffusée en 2006 par l'American Public Health Association, on exprime « le besoin et l'occasion pour les professions de pharmacie et de santé publique de collaborer à la réalisation de précieuses recherches » [traduction libre][5]. Aux États-Unis, la National Association of Boards of Pharmacy inclut la « recherche sur les médicaments ou en lien avec eux » dans sa définition de la pratique de la pharmacie et le Council on Credentialing in Pharmacy indique que la « participation aux activités de recherche » est un domaine de la pratique de la pharmacie[6]. La Société canadienne des pharmaciens d'hôpitaux (SCPH) énonce clairement qu'elle « est en faveur de la recherche et reconnaît qu'elle fait partie intégrante de la pratique de la pharmacie [et que] c'est pourquoi elle encourage ses membres à soutenir les activités de recherche, à entreprendre de tels projets et à y participer »[7]. D'autres éditoriaux du JCPH ont appelé les pharmaciens d'hôpitaux du Canada à participer davantage à la recherche et à publier encore plus[8,9]. Il semble hors de tout doute que la recherche est considérée comme un élément essentiel de la pratique de la pharmacie hospitalière.

Mais alors, comment surmonter les obstacles à la recherche qui se dressent devant les pharmaciens d'hôpitaux? Les problèmes de temps et de priorités concurrentes ne sont pas faciles à surmonter. Dans un monde idéal, les services de pharmacie des hôpitaux réserveraient du temps de recherche aux pharmaciens, mais cela est peut-être irréalisable. Cependant, des moyens incitant les pharmaciens d'hôpitaux à participer à des recherches pourraient être mis en place par les services de pharmacie hospitalière grâce à des programmes de rémunération au mérite ou des programmes de perfectionnement professionnel pour lesquels la participation à des recherches serait l'un des critères pris en compte pour une augmentation salariale ou une promotion. De plus, les services de pharmacie hospitalière pourraient rendre la recherche attrayante en octroyant des indemnités de déplacement aux pharmaciens qui présentent leurs travaux de recherche à des congrès nationaux. Les pharmaciens d'hôpitaux dotés d'un intérêt marqué pour la recherche pourraient faire équipe avec des chercheurs plus expérimentés pour appuyer les études en cours ou à venir. Cela pourrait mener à des effets positifs comme céder la responsabilité d'un élément de l'étude à un pharmacien, entretenir des collaborations futures avec les chercheurs et acquérir une plus grande expérience en recherche qui pourrait mener à des travaux indépendants. Qui plus est, les organismes des systèmes de santé ou les organismes professionnels pourraient mettre au point des programmes de formation en recherche avec mentor ou envoyer des pharmaciens participer à des programmes déjà en place comme ceux élaborés par l'ACCP[10].

L'étude par sondage de Lee et collab.[2] met en évidence le désir des pharmaciens d'hôpitaux de participer à la recherche et révèle leurs motivations ainsi que certains éléments perçus comme des obstacles. Les pharmaciens ont l'occasion de participer à une large gamme de recherches cliniquement importantes. L'intérêt manifesté par les pharmaciens d'hôpitaux à participer en recherche est opportun et augure bien pour l'avenir de la recherche dirigée par les pharmaciens d'hôpitaux.

[Traduction par l'éditeur]

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ORIGINAL RESEARCH

Evaluation of Standardization of Transfer of Accountability between Inpatient Pharmacists

Vivian Tsoi, Norman Dewhurst, and Elaine Tom

ABSTRACT

Background: A compelling body of evidence supports the notion that transfer of accountability (TOA) improves communication, continuity of care, and patient safety. TOA involves the transmission and receipt of information between clinicians at each transition of care. Without a notification system alerting pharmacists to patient transfers, pharmacists' ability to seek out and complete TOA may be hindered. A standardized policy and process for TOA, with automated workflow, was implemented at the study hospital in 2015, to ensure consistency and timeliness of documentation by pharmacists.

Objective: To evaluate pharmacists' adherence to and satisfaction with the TOA policy and process.

Methods: A retrospective audit was conducted, using a random sample of individuals who were inpatients between June 2014 and February 2016. Transition points for TOA were identified, and the computerized pharmacy system was reviewed to determine whether TOA had been documented at each transition point. After the audit, an online survey was distributed to assess pharmacists' response to and satisfaction with the TOA policy and workflow.

Results: Before the TOA workflow was implemented, TOA documentation by pharmacists ranged from 11% (10/93) to 43% (48/111) of transitions. Eight months after implementation of the workflow, the rate of TOA documentation was 87% (68/78), exceeding the institution's target of 70%. Of the 32 pharmacists surveyed, most were satisfied with the TOA policy and agreed that the standardized workflow was simple to use, increased the number of TOAs provided and received, and improved the quality of completed TOAs. Respondents also indicated that the TOA workflow had improved patient care (mean score 4.09/5, standard deviation 0.64).

Conclusions: The standardized TOA policy and process were well received by pharmacists, and resulted in consistent TOA documentation and a TOA documentation rate that exceeded the institutional target.

Keywords: transfer of accountability, standardization, policy, documentation, pharmacist

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RÉSUMÉ

Contexte : Un nombre imposant de données probantes viennent appuyer l'idée que le transfert de responsabilité (TDR) améliore la communication, la continuité des soins et la sécurité des patients. Le TDR consiste en la transmission et la réception d'information entre cliniciens à chaque transfert des soins. Sans système de notification informant les pharmaciens d'un transfert de patient, leur capacité de trouver et de réaliser un TDR pourrait être restreinte. Une politique et un processus normalisés de TDR, comprenant une automatisation du flux de travaux, ont été mis en place en 2015 dans l'hôpital à l'étude afin d'assurer que la consignation par les pharmaciens soit uniforme et opportune.

Objectif : Évaluer dans quelle mesure les pharmaciens respectent la politique et le processus de TDR, et en sont satisfaits.

Méthodes : Un audit rétrospectif a été mené à l'aide d'un échantillon aléatoire composé de patients hospitalisés entre juin 2014 et février 2016. Les points de transition pour le TDR ont été recensés et le système informatique de la pharmacie a été consulté pour déterminer si le TDR avait été consigné à chaque point de transition. Après l'audit, un sondage en ligne a été envoyé aux pharmaciens pour évaluer leurs réactions à l'égard de la politique de TDR ainsi que du flux de travaux correspondant et pour connaître leur degré de satisfaction.

Résultats : Avant la mise en place du flux de travaux associé au TDR, la fréquence de consignation du TDR par les pharmaciens variait entre 11 % (10/93) et 43 % (48/111) des transitions. Huit mois après la mise en place du flux de travaux, le taux était de 87 % (68/78), dépassant ainsi la cible de 70 % fixée par l'établissement. Parmi les 32 pharmaciens sondés, la plupart étaient satisfaits de la politique de TDR et ils estimaient que le flux de travaux normalisé était simple à suivre, qu'il augmentait le nombre de TDR reçus et fournis et qu'il améliorait la qualité des TDR menés à terme. Les pharmaciens ont aussi indiqué que le flux de travaux associé au TDR avait amélioré les soins aux patients (score moyen de 4,09/5, écart-type de 0,64).

Conclusions : La politique et le processus normalisés de TDR ont été bien reçus par les pharmaciens et ont permis d'obtenir une harmonisation de la consignation du TDR et un taux de consignation du TDR qui dépassait la cible de l'établissement.

Mots clés : transfert de responsabilité, normalisation, politique, consignation, pharmacien

INTRODUCTION

Routine transfer of accountability (TOA) should occur between pharmacists to ensure patient safety and continuity of care.[1] Although no universal definition for TOA exists, general principles include the transfer of duties, obligations, and patient information from one health care provider to another at each transition of care. In recent years, TOA has gained greater momentum. As of 2007, the World Health Organization has made communication during patient handover 1 of its 9 safety priorities.[2] For Canadian pharmacists, the National Association of Pharmacy Regulatory Authorities has not provided guidance on best practices for TOA. Moreover, there is limited literature on TOA completed by pharmacists.

Integrated systems and processes are required for accurate documentation of information related to TOA.[3,4] One analysis of incident reports related to clinical handover showed that patients were transferred from one service to another without adequate TOA in 29% of cases, and rates of omission of critical information varied between 14% and 19%.[5] The authors concluded that a structured, standardized approach to handover was required to prevent unintentional data omissions.[5] This approach was reinforced by the American College of Clinical Pharmacy (ACCP),[6] which advised that various process measures (i.e., acts completed by practitioners that are directed toward and performed for the patient) should be used to identify and maintain the quality of pharmacist clinical services. Of note, the ACCP proposed that optimal care transitions should begin with pharmacist-led medication reconciliation and should proceed with formal documentation in the patient's medical record, patient counselling, and ideally verbal (or alternatively written) hand-off of therapeutic problems to the incoming pharmacist. Ultimately, this workflow encourages consistency and is recommended for every level of patient transfer.[6]

In December 2010, the US National Transitions of Care Coalition released a position paper on health information technology and care transition. In this paper, the Coalition recommended a minimum data set for TOA, with a functional electronic health system for pharmacists, to enable standardization, good communication, accountability, and care coordination.[7]

In July 2014, a TOA policy for all health disciplines was implemented at the authors' institution, along with a corporate TOA target of 70%. The policy required that TOA be communicated for each internal transition point, with documentation in the patient's medical record using a discipline-specific DARP format (i.e., data, assessment, response, and plan). Although TOA was already occurring among pharmacists, the extent and consistency of documentation of TOA completion was below institutional targets. Therefore, a pharmacy-specific TOA policy and procedure, which was aligned with the health disciplines policy and accompanied by an automated workflow, came into effect on July 16, 2015.

The current study evaluated the utility of the standardized policy and process, with its associated automated workflow, in improving the frequency, consistency, and timeliness of TOA documentation by inpatient pharmacists.

METHODS

This study was part of a quality improvement initiative completed within the Pharmacy Department at St Michael's Hospital, a large health care institution in Toronto, Ontario. The institution is an urban, tertiary care teaching hospital with 463 acute care inpatient beds. On weekdays, most of the hospital's units are staffed with at least one clinical pharmacist or specialist. The Pharmacy Department has a designated electronic pharmacy system that processes all medication orders (Cerner Pharmacy, formerly known as Siemens Pharmacy).

The TOA workflow introduced in July 2015 is outlined in Figure 1. The dispensary pharmacy system for inpatients prints a "Notice of Transfer" label each time a patient is transferred between 2 locations within the hospital. This label shows the patient's name, hospital encounter number, location of origin, and destination location (unit and bed number). A pharmacy technician collects these labels and gives them to the dispensary pharmacist for processing. The dispensary pharmacist then opens an "intervention" within the electronic pharmacy system, notifying the receiving pharmacist of the patient transfer. This intervention (i.e., task cue functionality) is an electronic tool used to identify issues for follow-up by a pharmacist. Finally, the dispensing pharmacist initials the "Notice of Transfer" label, which is filed by the pharmacy technician.

The presence of a TOA intervention both cues and places the onus on the receiving pharmacist to seek out TOA from the transferring pharmacist. TOA may be completed verbally, by paper-based communication, or by electronic means (e.g., secure and confidential institutional e-mail). The receiving pharmacist is required to document receipt of the TOA, even if no issues requiring follow-up are present at the time of transfer. As part of the standardization process, a TOA documentation template was built into the electronic pharmacy system. This template was intended to supplement standard electronic pharmacist documentation. At a minimum, the following 5 pieces of information are required: reason for admission, whether medication reconciliation was completed, past medical history, assessment and current issues, and care plan with to-do list.

Within the pharmacy system, the receiving pharmacist must document that TOA was received and must close the previously opened intervention. Pharmacists review their electronic interventions at the beginning and the end of each business day and periodically throughout the day. In addition, they may run a report indicating TOA interventions that are active. The receiving pharmacist should then document the following information: the fact that TOA was completed, the name of the pharmacist providing TOA, and the name of the pharmacist who received

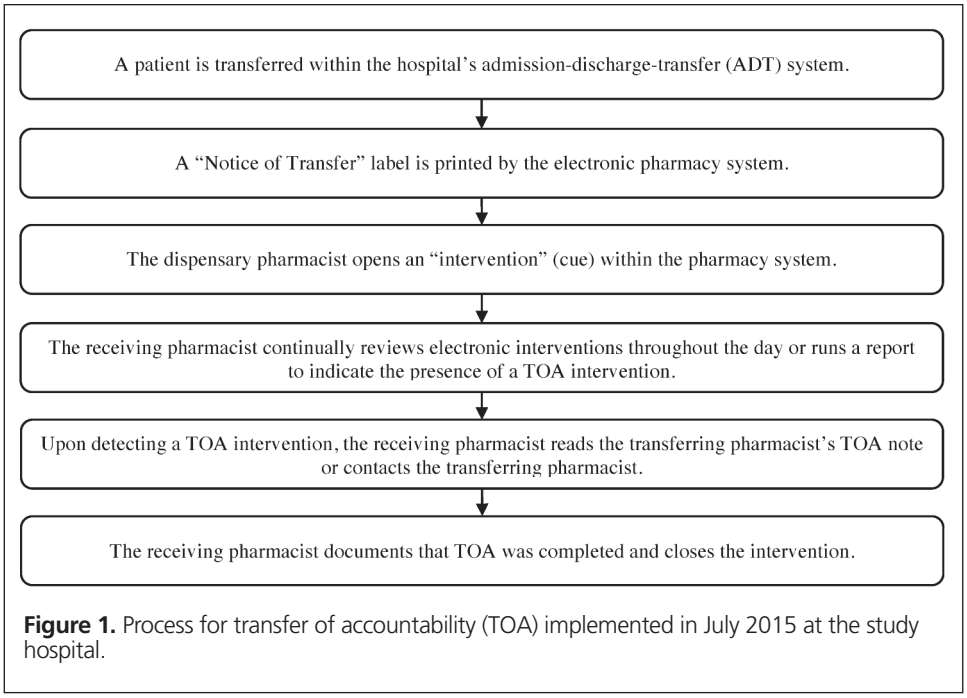

Figure 1. Process for transfer of accountability (TOA) implemented in July 2015 at the study hospital.

TOA (including the person's professional designation, i.e., RPh). Ideally, TOA documentation should occur within 1 business day when full unit coverage is available. In the absence of full clinical coverage, documentation of TOA should occur within 3 business days from the day of transfer.

For the current study, electronic patient charts were audited for consecutive 3-month periods from June 2014 to February 2016, to determine pharmacists' compliance with the TOA policy. Random samples of inpatients were identified from among patients admitted during the prespecified 3-month periods; 4 of these periods occurred before policy implementation, 1 period spanned the implementation date (July 16, 2015), and 2 periods occurred after policy implementation. For each patient chart, all internal TOA transition points were identified, by mapping the patient's location during the hospital stay. A transition point occurred when a patient was transferred between 2 different inpatient units, provided that the transition occurred during pharmacy business hours (from 0800 to 1600) and the patient remained on the new unit for at least 4 h. Exceptions (where formal TOA could not have been done) included transitions on weekends and statutory holidays, and the following types of transfer: to and from the operating room, from the emergency department, to palliative care, and to units where the same pharmacist or pharmacists were providing clinical coverage (e.g., from wards to "step-up" units). After all TOA transition points were identified, the electronic pharmacy system was reviewed to check whether TOA had been documented. The rates of TOA documentation were compared before and after implementation of the TOA policy.

After the February 2016 audit, an online survey was distributed to assess pharmacists' satisfaction with the TOA workflow. Demographic characteristics (e.g., unit where the pharmacist works, self-perceived number of TOAs completed and provided per day), responses to statements about the TOA workflow, and overall satisfaction with the current process were captured in the survey.

RESULTS

A total of 468 electronic patient charts were audited from June 1, 2014, to February 29, 2016. Before implementation of the health disciplines policy in July 2014, the rate of TOA documentation was unknown. After implementation of the health disciplines policy, the rate of TOA documentation at each transition point steadily improved (Table 1). After introduction of the TOA policy and workflow for pharmacists, the rate of TOA documentation continued to increase, eventually reaching 87% (68/78).

During the latest audit period (December 2015 to February 2016), the largest number of internal transition points occurred for patients admitted to the medical–surgical intensive care unit (21/78 [27%]) or general internal medicine (20/78 [26%]), those transferred from the trauma neurosurgery intensive care unit to the trauma neurosurgery ward (13/78 [17%]), and those transferred from the cardiovascular intensive care unit to the cardiology ward (12/78 [15%]).

The online survey asked pharmacists to respond to statements on a 5-point scale, where 1 = strongly disagree and 5 = strongly agree. Of the 32 pharmacists who participated in the

Table 1. Rates of TOA Documentation by Pharmacists before and after Implementation of a Standardized TOA Policy with Associated Workflow

Audit Parameter	Before Implementation				Overlap*	After Implementation	
	Period 1: Jun–Aug 2014	Period 2: Sep–Nov 2014	Period 3: Dec 2014–Feb 2015	Period 4: Mar–May 2015	Period 5: Jun–Aug 2015	Period 6: Sep–Nov 2015	Period 7: Dec 2015–Feb 2016
Total no. of charts audited	102	135	122	100	100	100	110
No. of potential transition points for TOA	93	107	60	111	136	123	78
No. of TOA points documented	10	22	24	48	69	97	68
% of TOA points documented	11	21	40	43	51	79	87

TOA = transfer of accountability.
*Standardized policy was implemented on July 16, 2015, and data were available to the study team in prespecified 3-month (quarterly) blocks. As such, period 5 encompassed both pre- and post-implementation data.

survey, the majority agreed that the TOA workflow was easy to use (mean score 4.1) (Table 2). Respondents perceived that the new policy had increased the number of TOAs being received (mean score 3.8) and provided (mean score 3.5), and improved the quality of TOAs being completed (mean score 3.8). Overall, pharmacists were satisfied with the TOA workflow (mean score 4.0), and they perceived that the process had improved patient care (mean score 4.1).

DISCUSSION

The results of this study suggest that implementation of a standardized policy, with an automated workflow, is an effective method to ensure consistency and timeliness of TOA documentation. Given the challenges of limited pharmacist resources and time, TOA may not occur at all transitions of care. Furthermore, a lack of awareness of patient transfers may affect a pharmacist's ability to adequately seek out and complete TOA. To the authors' knowledge, the evaluation of TOA between inpatient pharmacists and the use of an automated workflow for TOA have not been previously described.

Within the pharmacy-specific literature, exploratory studies have been completed in community pharmacies to better understand the attributes of clinical handover. Such studies have included identifying various information hazards (e.g., information overload, underload, or scatter; erroneous information) that may occur, and determining how information is being shared and documented (e.g., verbally or in writing).[8,9] Other studies have supported the use of standardized systems (e.g., forms and electronic information transfer tools) to enhance continuity of care and to minimize communication gaps between hospital and community pharmacists.[10,11] In light of these factors, it is clear that standardized processes for documentation are an imperative component of TOA.

In contrast to the fields of nursing and medicine, there is a lack of literature characterizing the clinician handover process in inpatient hospital pharmacy. A common recommendation is the development of minimum data sets, electronic health records, and online modules to standardize information transfer.[12,13] One major caveat is that these technologies may not be easily transferable to other inpatient areas (e.g., from nursing to pharmacy).

Before implementing the pharmacy-specific TOA workflow and policy, TOA was an expected practice standard for all practitioners at the study hospital. However, there was no standardized notification process or tool for documentation. Pharmacists had to identify for themselves the patients requiring TOA, and there was no mechanism capturing quantitative data regarding TOA. As explored in this study, the use of an automated notification system for patient transfer is novel and has not been previously described. These strengths, coupled with the positive uptake by and general satisfaction of pharmacists, indicate that this framework is a practical strategy for ensuring timely and consistent completion of TOA.

This study had some limitations, including its retrospective, single-centre design, with data collection limited to electronic chart review. Given that the contents and style of TOA documentation were not analyzed, it is difficult to discern whether the quality of information from the transferring pharmacist was clear or sufficient for care optimization by the receiving pharmacist. Nonetheless, the survey results indicate that pharmacists thought the current TOA workflow had improved patient care. In addition, TOA was deemed appropriate if it fell within the timeframes outlined by the TOA policy. Evaluation of the total time needed to complete TOA (i.e., from the point of transfer through to documentation), as a metric of timeliness, may provide further insight for system improvement. Finally, it would be interesting to see whether this pharmacy-based policy and workflow could be modified to function in another clinical setting, and whether it would yield similar results in other areas. Collectively, these insights may inform and further enhance best practices for TOA.

Table 2. Results of an Online Survey Assessing Pharmacists' Satisfaction with the New TOA Workflow

Statement	Response; No. of Survey Participants (n = 32)					Mean* ± SD	Skew
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
The TOA workflow is easy to use when working in the dispensary.	0	3	3	15	11	4.1 ± 0.9	–0.9
The TOA workflow is easy to use on your clinical unit.	0	0	5	17	10	4.2 ± 0.7	–0.2
The standardized TOA template in [the electronic pharmacy system] assists me in cuing essential information that needs to be communicated for TOA.	0	2	17	12	1	3.4 ± 0.7	0.1
The number of TOAs I receive has increased with the current workflow.	2	3	3	14	10	3.8 ± 1.2	–1.1
The number of TOAs I provide has increased with the current workflow.	1	5	8	12	6	3.5 ± 1.1	–0.4
Overall, the quality of TOA has improved after implementing the current workflow.	0	1	10	14	7	3.8 ± 0.8	–0.1
Overall, the current TOA workflow has improved patient care.	0	0	5	19	8	4.1 ± 0.6	–0.1
Overall, how satisfied are you with the new TOA workflow?	0	0	6	21	5	4.0 ± 0.6	0.0

SD = standard deviation, TOA = transfer of accountability.
*Responses were converted to numeric data as follows: strongly disagree/strongly dissatisfied = 1, disagree/dissatisfied = 2, neutral = 3, agree/satisfied = 4, strongly agree/strongly satisfied = 5.

CONCLUSION

Although the rate of pharmacist TOA improved substantially after implementation of the policy, more data are required to demonstrate the sustainability of this practice. Future audits will allow for continued confidence in the effectiveness of and adherence to this policy, and will indicate the potential for extension of the workflow to other health disciplines. This study suggests that implementation of a standardized TOA policy, with an automated workflow, is an effective approach to ensure consistency and timeliness of documentation between inpatient pharmacists. This successful combination has enabled TOA documentation rates to far exceed the institutional target.

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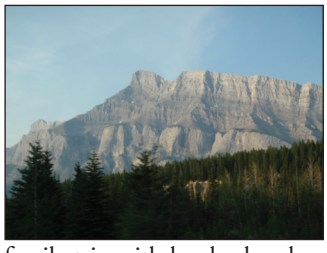
ON THE FRONT COVER



Banff National Park, Alberta

This issue's cover photo was taken in Banff National Park in July 2009. Kimberley Caouette took the photo while on a family trip with her husband and two children, shortly after her husband's return from a deployment in Afghanistan. The photo was taken on a compact Olympus Stylus 1030 SW camera. Kimberley Caouette is a Clinical Pharmacist at the BC Cancer Agency in Victoria, British Columbia.

The *CJHP* would be pleased to consider photographs featuring Canadian scenery taken by CSHP members for use on the front cover of the Journal. If you would like to submit a photograph, please send an electronic copy (minimum resolution 300 dpi) to publications@cshp.ca.

Perceptions of Hospital Pharmacists Concerning Clinical Research: A Survey Study

Robin Lee, Karen Dahri, Tim T Y Lau, and Stephen Shalansky

ABSTRACT

Background: Few studies have attempted to determine the proportion of Canadian hospital pharmacists involved in clinical research, despite a general consensus that research should be an essential component of a pharmacist's professional role.

Objectives: The primary objective was to characterize the involvement in clinical pharmacy research of hospital pharmacists in the 4 health authorities of the Lower Mainland of British Columbia (collectively known as the Lower Mainland Pharmacy Services). The secondary objective was to identify perceived barriers to conducting research.

Methods: Pharmacists employed within Lower Mainland Pharmacy Services were invited to participate in an online cross-sectional survey, for completion in August and September 2015. Descriptive statistics were used to analyze the results. Groups of survey participants were compared to examine differences in measured outcomes.

Results: A total of 534 pharmacists were surveyed, with a response rate of 16% (85/534). Overall, 77% (55/71) of the respondents reported having participated in research, and 87% (62/71) expressed interest in conducting future research. Chart reviews (78%, 36/46) and surveys (41%, 19/46) were the most common study designs used in prior research. Participants self-identified their research-related strengths as literature evaluation (46%, 27/59) and hypothesis generation (44%, 26/59). Conversely, 81% (48/59) of respondents self-identified statistical analysis as a weakness. Most respondents stated that personal satisfaction (82%, 49/60) and the opportunity to learn about disease states (78%, 47/60) were the driving factors for conducting research. The most commonly cited barrier to conducting research was lack of time (92%, 55/60). Opportunities to join existing teams (73%, 44/60) and mentorship programs (70%, 42/60) were identified as the most popular arrangements for encouraging future research.

Conclusions: Most of the pharmacists who responded to this survey reported having participated in clinical pharmacy research, but a lack of dedicated time appears to be a major hurdle to greater research participation. A targeted program increasing exposure to existing research teams and mentorship opportunities is recommended for promoting future research.

Keywords: clinical research, pharmacist, barriers, strengths, weaknesses, survey

RÉSUMÉ

Contexte : Peu d'études ont cherché à déterminer la proportion de "pharmaciens d'hôpitaux canadiens qui contribuent à la recherche clinique, et ce, malgré un consensus voulant que la recherche doive être un élément essentiel du rôle professionnel des pharmaciens.

Objectifs : L'objectif principal était d'offrir un portrait de la contribution à la recherche sur la pharmacie clinique des pharmaciens d'hôpitaux des quatre régies régionales des basses-terres continentales de la Colombie-Britannique (appelées collectivement *Lower Mainland Pharmacy Services*, c.-à-d. services de pharmacie des basses-terres continentales). L'objectif secondaire était de recenser les éléments perçus comme des obstacles à la réalisation de recherches.

Méthodes : Les pharmaciens employés au sein des services de pharmacie des basses-terres continentales ont été invités à participer par voie électronique à une enquête transversale qui devait être complétée en août et en septembre 2015. Des statistiques descriptives ont été employées pour analyser les résultats. On a aussi comparé des groupes de participants à l'enquête afin d'examiner les différences entre les résultats mesurés.

Résultats : Au total, 534 pharmaciens ont été sondés et le taux de réponse était de 16 % (85/534). Dans l'ensemble, 77 % (55/71) des répondants indiquaient avoir participé à des recherches et 87 % (62/71) souhaitaient faire de la recherche dans l'avenir. L'analyse de dossiers médicaux (78 %, 36/46) et les sondages (41 %, 19/46) représentaient les plans d'étude les plus utilisés par les répondants au cours de recherches antérieures. Les participants ont indiqué que leurs forces en lien avec la recherche étaient leur capacité d'évaluer la littérature (46 %, 27/59) et de formuler des hypothèses (44 %, 26/59). En revanche, 81 % (48/59) ont signalé l'analyse statistique comme leur point faible. La plupart des répondants croyaient que la satisfaction personnelle (82 %, 49/60) et la perspective d'acquérir des connaissances sur les maladies (78 %, 47/60) représentaient les principaux facteurs les motivant à faire de la recherche. Ce qui était évoqué le plus souvent comme un obstacle à la recherche était le manque de temps (92 %, 55/60). Les occasions de se joindre à des équipes en place (73 %, 44/60) et les programmes de mentorat (70 %, 42/60) ont été désignés comme les dispositions les plus attrayantes pour encourager à poursuivre de futures recherches.

Conclusions : La plupart des pharmaciens ayant répondu au sondage ont indiqué avoir contribué à des recherches en pharmacie clinique, mais le manque de temps réservé pour la recherche semblait être un obstacle important à une plus grande participation aux activités de recherche. Un programme ciblé multipliant les possibilités de fréquenter des équipes de recherche déjà établies et offrant plus d'occasions de mentorat serait une façon de promouvoir de futures recherches.

Mots clés : recherche clinique, pharmacien, obstacles, forces, faiblesses, enquête

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INTRODUCTION

Clinical pharmacy research is important for advancing the pharmacy profession; however, there is limited information in the literature regarding current perceptions, barriers, and competencies related to pharmacy research.[1] Pharmacists have previously identified research as one of their professional responsibilities and an essential activity for improving patient care.[2-7] One study reported that 96% of pharmacists surveyed considered research to be an important factor in improving care, and 80% expressed a desire to be more involved in research.[1] Although pharmacists' interest in conducting research is high, current levels of research participation remain low, at about 30% to 50%.[1,2,6-8] High levels of interest combined with a low level of participation indicate a need to identify impediments to research that exist in the workplace, as well as the educational approaches that could be employed to increase participation.

Previous studies have identified several barriers to conducting research, such as lack of time and lack of reimbursement.[2,8,9,10] Some key competencies have also been shown to be necessary for pharmacists to conduct clinical pharmacy research, including literature review and evaluation, hypothesis generation, study design, and research methods.[11-13] Although these fundamental skills have been identified as essential, the extent of training that pharmacists have received in these areas has not been quantified.

One of the strategic goals of the Lower Mainland Pharmacy Services in British Columbia is to double the annual rate of research activity. The objective of the study reported here was to survey hospital pharmacists within the Lower Mainland Pharmacy Services to identify their current level of research activity and barriers that prevent them from conducting research. The findings from this survey will be used to develop a targeted initiative to advance the research-related skills of the organization's pharmacy staff, with the hope of increasing the rate of research activity within the region.

METHODS

Design

This cross-sectional survey targeted hospital pharmacists in the Lower Mainland's 4 health authorities, which include 26 hospitals. The study was approved by the Behavioural Research Ethics Board at the University of British Columbia, and informed consent was obtained from all participants.

Study Population

All hospital pharmacists were eligible to participate, regardless of the level of advanced training that they had completed beyond their initial pharmacy degree; nonpharmacist staff were excluded. A total of 534 pharmacists were identified for initial contact. Potential survey participants were contacted via e-mail using the health authorities' e-mail group lists.

Sampling Method

An invitation to participate in this study, which included a link to the online survey, was sent by e-mail to all pharmacists employed by the 4 health authorities. To preserve anonymity, no identifying information was collected from participants. Two weeks after the initial invitation, a reminder was sent by e-mail.

Intervention

The online survey was administered using the survey platform FluidSurveys (http://fluidsurveys.com/). The survey questions were based on articles identified in a comprehensive literature search of MEDLINE and Embase, as well as articles identified by reviewing the reference lists of selected articles and input from stakeholders. The survey was trialled with 6 pharmacists, and the questions were reworded, reorganized, or further explained as necessary to improve clarity.

The survey contained 7 major sections: baseline information (6 multiple-choice and open-answer questions); participation in previous projects (2 yes/no questions); perceptions about research (18 open-response [e.g., numeric response], multiple-choice, and yes/no questions); strengths and weaknesses in conducting research (2 multiple-choice questions); factors, barriers, and benefits to conducting research (3 multiple-choice questions); strategies to promote research (1 multiple-choice question); and additional comments (1 multiple-choice question). Survey questions used in the study are listed in Appendix 1 (available at https://www.cjhp-online.ca/index.php/cjhp/issue/view/126/showToc).

On the basis of their responses to questions about previous research experiences and interest in future projects, respondents were separated into 4 groups: those who had participated in or conducted previous research and were interested in future research, those who had participated in or conducted research but were not interested in future research, those who had not participated in or conducted previous research but were interested in future research, and those who had not participated in or conducted previous research and were not interested in future research. Respondents saw only those questions pertinent to their own group; they could not view questions directed to the other groups. The survey flow is outlined in Appendix 2 (available at https://www.cjhp-online.ca/index.php/cjhp/issue/view/126/showToc).

One month was allowed for the survey to be completed after the initial e-mail invitation was sent. The survey was conducted in August and September 2015.

Statistical Analysis

All survey responses were included in the analysis of the data. Aggregate survey data were downloaded from the survey website and coded into a password-protected spreadsheet (Excel 2013 for

Windows, Microsoft Corporation). The survey responses were manually reviewed by one of the investigators (R.L.) in the spreadsheet and verified with the primary investigator (K.D.) before analyses were performed. Descriptive statistical analyses were employed. All statistical analyses were performed in the spreadsheet software.

RESULTS

Demographic Characteristics

A total of 534 pharmacists were invited to participate, and 85 (16%) submitted responses (Figure 1); however, some participants did not answer every question. Both complete and incomplete survey responses were included in the analysis. Each question was analyzed according to responses submitted, and denominators were adjusted as appropriate to reflect the number of respondents.

Baseline demographic characteristics of the survey respondents are presented in Table 1. The highest level of training was most commonly a hospital residency program (52%, 37/71), followed by a postgraduate PharmD program (31%, 22/71). Survey participants had worked in a pharmacy for a median of 10 years (interquartile range [IQR] 4–20 years), with a median of 11 years (IQR 4–22 years) of pharmacy practice experience across a wide range of practice settings. Overall, 85% (60/71) of participants self-identified as being "moderately experienced" with research, 7% (5/71) of participants identified as being "experienced", and 8% (6/71) identified as being "inexperienced" (no experience with any research projects). The majority of respondents (77%, 55/71) had participated in previous research projects, and 87% (62/71) were interested in participating in future projects.

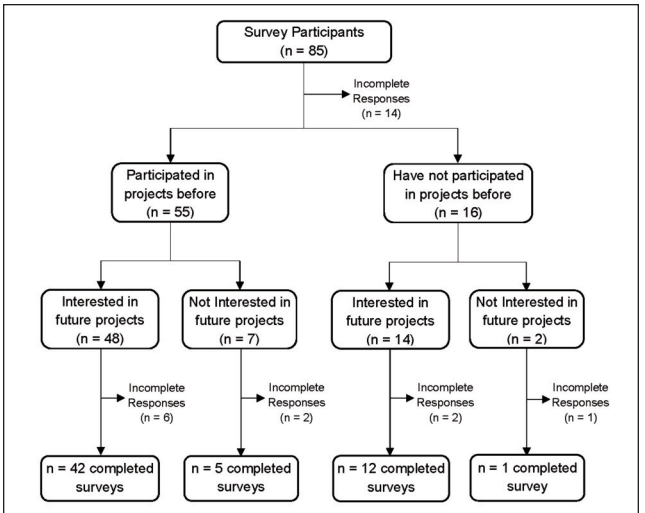

Figure 1. Study flow chart. Participants were divided into 4 groups according to their survey responses concerning previous research experience and interest in future research.

Pharmacists' Involvement in Research

Information about respondents' research involvement and publication experience is presented in Table 2. Survey respondents with recent research experience had participated in a median of 3 projects (IQR 1–4.5 projects) within the past 5 years. The most common research-related tasks performed by respondents were data analysis (64%, 30/47) and presentation of study findings (66%, 31/47). Most respondents reported having completed both of these tasks 1–3 times within the past 5 years. Of respondents who had participated in research, the majority (81%, 38/47) had not applied for grant funding for their projects. The most popular dissemination activity was poster presentations (72%, 34/47),

Table 1. Demographic Characteristics of Study Participants

Characteristic	No. (%) of Participants* (*n* = 71)	
Current position		
Clinical pharmacist	28	(39)
Clinical pharmacy specialist	18	(25)
Clinical coordinator	8	(11)
Dispensary pharmacist	4	(6)
Clinical supervisor	3	(4)
Other	10	(14)
Time worked in pharmacy (years) (median and IQR)	10	(4–20)
Time in practice (years) (median and IQR)	11	(4–22)
Highest level of education		
Residency	37	(52)
Postgraduate PharmD	22	(31)
Bachelor's degree in pharmacy (BScPharm)	7	(10)
Fellowship	2	(3)
PhD	1	(1)
Other	2	(3)

*Except where indicated otherwise.

Table 2. Research and Publication Experience of Respondents Who Reported Having Conducted Research in the 5 Years Preceding the Survey

Participant's Experience	No. (%) of Participants*					
Projects in past 5 years			*n* = 47			
Total no. of projects (any role) (median and IQR)			3	(1–4.5)		
As primary co-investigator (median and IQR)			1	(0–2)		
As co-investigator (median and IQR)			2	(0–3)		
Specific activity (n = 47)†	None		1–3 times		> 3 times	
Development of research protocol	18	(38)	19	(40)	10	(21)
Apply for grant funding	38	(81)	9	(19)	0	(0)
Perform data analysis	17	(36)	22	(47)	8	(17)
Present study findings	16	(34)	26	(55)	5	(11)
Publish study findings	22	(47)	20	(43)	5	(11)
Studies conducted in the past			*n* = 46			
Chart review			36	(78)		
Survey			19	(41)		
Controlled clinical trial			9	(20)		
Case–control or cohort study			9	(20)		
Focus group or qualitative research study			8	(17)		
Other			14	(30)		

*Except where indicated otherwise. Note that some respondents who reported having conducted research in the 5 years preceding the survey did not answer questions about their research experience.
†Data are subdivided according to the frequency of each activity.

followed by publication of journal articles (62%, 29/47) and podium presentations (47%, 22/47).

The most common type of studies completed were chart reviews (78%, 36/46), and the least common types were focus group and qualitative studies (17%, 8/46). The majority of respondents had conducted research for personal interests (80%, 37/46) and as part of their job requirements (52%, 24/46).

Eighty percent (47/59) of respondents were interested in conducting chart reviews in the future, and 49% (29/59) were interested in conducting survey studies. Within the subset of respondents without previous research experience, there was a high degree of interest in controlled clinical trials (85%, 11/13).

Self-Identification of Research Strengths and Weaknesses

The following strengths related to the research process were reported by just under half of respondents: extracting, critiquing, and evaluating scientific evidence from the literature (46%, 27/59); hypothesis generation (44%, 26/59); and conduct of the study (41%, 24/59). Eighty-one percent (48/59) of participants reported that their skills were weakest in statistical data analysis.

Barriers, Factors, Benefits, and Strategies to Continuing Research

Details regarding barriers to conducting research, as well as supporting factors, benefits, and strategies for conducting research in the future are presented in Table 3. Most respondents identified a lack of dedicated time (92%, 55/60) and competing workload priorities (88%, 53/60) as major barriers to conducting research, with a smaller proportion (42%, 25/60) identifying a lack of support from management as a barrier. Factors cited as favourable to conducting research included increased personal satisfaction (82%, 49/60) and increased opportunity to learn about a disease state (78%, 47/60). More than 85% of respondents cited improvements in existing knowledge and filling knowledge gaps as the greatest benefits to conducting research. Opportunities to join existing teams (73%, 44/60) and mentorship programs (70%, 42/60) were identified as the most popular strategies for promoting future research.

DISCUSSION

Pharmacy research is essential to the advancement of pharmacy practice and the optimization of patient outcomes. Although this study provides evidence that pharmacists continue to recognize the value of research and are interested in becoming involved in future research, it also documents the persistence of barriers and challenges.

In this study, participants had higher levels of experience developing study protocols, analyzing study data, and presenting study findings and lower levels of applying for study grant funding than was reported in a survey of Canadian critical care pharmacists.[1] Participants in the current study without prior research experience expressed strong interest in becoming involved in controlled clinical trials, which may reflect a lack of appreciation of and knowledge about the complexities involved in conducting this type of study.

The majority of survey respondents who reported being moderately experienced in research declared a weakness in statistical analysis and experimental design. Continued emphasis on and additional support for developing statistical analysis skills

Table 3. Barriers, Supporting Factors, Benefits, and Strategies for Conducting Research

Element	No. (%) of Respondents* (*n* = 60)	
Barriers		
Lack of dedicated time	55	(92)
Competing priorities with workload	53	(88)
Lack of resources to conduct higher-level studies	37	(62)
Lack of skills to carry out study	31	(52)
Lack of support from management	25	(42)
Unaware of possible ongoing research	18	(30)
No personal interest	3	(5)
No ideas as to the possible barriers	1	(2)
Factors supporting research involvement		
Personal satisfaction	49	(82)
Opportunity to learn about disease state	47	(78)
Professional advancement	42	(70)
Promotion incentive	20	(33)
Financial reward incentive	18	(30)
Perceived benefits of doing research		
Improve knowledge	53	(88)
Fill in knowledge gap	52	(87)
Personal growth	48	(80)
Improve patient care	47	(78)
Variety in job	44	(73)
Work satisfaction	40	(67)
Suggested strategies for conducting future research		
Opportunities to join existing teams	44	(73)
Mentorship program	42	(70)
Workshops on relevant research topics	32	(53)
Independent self-study resources	22	(37)
Videos or webinars	16	(27)
Other	7	(12)

*For each section, percentages sum to more than 100 because respondents were instructed to choose all options that applied.

and addressing other perceived weaknesses could promote increased research involvement.[14] Workshops and on-site access to a statistician could also be offered to pharmacists as resources to enhance their expertise in statistical data analysis.

Several barriers have been identified by pharmacists in different settings and various countries. Lack of dedicated time, competing priorities related to workload, and lack of resources to carry out higher-level studies have been common themes.[1,2,5,6,8,9,15,16] Few pharmacist positions include research as part of the job description. If increased research activity is expected, then employer support for such activity needs to be improved, through the addition of educational resources and the protection of dedicated research time. A previous study found that secure funding and protected time for conducting research were significant predictors of the number of scientific publications written by pharmacists.[17]

A lower level of management support for research was found in the current study (42%, 25/60) than in a previous research study, in which 50% (105/210) of respondents believed there was adequate hospital and pharmacy administration support.[1] Continued support from management is crucial to research success, and studies evaluating pharmacy services could help improve efficiency and maximize appropriate allocation of pharmacy resources.

Opportunities to join existing teams, mentorship programs, and workshops were identified as being most beneficial for engaging pharmacists in future research; pharmacists without prior research exposure favoured these activities more than those with prior experience. A mechanism to offer pharmacists without prior access to established research teams should be explored. Researchers have advocated for the creation of practice-based research networks as a way to promote research culture and mentorship.[2,18] Pharmacists can form and join such networks to connect and collaborate with other interdisciplinary professionals on various research topics. The proposed benefits of practice-based research networks include increasing community engagement, ensuring the design of robust studies, and facilitating mentorship between pharmacists.[2,18,19] Relationships between health authorities and faculties of pharmaceutical sciences could also contribute to increased collaboration and research activity.

This study had several limitations. It was not possible to prevent a single individual from completing the survey more than

once, because the survey link was not tied to individual e-mail addresses. In addition, the response rate was low, with a high proportion of respondents having prior research experience; this may have introduced bias, thus limiting the generalizability of the results. In comparison, a study of intensive care pharmacists across Canada achieved a 66% (215/325) response rate.[1] The data collected in the current study reflected self-identified assessments, and were not objectively verified. In particular, the survey lacked a standardized approach for respondents to categorize their current research skills, so respondents were asked to identify their skills on the basis of self-reflection, which may have increased subjectivity and bias in the results and analysis. Those who chose to participate in the study may have been more inclined to be involved in research than nonrespondents, producing a response bias. Given these potential limitations, future research could examine similar issues both before and after implementation of strategies to engage pharmacists in conducting research, and could also examine post-implementation research output.

CONCLUSION

Pharmacists appear to have a keen interest in participating in clinical research; however, significant barriers and competing workload priorities exist. An improved mechanism for connecting pharmacy staff to existing research teams and creation of a mentorship program are recommended to engage pharmacists in the Lower Mainland Pharmacy Services and to increase their research output.

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ORIGINAL RESEARCH

Improving the Clinical Pharmacist Handover Process in the Intensive Care Unit with a Pharmacotherapy-Specific Tool: The I-HAPPY Study

Emma Attfield, Matthew P Swankhuizen, Nicole Bruchet, Richard Slavik, and Sean K Gorman

ABSTRACT

Background: Pharmacists in the intensive care unit (ICU) provide pharmaceutical care to critically ill patients. Identification and resolution of drug therapy problems improves outcomes for these patients. To maintain continuity of care, pharmacotherapy plans should be transferred to a receiving pharmacist upon discharge of patients from the ICU. No previous studies have addressed the development or evaluation of a systematic, standardized clinical handover tool and process for pharmacists.

Objectives: To assess pharmacists' satisfaction with and utilization of a pharmacotherapy-specific handover tool and process.

Methods: Plan–do–study–act methodology was employed to develop a clinical handover tool and process, which were implemented in a Canadian health authority. For evaluation of the tool and process, a multicentre, online survey questionnaire was distributed to 14 clinical pharmacists in the ICU and ward settings at 5 hospitals between February 15 and April 22, 2016.

Results: Thirteen of the pharmacists completed the survey. All 13 pharmacists (100%) were satisfied with usability; 12 (92%) were satisfied with training, organization, and accuracy of the process; and 11 (85%) were satisfied with completeness and efficiency. Most pharmacists conducted 1 or 2 handovers per week, with each having a duration of 3–5 min. Seven (54%) of the respondents reported that they communicated handovers mostly or exclusively by telephone, and 6 (46%) reported using mostly or exclusively face-to-face communication. However, 6 (46%) reported a preference for face-to-face communication, and 3 (23%) reported a preference for the telephone; the remaining 4 (31%) had no preference for mode of communication.

Conclusions: Respondents were highly satisfied with the handover tool and process. ICU pharmacists appeared more satisfied with the training, organization, and completeness of handover, whereas ward pharmacists appeared more satisfied with the accuracy and efficiency of handover. Workload requirements were minimal, and face-to-face interaction, although slightly less well utilized than the telephone, was the preferred method of communication.

RÉSUMÉ

Contexte : Les pharmaciens exerçant dans les unités de soins intensifs (USI) prodiguent des soins pharmaceutiques aux patients gravement malades. Or, déceler et résoudre les problèmes pharmacothérapeutiques améliore les résultats cliniques pour ces patients. Afin de maintenir la continuité des soins, les plans pharmacothérapeutiques doivent être communiqués au moment du congé des patients de l'USI à un autre pharmacien qui prendra ensuite le relais. Aucune étude n'avait auparavant étudié la mise au point ou l'évaluation d'un outil et d'un processus normalisés de transfert des soins à être utilisés systématiquement par les pharmaciens.

Objectifs : Évaluer le taux de satisfaction des pharmaciens à l'égard d'un outil et d'un processus destinés au transfert des soins pharmacothérapeutiques et en analyser leur utilisation.

Méthodes : La méthodologie planifier-exécuter-étudier-agir a été employée pour mettre au point un outil et un processus de transfert clinique introduits dans une régie de santé canadienne. Afin d'évaluer l'outil et le processus, un sondage en ligne a été présenté à 14 pharmaciens cliniciens travaillant soit dans les USI soit dans d'autres services intrahospitaliers de 5 hôpitaux, entre le 15 février et le 22 avril 2016.

Résultats : Treize pharmaciens ont rempli le sondage. Les 13 (100 %) étaient satisfaits de la facilité d'emploi; 12 (92 %) étaient satisfaits de la formation, de l'organisation et de l'exactitude du processus; et 11 (85 %) étaient satisfaits du degré d'exhaustivité et de l'efficacité. La plupart des pharmaciens réalisaient 1 ou 2 transferts par semaine, chacun d'une durée de 3 à 5 minutes. Sept (54 %) répondants ont indiqué qu'ils communiquaient les transferts surtout ou seulement par téléphone et 6 (46 %) ont dit le faire surtout ou uniquement en personne. Or, 6 (46 %) ont indiqué une préférence pour la communication en personne et 3 (23 %) ont dit préférer la voie téléphonique. Les 4 (31 %) autres étaient indifférents au mode de communication utilisé.

Conclusions : Les répondants étaient grandement satisfaits de l'outil et du processus de transfert. Les pharmaciens exerçant dans les USI semblaient plus satisfaits de la formation, de l'organisation et du degré

Key words: clinical handover, intensive care, pharmaceutical care, pharmacist

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d'exhaustivité du transfert alors que les pharmaciens travaillant dans d'autres services intra-hospitaliers semblaient plus satisfaits de l'exactitude et de l'efficacité du transfert. La charge de travail était minimalement accrue et la communication en personne, bien qu'utilisée moins fréquemment que celle par téléphone, était le mode préféré.

Mots clés : transfert clinique, soins intensifs, soins pharmaceutiques, pharmacien

INTRODUCTION

Pharmacists providing team-based, direct patient care to critically ill patients improve outcomes by implementing pharmaceutical care plans and resolving drug therapy problems (DTPs).[1] For example, interventions by pharmacists in the intensive care unit (ICU) have been shown to reduce the incidence of ventilator-associated pneumonia, to prevent adverse drug reactions, and to shorten the duration of the hospital stay.[1,2] ICU pharmacists intervene throughout a critically ill patient's journey from admission to transfer out of the ICU. However, it is often difficult to implement all aspects of a patient's pharmaceutical care plan in the ICU. Therefore, ICU pharmacists should hand over pertinent aspects of a patient's pharmaceutical care plan when the patient is transferred out of the ICU.

Clinical handover is defined as "the process of transferring primary authority and responsibility for providing clinical care to a patient from one departing caregiver to one oncoming caregiver" and is a communication-heavy event.[3] Miscommunication when handing off responsibility for patients plays a role in an estimated 80% of serious preventable adverse events, and communication failure is among the top 3 most frequent causes of sentinel events, treatment delays, and transfer-related events.[4,5]

Standardized, structured handover tools and processes, such as the situation, background, assessment, recommendation (SBAR) approach and the subjective, objective, assessment, plan (SOAP) approach have been created to support and improve the quality of handover episodes.[6] Standardization of handover, guided by forms or checklists, has been associated with reductions in adverse events, increases in perceived accuracy of transferred information, and faster finalization of ICU discharge documentation.[6,7] However, a significant limitation of published handover tools is that they are too vague to fit the specific demands of clinical handover in different contexts.[6,7]

There is a paucity of published literature describing the effectiveness of pharmacist-specific handover tools and processes. One study evaluated the implementation of a pharmacist-initiated pharmaceutical handover tool for oncology and hematology patients requiring transfer to the ICU.[6] Pharmacist handover of patients' medication-related information with guidance from a structured form significantly reduced medication errors and increased the on-time administration of medication therapies.[6]

A PubMed search from inception to March 1, 2017, revealed no studies addressing handover by ICU pharmacists. Before evaluating the effectiveness of a standardized pharmacist tool and process in improving information transfer, processes of care, and outcomes, it is essential to determine whether end-users are satisfied with key aspects of the tool and process. Low pharmacist satisfaction related to perceived usefulness and ease of use with a handover tool and process reduces the chance of adoption by pharmacists, rendering the tool and process ineffective in improving the quality of patient care.[8] Therefore, the aim of this study was to assess pharmacists' satisfaction with a systematically developed clinical handover tool and process for patients transferred from the ICU to a hospital ward.

METHODS

Design and Participants

This online survey study was conducted in the pharmacy department of a Canadian health authority. This health authority encompasses 22 hospitals, 10 of which have clinical pharmacists on staff. Following receipt of approval from the institutional research ethics board, a general call for expressions of interest to participate in the study was made through the health authority's pharmacist e-mail forums for critical care, medicine, and surgery. Additionally, all ICU pharmacists belonging to these e-mail forums were contacted individually to ascertain their interest in participating. Thus, a convenience sampling method was used, and there was no target sample size.

Interested pharmacists were screened by the principal investigator (M.P.S.) to ensure they met the following inclusion criteria: clinical pharmacists dedicated to the provision of care to patients in an ICU of sufficient size (defined as 4 beds or more). All ICUs in the health authority had the capability to admit patients requiring invasive mechanical ventilator support and hemodynamic support. Clinical pharmacists who provided full-time coverage (7.5 h/day, Monday–Friday) on a medical or surgical ward and who received at least 1 patient transfer per week from an ICU with a participating full-time ICU pharmacist were

also eligible to participate. Included pharmacists were involved in developing the checklist tool and handover process and were also part of the evaluation process (Figure 1). All participants provided written informed consent before participating in this study.

Development of Checklist Tool and Handover Process

The plan–do-study–act (PDSA) methodology[9] was used in developing the checklist tool and handover process. Version 1 of the checklist tool and process was developed through co-investigator consensus. The tool incorporated essential aspects of handover as described by the World Health Organization; these included using a standardized process, allowing time for questions, and limiting information to that which is necessary.[10] Three key questions guided identification of components for the handover tool: Where do DTPs occur with respect to handover? Which pharmacist interventions increase patient adherence? What technical aspects of pharmaceutical care are pertinent to handover? To answer these questions and thus inform creation of the tool, a systematic review of the literature was performed by 2 of the investigators (E.A., M.P.S.) using PubMed (1950 to August 2015), Embase (1947 to August 2015), and Google Scholar.

Before PDSA cycle 1, a video presentation (developed by the author team) was used as a training module for participants; the video provided detailed information on the handover tool and process, and showed an example handover. When new versions of the tool and process were issued, a newsletter was used to inform participants about changes made. During cycle 1, participants implemented version 1 of the tool and process for 14 days. A teleconference focus group was then held (for which at least 50% of included pharmacists were required to be present) during which participant feedback was solicited using a semistructured interview guide (Appendix 1, available at https://www.cjhp-online.ca/index.php/cjhp/issue/view/126/showToc). This feedback was used to inform adaptation and refinement of the tool and process leading to the creation of version 2. The focus group was the only avenue for providing feedback; pharmacists who were unable to attend the teleconference were not given any other option for providing feedback. PDSA cycle 2 was analogous to cycle 1 (Figure 1). Then, the final version of the tool and process (Figure 2 and Figure 3, respectively) was implemented. The 2 focus group sessions used to refine the handover tool and process met quorum, with attendance by 9 pharmacists (64%) for focus group 1 and 8 (57%) pharmacists for focus group 2.

Evaluation of Checklist Tool and Handover Process

After a 21-day implementation period for the final version of the checklist tool and handover process, pharmacist satisfaction and overall utilization of the tool and process were evaluated using

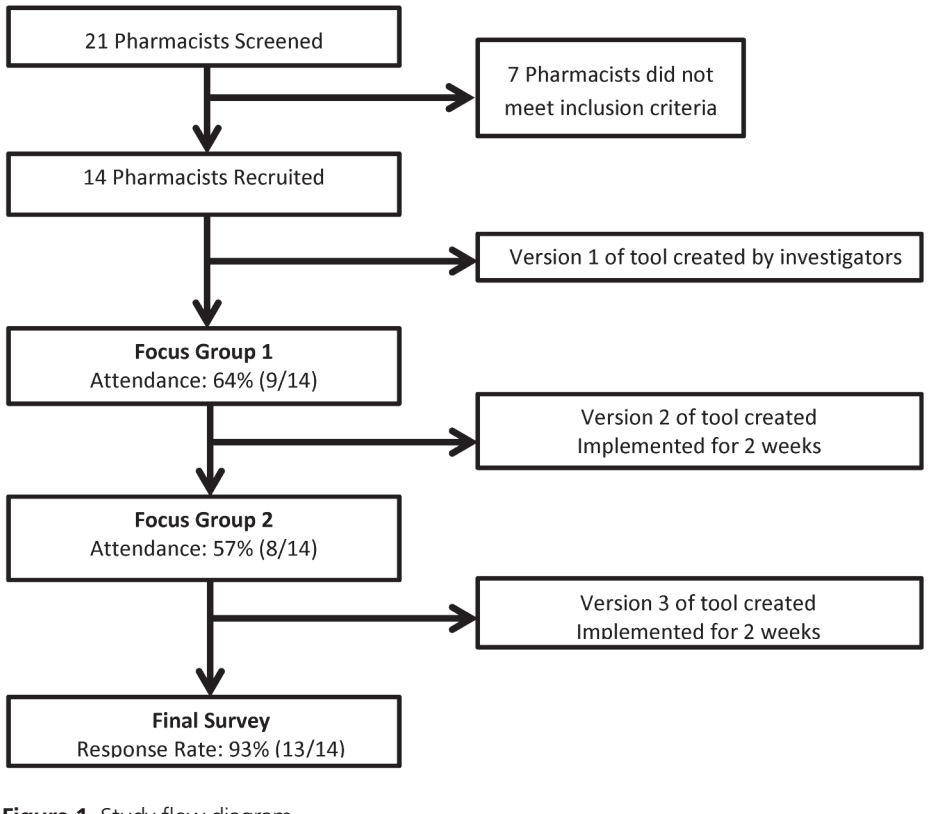

Figure 1. Study flow diagram.

I Identification
- □ Full Name □ Age □ Gender

H History
- □ Date of admission to ICU
- □ Reason for admission to ICU
  - □ Was reason for admission *drug-related?*
- □ Allergies
- □ Past Medical History
- □ Medications prior to admission
- □ Date of transfer or anticipated transfer out of ICU

A Actual and Potential DTP's
- □ List current medical conditions and current medications for each condition
- □ Actual and Potential DTP's
  - □ Refer to *"Common Issues in ICU Handover"*
- □ Action plan to resolve DTP's

P Patient or Family Needs
- □ Education and counselling requirements during hospital stay or at discharge
- □ Patient preferences and beliefs with respect to drug therapy

P Pharmacist to Contact Healthcare Providers
- □ Need for community pharmacist contact
- □ Need for family physician contact

Y Your Questions
- □ Answer all remaining questions posed by the receiving pharmacist

Figure 2. The I-HAPPY checklist tool for handover of a patient from intensive care unit pharmacist to ward pharmacist.

1. **ICU and Ward Pharmacist Daily Review For Potential Handover**
   The ICU and ward pharmacist will review their patient load daily for patients who meet criteria for handover.
   Suggested duration: 5 minutes.
   Patient Criteria:
   - Transferring from ICU to medical/surgical ward
   - Transferring today, tomorrow, or transferred yesterday

2. Contacting the Ward or ICU Pharmacist
Whomever first determines a patient transfer from ICU to ward occurred, either the ICU or ward pharmacist, will initiate contact with the other pharmacist (in person or by phone). Both pharmacists will agree on a mutually convenient meeting time to conduct handover.

3. Handover Mode of Communication
Verbal communication (in person or by phone). Written information (i.e. monitoring forms) may be provided to the receiving pharmacist if the ICU pharmacist and receiving pharmacist agree it is beneficial.

4. Conducting Handover
It is suggested that the ICU pharmacist, in preparation for handover, identifies all medication reconciliation issues (with reference back to admission BPMH) and DTP's based on their last encounter with the patient. It is suggested that the ICU and/or ward pharmacist, in preparation for handover, have knowledge of the most up-to-date medication list. In addition, pharmacists should obtain a copy of the "I-HAPPY" tool for reference.
Handover will follow tool components in the set numbered order, from top to bottom. Efforts should be made to minimize the risk of distractions and interruptions in the surrounding environment while conducting handover.

5. Documentation of Handover
As per the Clinical Practice Standard for Health Record Documentation, interventions facilitated by handover may be documented in the patient chart by the ward pharmacist as per standard practice. These may include, but are not limited to:
- Transfer medication reconciliation
- IV to PO antibiotic stepdown
- Patient education/counselling
- Seamless care activities

Documentation may occur in the progress notes or care plan record, depending on the nature of the intervention.

Figure 3. The I-HAPPY process for handover from intensive care unit pharmacist to ward pharmacist.

an online survey administered through SurveyMonkey (https://www.surveymonkey.com/); the survey questions are available in Appendix 2 (at https://www.cjhp-online.ca/index.php/cjhp/issue/view/126/showToc). To be eligible to complete the survey questionnaire, a pharmacist had to have conducted at least 1 handover during the final 21-day period. Six domains of satisfaction were evaluated: usability of the tool and process, training provided on the process and tool (learnability), efficiency of the handover process, completeness of the tool and process, accuracy of the tool and process, and organization of information transfer when using the tool and process. Respondents were asked to rate each domain on a 5-point Likert scale, from very dissatisfied (1) to very satisfied (5). Satisfaction with the tool or process was defined a priori as a rating of 4 or 5 on the 5-point Likert scale. Pharmacists' utilization of the handover tool and process with respect to workload and communication was evaluated using the same survey questionnaire. The workload parameters were the estimated time to conduct handover and the average number of handovers per week, as reported by survey respondents. The communication parameters were the communication method utilized and preferred. Results are reported for the entire group and for subgroups of ICU pharmacists and ward pharmacists. Additionally, data were collected for the following baseline characteristics: pharmacist coverage area (ICU or ward), years of clinical experience, and handover practices before this study. All results are reported with descriptive statistics for binary and ordinal data.

RESULTS

A total of 21 pharmacists were screened, of whom 14 were eligible for inclusion. However, 1 pharmacist did not complete

the survey questionnaire, so the final sample consisted of 13 pharmacists: 4 (31%) ICU pharmacists and 9 (69%) ward pharmacists. Eleven (85%) of the respondents had less than 5 years of experience in hospital pharmacy, 1 (8%) pharmacist had 5–10 years of experience, and 1 (8%) had more than 10 years of experience. Twelve (92%) of the respondents reported that, before this study, they had occasionally participated in handover, and 1 (8%) reported consistently participating in handover.

At least 85% of pharmacists were satisfied or very satisfied with the handover tool and process across all 6 satisfaction domains evaluated (Figure 4). Among the ICU pharmacists, all 4 were satisfied or very satisfied with usability, training, organization of information, and completeness of information in the tool and process, 3 (75%) were satisfied or very satisfied with the accuracy of the tool and process, and 2 (50%) were satisfied or very satisfied with the efficiency of the tool and process (Figure 5). At least 78% of the ward pharmacists were satisfied or very satisfied with the handover tool and process across all 6 satisfaction domains (Figure 6).

Reported workload outcomes are presented in Table 1. Eight (62%) of the 13 pharmacists reported that workload associated with handover most frequently entailed a 3- to 5-min discussion,

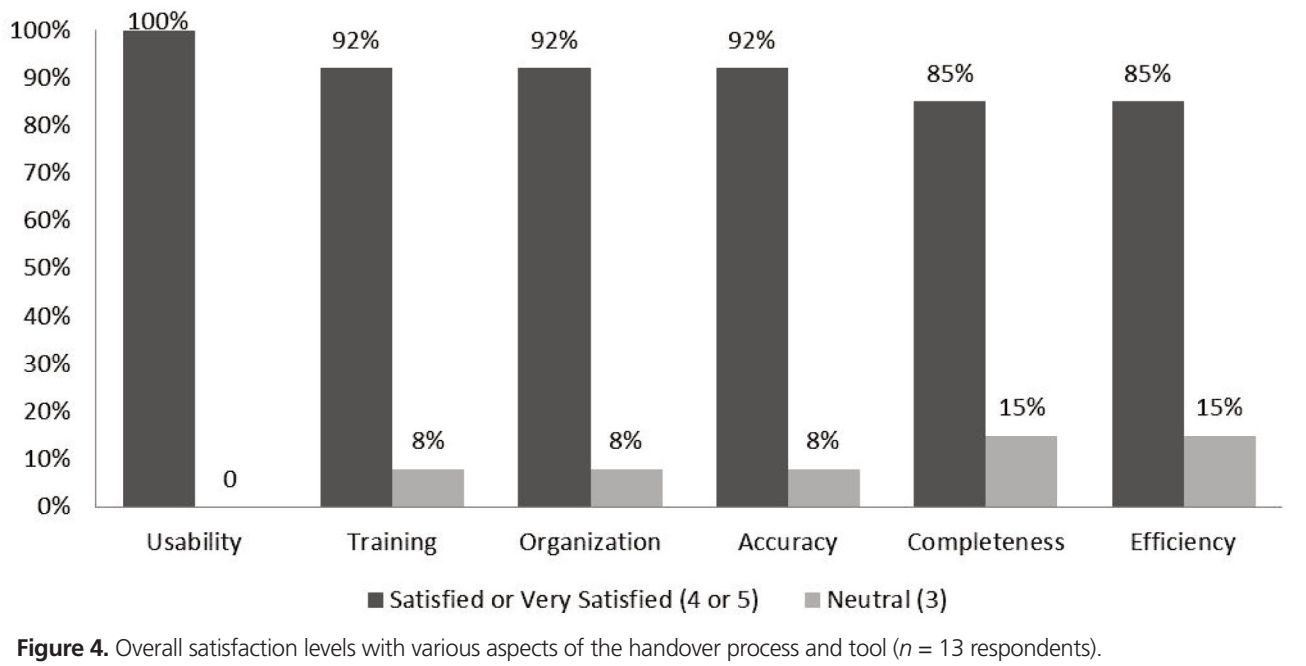

Figure 4. Overall satisfaction levels with various aspects of the handover process and tool (*n* = 13 respondents).

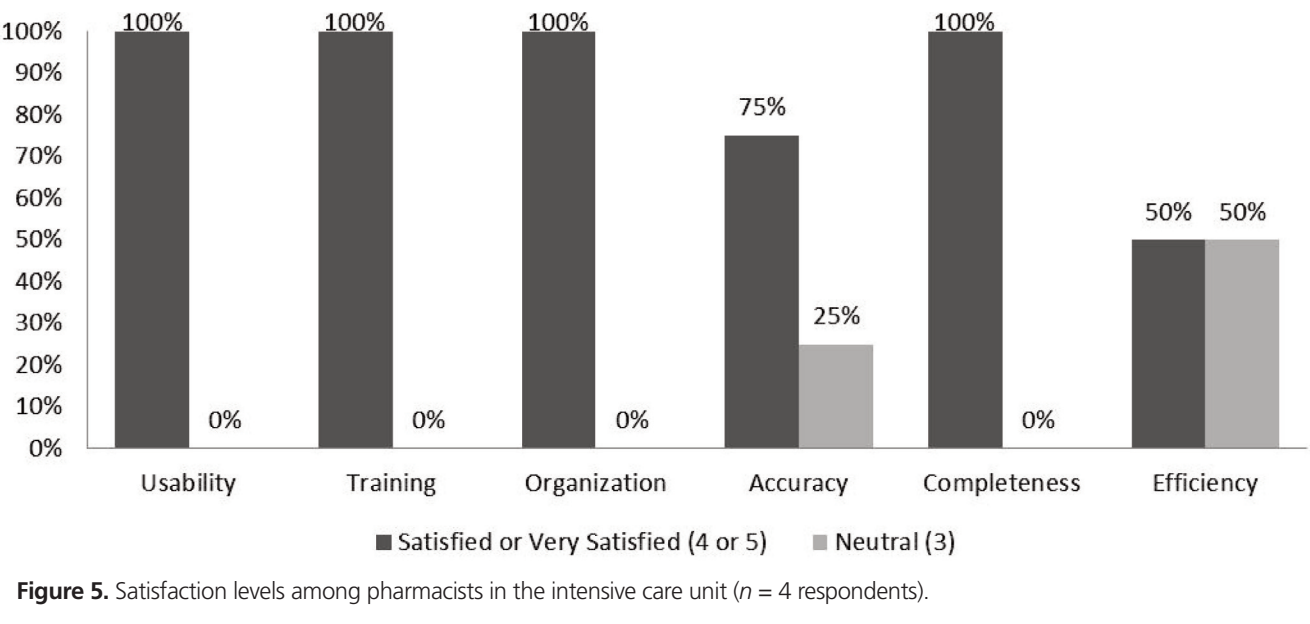

Figure 5. Satisfaction levels among pharmacists in the intensive care unit (*n* = 4 respondents).

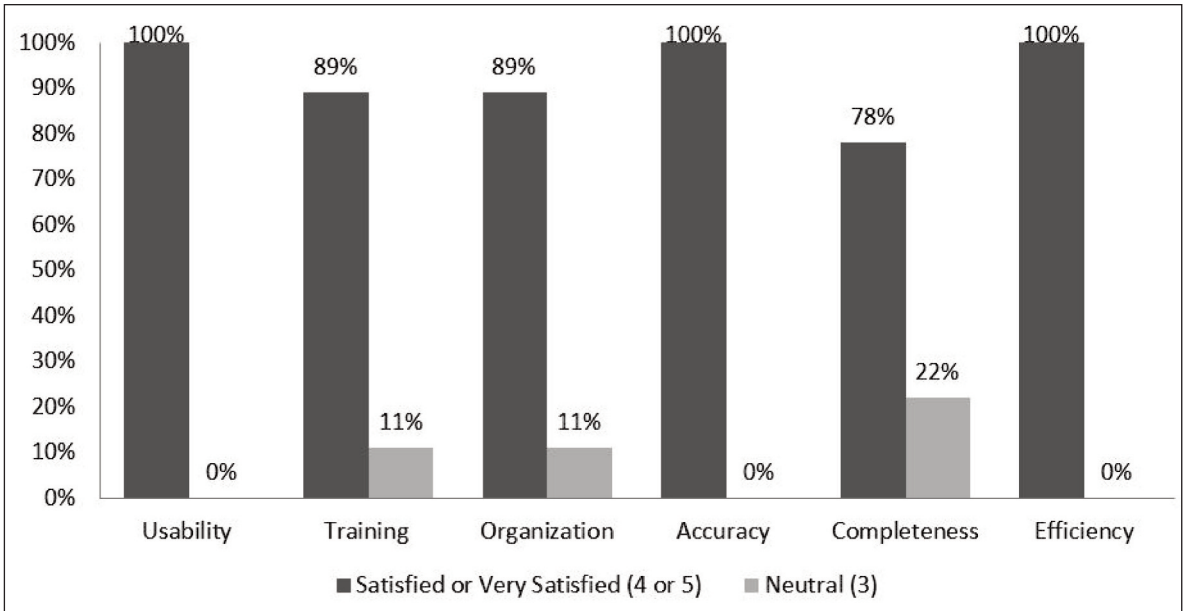

Figure 6. Satisfaction levels among ward pharmacists (*n* = 9 respondents).

and 10 (77%) of the pharmacists reported performing 1 or 2 handovers per week. The maximum workload reported was 5 handovers per week, up to 10 min in duration.

Communication outcomes are presented in Table 2. With respect to communication methods actually used, 7 (54%) of respondents reported mostly or only using the phone, and 6 (46%) reported mostly or only using face-to-face communication. In terms of preferences, 6 (46%) of the respondents preferred face-to-face handover, and 3 (23%) preferred handover by phone.

Table 1. Workload-Related Outcomes

Outcome*	No. (%) of Respondents (*n* = 13)
Time to conduct handover	
≤ 2 min	1 (8)
3–5 min	8 (62)
5–10 min	4 (31)
> 10 min	0 (0)
No. of handovers/week	
≤ 2	10 (77)
3–5	3 (23)
5–10	0 (0)
> 10	0 (0)

*The categorization shown here reflects exactly the response options presented in the survey.

DISCUSSION

This study evaluated satisfaction with various aspects of a pharmacist-developed, pharmacotherapy-specific tool and process for clinical handover within a Canadian health authority. Overall, the study participants were satisfied with the handover tool and process that they helped to create. Participants were unanimously satisfied with the ease of using the tool. The efficiency domain had a lower overall satisfaction level, a result driven by lower satisfaction among ICU pharmacists. This finding may reflect several factors: handover likely causes disruption in workflow, the workload burden for handover falls mostly on ICU pharmacists, and the handover process focuses on patients who are near or have completed ICU discharge and potentially are a lower priority for the ICU pharmacists. Conversely, ward pharmacists were completely satisfied with efficiency, probably because the handover serves as a helpful head start toward the workup of a new patient. Completeness was another domain with a lower overall satisfaction level, a result driven by lower satisfaction among ward pharmacists. This finding may reflect the fact that, during handover, ward pharmacists are receiving specific information about drug-related issues without the luxury of much background information about the patient, which may give the impression of incomplete information transfer. Information available in medical records would be expected to provide context and fill in any information gaps. It is also understandable that ICU pharmacists perceived greater completeness and organization than their ward counterparts, given their familiarity with the patients and the information being provided. ICU pharmacists were also less satisfied than ward pharmacists with accuracy of the tool and process, which may be partly because they are not always present at patient discharge, and are therefore unaware of changes that may occur during or after patient transfer.

Utilization measures showed that workload requirements were minimal and that broad implementation across a regional health authority was achievable. Interestingly, face-to-face and phone handover were both well-used methods of communication,

Table 2. Communication-Related Outcomes

Communication Mode	Group; No. (%) of Respondents		
	All Pharmacists (*n* = 13)	ICU Pharmacists (*n* = 4)	Ward Pharmacists (*n* = 9)
Used			
Face-to-face only	5 (38)	2 (50)	3 (33)
Mostly face-to-face	1 (8)	0 (0)	1 (11)
Phone only	4 (31)	1 (25)	3 (33)
Mostly phone	3 (23)	1 (25)	2 (22)
Both phone and face-to-face equally	0 (0)	0 (0)	0 (0)
Preferred			
Face-to-face	6 (46)	3 (75)	3 (33)
Phone	3 (23)	1 (25)	2 (22)
Both phone and face-to-face equally	4 (31)	0 (0)	4 (44)

but face-to-face interaction was preferred. These results suggest that the intricacies and clarity of face-to-face interaction may allow for a better handover experience, and that the convenience of phone communication could be reserved for when face-to-face communication is not possible because of time or location restraints.

One risk with verbal handover is a loss of information through reliance on memory. In one study comparing handover methods, there was information retention of 2.5% with verbal-only communication, 85.5% with verbal communication plus note-taking by the receiver, and 99% with use of a preprinted sheet containing all patient information.[11] Therefore, it is important to stress the necessity of note-taking during handover. Incorporating a written component into the tool was not deemed feasible because of the potential for such a requirement to compromise efficiency and be a significant barrier to the ICU pharmacist's ability to incorporate handover into their daily practice. It might be argued that most information required to develop a care plan is already being documented, and that what is missing is the verbal communication of information not included in the documentation. Verbal interaction also provides opportunity for questions, discussion, collegiality, and peer-to-peer education.

One strength of this study was the use of PDSA methodology. This approach allowed for adaptation to the real-world practice environment and adjustments for unforeseen difficulties, ensuring that the final version of the handover tool and process was fit-for-purpose. In addition, PDSA mitigated one possible barrier to the adoption of the tool, that is, the potential lack of insight among pharmacists regarding the need to change handover practices. Buy-in from the pharmacists was promoted through early engagement in the planning phase, which thereby avoided the risk of participants developing a negative bias toward using a tool that lacked their input. Additionally, much thought was put into arranging the checklist components of the tool in a manner that would flow logically and facilitate a narrative. Including narrative thought means that not only are specific pieces of information conveyed, but also the way in which those details fit together into a "story" that is unique to each patient, thereby making sense of patients' often complex and evolving clinical courses.

The limitations of this study included its small sample size, which may not be representative of clinical pharmacists practising in other regions of Canada or in other countries. It is acknowledged that many potential biases could not be practically measured or controlled for in the analysis. There was a risk of proficiency bias, whereby pharmacists naturally became more skilled at handover over the course of the intervention and thus might have developed a positive bias toward the outcomes of interest. Also, a risk of responder bias exists, because the pharmacists who participated in development of the handover tool and process also participated in the evaluation. The pharmacists self-reported utilization measures, so there was a risk of recall bias. As well, a risk of researcher bias exists, in that the survey questionnaire may have posed questions in a manner leading toward positive responses. Finally, although study participants were satisfied with the tool, such satisfaction does not necessarily translate into improvements in clinical outcomes. Further study and evaluation will be required to address the impacts of this handover tool and process on process and outcome measures.

Development of and evaluation of satisfaction with a pharmacist-specific clinical handover tool and process align with many national and global handover initiatives. Shifting from an "individual-dependent" process to a standardized process for patient transfer has been endorsed internationally.[12,13] In North America, Accreditation Canada's 2017 Required Organizational Practices have mandated that "the [health care] team transfers information effectively among service providers at transition points".[14] This new tool and process represent a mechanism for information transfer that has the potential to enhance the consistency, efficiency, efficacy, and safety of patient care.

Given the crucial role of ICU pharmacists in providing care to patients in the ICU, appropriate handover processes are needed to ensure that each patient's drug therapy needs are met while in hospital after leaving the ICU, and such processes may prevent

unfavourable consequences for patients, families, practitioners, and the health care system. It is important to emphasize that although medication reconciliation at transitions is an essential part of the tool and process created here, their ultimate purpose was to meet the priority pharmacotherapy needs of patients during and after the transfer of care.

A PubMed search from inception to March 1, 2017, showed no published literature on handovers from ICU pharmacists to ward pharmacists for comparison. Therefore, further research on the subject is necessary, specifically to determine impacts on information transfer, processes of care such as DTP resolution rates, and outcomes such as medication adherence rates. Moreover, future evaluation is needed to address the potential impacts of this standardized handover tool and process on patients being transferred into the ICU from other areas of the hospital.

CONCLUSION

Pharmacists participating in this survey study were satisfied with the systematic development and implementation of a pharmacist-specific clinical handover tool and process. This tool and process have the potential to improve information transfer, which may in turn improve processes of care and outcomes.

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Urosepsis Due to Extended-Spectrum ß-Lactamase–Producing *Escherichia coli*: A Retrospective, Single-Centre Review of Risk Factors and Clinical Outcomes

Yi-Wenn Yvonne Huang, Alison Alleyne, Vivian Leung, and Michael Chapman

ABSTRACT

Background: Extended-spectrum ß-lactamase (ESBL)–producing Enterobacteriaceae are pathogens that are implicated in urosepsis and may be associated with greater morbidity and mortality than non-ESBL Enterobacteriaceae. Identification of risk factors for ESBL infection may facilitate the selection of appropriate empiric therapy.

Objectives: The primary objectives were to determine the cumulative incidence of ESBL urosepsis, to identify major risk factors for ESBL urosepsis, and to determine the impact of international travel on development of ESBL urosepsis in an ethnically diverse Canadian population. The secondary objective was to characterize the outcomes of patients with ESBL urosepsis.

Methods: A single-centre retrospective nested case–control study was conducted from January 2011 to June 2013. The study cohort consisted of adult patients with urosepsis and positive results on blood culture for ESBL-producing and non–ESBL-producing Enterobacteriaceae. Multivariate analysis was then used to determine risk factors for ESBL urosepsis.

Results: The cumulative incidence of ESBL urosepsis at the study site was 19.4% (58/299) over 2.5 years. The 58 cases of ESBL urosepsis were compared with 118 controls (patients with urosepsis caused by non-ESBL Enterobacteriaceae). Significant predictors of ESBL urosepsis were chronic renal insufficiency (odds ratio [OR] 4.66, 95% confidence interval [CI] 1.96–11.08; $p < 0.001$) and travel to an endemic region in the previous 6 months (OR 4.62, 95% CI 1.17–18.19; $p = 0.029$), as well as Punjabi or Hindi as the primary language (OR 3.25, 95% CI 1.45–7.29; $p = 0.004$) and male sex (OR 2.65, 95% CI 1.21–5.80; $p = 0.015$). Patients with ESBL urosepsis had worse prognosis—in terms of death or discharge with palliative measures only—than those with non-ESBL urosepsis (7/58 [12.1%] versus 4/118 [3.4%]; $p = 0.042$).

Conclusions: Institution-specific data support prompt recognition of patients at risk for ESBL infections. Chronic renal insufficiency, recent travel to regions endemic for ESBL-producing organisms, primary language of Punjabi or Hindi, and male sex were the strongest risk factors for ESBL urosepsis at the study centre. However, findings from this single-centre study may not be generalizable to other institutions.

RÉSUMÉ

Contexte : Les entérobactériacées productrices de ß-lactamases à spectre étendu (BLSE) sont des pathogènes en cause dans les cas d'urosepsie et peuvent être associées à des taux de morbidité et de mortalité supérieurs à ceux liés aux entérobactériacées ne produisant pas de BLSE. L'identification des facteurs de risque pour l'infection à BLSE pourrait faciliter le choix d'une antibiothérapie empirique appropriée.

Objectifs : Les objectifs principaux étaient de déterminer l'incidence cumulative des cas d'urosepsie à BLSE, d'identifier les facteurs de risque importants d'urosepsie à BLSE et de découvrir les effets des voyages à l'étranger sur l'apparition d'urosepsie à BLSE dans une population multiethnique canadienne. L'objectif secondaire était d'offrir un portrait de l'issue des patients atteints d'urosepsie à BLSE.

Méthodes : Une étude cas-témoins emboîtée rétrospective a été menée dans un seul centre entre janvier 2011 et juin 2013. La cohorte était composée de patients adultes atteints d'urosepsie dont les résultats d'hémoculture étaient positifs pour des entérobactériacées produisant des BLSE ou pour des entérobactériacées ne produisant pas de BLSE. Une analyse multivariée a ensuite été utilisée afin de discerner les facteurs de risque pour l'urosepsie à BLSE.

Résultats : L'incidence cumulative des cas d'urosepsie à BLSE dans l'établissement à l'étude était de 19,4 % (58/299) sur 2,5 ans. Les 58 cas d'urosepsie à BLSE ont été comparés à 118 témoins (des patients atteints d'urosepsie causée par des entérobactériacées ne produisant pas de BLSE). Les meilleures variables explicatives d'urosepsie à BLSE étaient : l'insuffisance rénale chronique (risque relatif approché [RRA] de 4,66, intervalle de confiance [IC] à 95 % de 1,96–11,08; $p < 0,001$) et les voyages dans une région endémique au cours des six derniers mois (RRA de 4,62, IC à 95 % de 1,17–18,19; $p = 0,029$) ainsi que le punjabi ou l'hindi comme langue principale (RRA de 3,25, IC à 95 % de 1,45–7,29; $p = 0,004$) et le sexe masculin (RRA de 2,65, IC à 95 % de 1,21–5,80; $p = 0,015$). Les patients atteints d'urosepsie à BLSE présentaient un pronostic plus sombre – en ce qui touche le décès ou le congé avec pour seule prescription des mesures palliatives – que ceux atteints d'urosepsie causée par des entérobactériacées non productrices de BLSE (7/58 [12,1 %] contre 4/118 [3,4 %], $p = 0,042$).

Conclusions : Des données propres à l'établissement incitent à dépister

Keywords: extended-spectrum ß-lactamase urosepsis, risk factors, travel

rapidement les patients à risque d'infection à BLSE. L'insuffisance rénale chronique, les voyages récents dans des régions où les organismes producteurs de BLSE sont endémiques, le punjabi ou l'hindi comme langue principale et le sexe masculin représentaient les facteurs de risques les plus importants pour l'urosepsie à BLSE au centre à l'étude. Cependant, il se pourrait que les résultats provenant de la présente étude réalisée dans un seul centre ne puissent pas être généralisés à d'autres établissements.

Mots clés : urosepsie à ß-lactamases à spectre étendu, facteurs de risque, voyage

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INTRODUCTION

In clinical practice, one of the most common types of bacterial infection encountered is urinary tract infection (UTI).[1] Although most UTIs are acquired in the community, they are also among the most common nosocomial infections.[2] Among urinary isolates, the most commonly implicated pathogens are *Escherichia coli* and *Klebsiella* spp.[3,4] Through plasmid-mediated mechanisms, some species of Enterobacteriaceae acquire the ability to produce extended-spectrum ß-lactamases (ESBLs), enzymes that hydrolyze ß-lactam antibiotics.[5] These plasmid adaptations confer multidrug resistance to an array of broad-spectrum ß-lactam antibiotics, including monobactams and third-generation cephalosporins (e.g., cefotaxime, ceftriaxone, ceftazidime),[3] thus creating clinical challenges by limiting the options for appropriate drug therapy. Carbapenems have been regarded as the treatment of choice for infections with ESBL-producing organisms, but the emergence of carbapenem-resistant Enterobacteriaceae has necessitated more judicious use of antimicrobial therapies.[6]

Globally, the increasing prevalence of infections due to ESBL-producing organisms has become an emerging public health concern. High prevalence of such organisms has been documented in regions such as South America and Asia, with the highest rates being observed in India (where > 55% of *Klebsiella pneumoniae* and 60% of *E. coli* clinical isolates from all sources produce ESBLs).[7-9] In Canadian hospitals, the prevalence of ESBL-producing *E. coli* and *K. pneumoniae* has been reported as about 4.9% and is on the rise.[3,10] The prevalence of ESBL-producing organisms in hospitals in the provinces of British Columbia and Alberta collectively has been documented at 7.6%, the highest across the nation.[3] Surrey Memorial Hospital is the second-largest hospital in British Columbia. It serves a multicultural population with a diverse history of travel activity worldwide. Among all isolates in the region served by this hospital, the prevalence of ESBL-producing organisms has been documented as 11% for *E. coli* and 5% for *K. pneumoniae*.[11] Prospective studies have suggested that international travel to destinations with higher prevalence of ESBL-producing organisms—such as the Indian subcontinent, Asia, and northern Africa—may be a risk factor for colonization and infection by ESBL-producing Enterobacteriaceae.[9,12-15]

The literature suggests that ESBL-producing strains of *E. coli* are an important cause of bloodstream infections from a urinary source.[16] The term "urosepsis" has been used to describe these serious UTIs. Bloodstream infections secondary to ESBL-producing organisms have been associated with a 2- to 3-fold increase in mortality, higher rates of treatment failure, and delayed time to initiation of appropriate antimicrobial therapy relative to infections with non–ESBL-producing organisms.[16-19] Numerous studies have attempted to elucidate risk factors for acquiring infections secondary to ESBL-producing organisms; these factors have included prior hospitalization, admission to the intensive care unit, recurrent UTIs, previous exposure to antibiotics (particularly oxyimino ß-lactams), previous invasive procedures of the urinary tract, and international travel.[14,15,20-24] The primary objectives of the current study were to evaluate the cumulative incidence of ESBL urosepsis at Surrey Memorial Hospital and to identify major risk factors and the impact of international travel on development of active ESBL infections in an ethnically diverse Canadian population. The secondary objective was to characterize the outcomes of patients with ESBL urosepsis.

METHODS

Study Population and Design

This study was a chart review of electronic health records conducted at Surrey Memorial Hospital, a 650-bed community care hospital. The study included patients 19 years of age or older with a diagnosis of urosepsis between January 2011 and June 2013. Patients were initially identified by screening the electronic health records for positive results of blood culture for *E. coli* or *K. pneumoniae*, as obtained by testing with a VITEK 2 instrument (bioMérieux Vitek Systems Inc). The electronic health records of patients initially identified were further reviewed by study investigators to determine the presence of urosepsis. Patients were deemed to have had urosepsis if they had positive results on blood culture for *E. coli* or *K. pneumoniae* due to a urinary source and if they presented with 2 or more of the criteria for systemic inflammatory response syndrome, as follows: temperature above 38.5°C or below 36°C, leukocyte count less than 4×10^9/L or greater than 12×10^9/L, heart rate greater than 90 beats/min, and respiratory rate greater than 20 breaths/min. For patients with

multiple episodes of urosepsis in the defined study period, only the first episode was included in the analysis.

The analysis began with determination of the cumulative incidence of ESBL urosepsis at the study site, from a cohort of patients with urosepsis due to *E. coli* or *K. pneumoniae*. Then, a case–control study nested within the cohort was conducted to estimate the magnitude of effect of risk factors for urosepsis caused by those ESBL-producing Enterobacteriaceae. Cases were matched 1:2 to controls based on infection with the same organism (i.e., *E. coli* or *K. pneumoniae*). For each case of ESBL urosepsis, 2 controls were randomly selected from the pool of patients with urosepsis due to non–ESBL-producing Enterobacteriaceae. Random selection of controls was accomplished with the list randomization function in Excel software (Microsoft Corp, Redmond, Washington). Administrative health care data of the patients were analyzed, including inpatient electronic health records and records from PharmaNet, the provincial registry of all outpatient prescription drugs dispensed in British Columbia. This study was approved by the Fraser Health Research and Ethics Board as a quality improvement project and was deemed appropriate for exemption from informed patient consent.

Data Collection

Patient characteristics for data collection were determined a priori on the basis of previous literature and site-specific observations. Demographic and clinical information, including age, sex, residence, primary language, travel history, and comorbidities, were collected. The following outcomes were also evaluated: length of hospital stay, duration of antimicrobial treatment, time to appropriate antibiotic therapy, and all-cause mortality among patients who died in hospital.

Patients with an admission diagnosis of urosepsis and no hospitalizations in the previous 48 h were defined as having a community-acquired infection. For the purpose of this study, "hospitalization" was defined as a visit to the emergency department or admission to hospital, but did not include residence in a long-term care facility or assisted living arrangements. Hospitalized patients with onset of symptoms more than 48 h after admission or within 48 h after discharge from any hospital were deemed to have a nosocomial infection.

Travel history within the past 6 months, as ascertained from all admitted patients at triage, was collected from the electronic health record. Travel to an endemic region was defined as travel to any region with a prevalence of ESBL-producing organisms above 30%, such as the subcontinent of India, Southeast Asia, China, the Middle East, South America, and northern Africa.[8,13] The Surrey Memorial Hospital is situated in a diverse and multicultural community. Although not previously studied as a risk factor, primary language was collected from triage information as a surrogate marker for potential familial contact with household travellers or visitors from abroad.

Vital signs at the time of triage were evaluated for patients who presented to the emergency department. For patients whose urosepsis developed during the hospital stay, vital signs at the time the treating physician ordered initial blood cultures were evaluated.

Chronic renal insufficiency was defined as estimated glomerular filtration rate (eGFR) less than 60 mL/min per 1.73 m^2 for a duration of 3 months or longer before the onset of infection. The eGFR was determined (as part of the current study) from the Modification of Diet in Renal Disease equation.

Appropriate antimicrobial therapy was defined as IV or oral agents to which the organism was susceptible. Use of ß-lactam and ß-lactamase inhibitors (e.g., piperacillin–tazobactam) as empiric therapy was considered inappropriate in cases of ESBL urosepsis. The time to appropriate antimicrobial therapy was calculated as the interval from time of sampling for initial blood cultures to time of receiving the first dose of antimicrobial therapy to which the organism was susceptible. Furthermore, patients were deemed to have received appropriate antimicrobial therapy within 24 h if the antibiotic was started within 24 h from the time of initial blood culture.

All-cause mortality was evaluated on the basis of in-hospital death. Patients who were discharged but whose care was withdrawn because of deteriorating clinical status (i.e., death was imminent) were deemed to be receiving palliative measures only.

Statistical Analysis

The distributions of the variables were examined using the Student *t* test, the χ^2 test, or the Fisher exact test, as deemed appropriate. Clinical outcomes were analyzed using the Mann–Whitney *U* test. To estimate the strength of the association between each covariate and ESBL-related urosepsis, univariate regression analyses were performed, with a covariate as the only explanatory variable and ESBL-related urosepsis as the outcome variable. Then, a series of multivariate models were fitted iteratively, beginning with variables that were deemed clinically significant with a *p* value less than 0.05 in the univariate analyses. At each step, one additional variable was entered into the model, and the model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test and the corresponding *p* value. The final model was fitted with only the strongest predictors of ESBL-related urosepsis, as determined by the highest Hosmer–Lemeshow *p* value. Alternative model specifications were explored in multivariate analyses to determine the sensitivity of the results to other combinations of variables. The analyses were performed using the SPSS version 15.0 statistical software package (SPSS Inc, Chicago, Illinois).

RESULTS

The selection of patients for this study is outlined in Figure 1. The organisms of interest, *E. coli* and *K. pneumoniae*, were identified in blood cultures from 503 unique patients during the

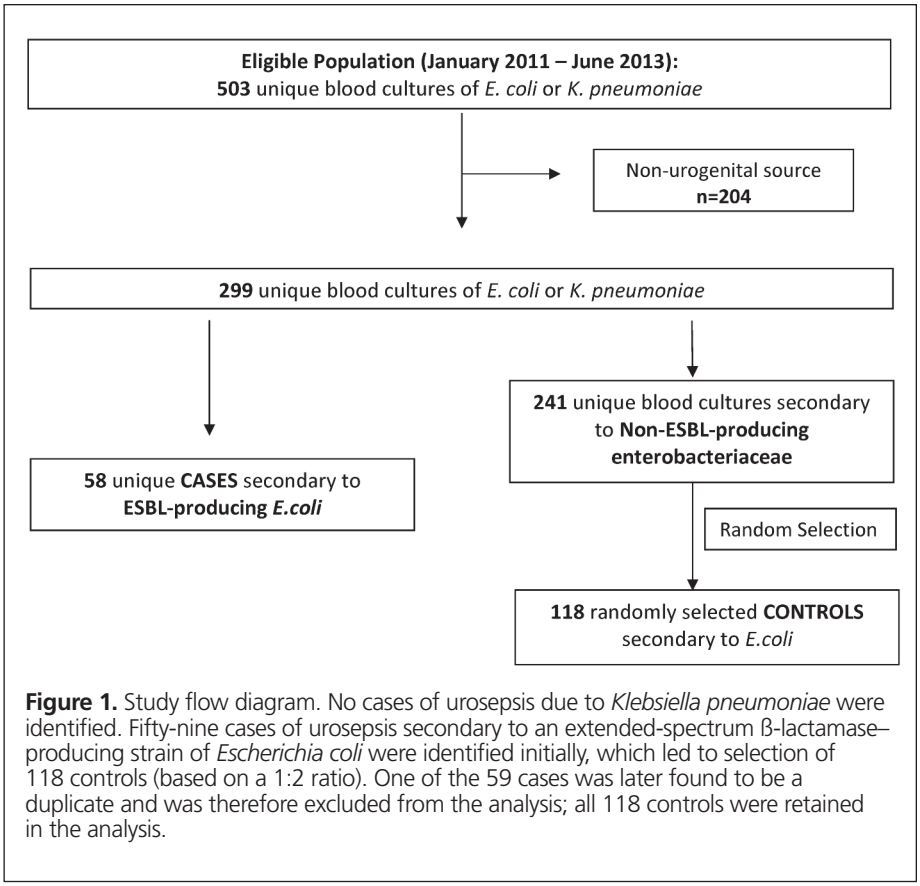

Figure 1. Study flow diagram. No cases of urosepsis due to *Klebsiella pneumoniae* were identified. Fifty-nine cases of urosepsis secondary to an extended-spectrum ß-lactamase–producing strain of *Escherichia coli* were identified initially, which led to selection of 118 controls (based on a 1:2 ratio). One of the 59 cases was later found to be a duplicate and was therefore excluded from the analysis; all 118 controls were retained in the analysis.

study period; of these, 299 unique patients (59.4%) had urosepsis. We initially identified 59 cases of urosepsis secondary to an ESBL-producing strain of *E. coli*, but 1 case was later found to be a duplicate and was excluded from the analyses. The 58 cases resulted in a cumulative incidence of urosepsis due to ESBL-producing *E. coli* at this site of 19.4% (58/299) over the 2.5-year study period. No cases of ESBL *K. pneumoniae* urosepsis were identified. From the patients with non–ESBL-producing *E. coli*, the first 118 unique patients that met the inclusion criteria were selected as controls (based on initial identification of 59 cases and a 1:2 ratio of cases to controls); all 118 controls were retained for analysis. Therefore, a total of 176 patients were included in this case–control study.

Patient Characteristics and Comorbidities

Patient characteristics, including recent travel history and comorbidities, are shown in Table 1. The mean age of all 176 patients was 67 years, and 72 (40.9%) were men. There was no significant difference in age between case and control patients; however, a greater proportion of the case patients were men (33/58 [56.9%] versus 39/118 [33.1%]; $p = 0.003$). Most of the infections were acquired in the community (145/176 [82.4%]). Univariate analysis suggested that primary language was a strong predictor of urosepsis secondary to an ESBL-producing organism, with case patients being more likely than control patients to speak Punjabi or Hindi as their primary language (33/58 [56.9%] versus 26/118 [22.0%]; $p < 0.001$). Hospitalization in the previous 12 months was also more commonly seen among case patients than control patients (32/58 [55.2%] versus 38/118 [32.2]; $p = 0.005$). Travel history as a risk factor was evaluated, but was not found to be statistically significant. However, among the 20 patients with recent (past 6 months) travel to an endemic region, 12 (60%) harboured an ESBL-producing organism. These 12 case patients with ESBL urosepsis and recent travel to an endemic region had all travelled to the subcontinent of India in the previous 6 months. Evaluation of comorbidities showed that case patients more frequently had renal insufficiency, recurrent UTIs, hepatitis C infection, tumour of the prostate or urinary tract, and benign prostatic hypertrophy. Univariate analysis showed that fluoroquinolone use in the previous 6 months was associated with acquisition of an ESBL-producing organism (24/58 [41.4%] versus 24/118 [20.3%]; $p = 0.004$), whereas no association was found with prior use of cephalosporins or penicillins (Table 2).

In the multivariate analysis (Table 3), the best-fit model demonstrated that the strongest predictors of urosepsis secondary to ESBL-producing organisms were chronic renal insufficiency (OR 4.66, 95% CI 1.96–11.08; $p < 0.001$) and travel to an endemic region in the previous 6 months (OR 4.62, 95%

Table 1. Patient Characteristics and Comorbidities

Characteristic	Group; No. (%) of Patients*		*p* Value
	ESBL Urosepsis (*n* = 58)	Non-ESBL Urosepsis (*n* = 118)	
Age (years) (mean ± SD)	69.6 ± 16.1	66.2 ± 18.7	0.24
Sex, male	33 (56.9)	39 (33.1)	0.003
Residence			0.89
Home	48 (82.8)	99 (83.9)	
Long-term care facility	7 (12.1)	12 (10.2)	
Assisted living	3 (5.2)	6 (5.1)	
Other	0 (0)	1 (0.8)	
Primary language			< 0.001
English	19 (32.8)	75 (63.6)	
Punjabi or Hindi	33 (56.9)	26 (22.0)	
Other	1 (1.7)	7 (5.9)	
Unknown	5 (8.6)	10 (8.5)	
Travel history			
In past 6 months	12 (20.7)	13 (11.0)	0.11
To endemic region in past 6 months	12 (20.7)	8 (6.8)	0.010
Exposure			
Community-acquired	48 (82.8)	97 (82.2)	> 0.99
Nosocomial	10 (17.2)	21 (17.8)	> 0.99
Hospitalization in past 12 months	32 (55.2)	38 (32.2)	0.005
Sepsis at time of presentation	45 (77.6)	82 (69.5)	0.29
Urological procedures† within 1 month before admission	10 (17.2)	14 (11.9)	0.36
Comorbidities			
Diabetes mellitus	27 (46.6)	42 (35.6)	0.19
CKD (eGFR < 60 mL/min per 1.73 m^2)	27 (46.6)	18 (15.3)	< 0.001
Hemodialysis	2 (3.4)	2 (1.7)	0.60
Recurrent UTI (> 3/year)	22 (37.9)	19 (16.1)	0.002
Pregnancy	3 (5.2)	5 (4.2)	0.72
Stroke or TIA	14 (24.1)	17 (14.4)	0.14
Neurological disorder‡	8 (13.8)	13 (11.0)	0.62
Immunocompromise			
HIV	1 (1.7)	0 (0)	> 0.99
Hepatitis C	5 (8.6)	2 (1.7)	0.040
Malignancy	4 (6.9)	10 (8.5)	> 0.99
Transplant recipient	0 (0)	2 (1.7)	> 0.99
Use of immunosuppressants§	3 (5.2)	5 (4.2)	0.72
Urogenital comorbidities			
Any structural malformation¶	31 (53.4)	45 (38.1)	0.075
Urinary retention	4 (6.9)	9 (7.6)	> 0.99
Nephrolithiasis	4 (6.9)	13 (11.0)	0.59
Renal stents	2 (3.4)	1 (0.8)	0.25
Tumour of prostate or urinary tract	4 (6.9)	1 (0.8)	0.041
Benign prostatic hypertrophy	14 (24.1)	13 (11.0)	0.028
Indwelling catheter	8 (13.8)	14 (11.9)	0.81

CKD = chronic kidney disease, eGFR = estimated glomerular filtration rate, ESBL = extended-spectrum ß-lactamase, SD = standard deviation, TIA = transient ischemic attack, UTI = urinary tract infection.
*Except where indicated otherwise.
†Transurethral prostate resection, insertion of renal stent, insertion of nephrostomy tube, biopsy of kidney and/or prostate, cystoscopy.
‡Spina bifida, multiple sclerosis, Alzheimer dementia, Parkinson disease, spinal cord injury.
§Use of methotrexate, corticosteroids > 5 mg equivalent of prednisone daily for > 14 days, calcineurin inhibitors, chemotherapy, biologics, other immune modulators.
¶Urinary retention, benign prostatic hypertrophy, indwelling catheter, malignancy of the prostate or urinary tract, renal stent, nephrolithiasis, urinary strictures, fistula, or trabeculation of the bladder.

Table 2. Antibiotic Use during 6 Months before Admission

Antibiotic Class*	Group; No. (%) of Patients		*p* Value
	ESBL Urosepsis (*n* = 58)	Non-ESBL Urosepsis (*n* = 118)	
Cephalosporins	12 (20.7)	13 (11.0)	0.11
Fluoroquinolones	24 (41.4)	24 (20.3)	0.004
ß-Lactams	19 (32.8)	24 (20.3)	0.09
Any antibiotic†	36 (62.1)	40 (33.9)	0.001

ESBL = extended-spectrum ß-lactamase.
*Patients received 1 or more doses of the antibiotic listed.
†Any systemic antibiotic received by patient (IV or oral), regardless of antibiotic class.

Table 3. Multivariate Regression Analysis

Variable	ß	Standard Error	*p* value	OR (95% CI)
Chronic renal insufficiency (eGFR < 60 mL/min per 1.73 m^2)	1.539	0.442	< 0.001	4.66 (1.96–11.08)
Travel to endemic region in past 6 months	1.530	0.699	0.029	4.62 (1.17–18.19)
Primary language Punjabi or Hindi	1.178	0.412	0.004	3.25 (1.45–7.29)
Male sex	0.975	0.400	0.015	2.65 (1.21–5.80)

CI = confidence interval, eGFR = estimated glomerular filtration rate, OR = odds ratio.

CI 1.17–18.19; $p = 0.029$). Speaking Punjabi or Hindi as the primary language (OR 3.25, 95% CI 1.45–7.29; $p = 0.004$) and male sex (OR 2.65, 95% CI, 1.21–5.80; $p = 0.015$) were the next strongest predictive variables. The Hosmer–Lemeshow p value was 0.961, which suggested a well-fitted model. Of note, adjustment for age, hospitalization in the past 12 months, and previous antibiotic use did not significantly affect the clinical effect size of other variables or improve the fit of the model. Furthermore, the variables included in the final model were not collinear.

Outcomes

Among patients with urosepsis due to ESBL-producing organisms, the median length of hospital stay was 4 days longer (11 days versus 7 days; $p = 0.003$) and treatment duration with antimicrobials was 1 day longer (14 days versus 13 days; $p = 0.048$) than for patients with urosepsis due to non–ESBL-producing organisms. Patients with ESBL-producing organisms less frequently received appropriate antimicrobial therapy within 24 h than control patients (48/58 [82.8%] versus 112/118 [94.9%]; $p = 0.012$). This finding also correlated with worse prognosis at discharge, with more patients experiencing all-cause mortality or being discharged with palliative measures only if they harboured an infection with an ESBL-producing organism. Outcomes are summarized in Table 4.

DISCUSSION

In this single-centre study, the cumulative incidence of urosepsis due to ESBL-producing *E. coli* over the 2.5-year study period was 19.4%, higher than documented for other Canadian institutions. Studies from Winnipeg, Manitoba, have shown steady increases in the proportion of ESBL-producing *E. coli* in blood isolates, from 1.8% in 2008 to 10.3% in 2015.[25] In a study from the Calgary Health Region, Peirano and others[26] noted that 14% of *E. coli* blood isolates analyzed in 2010 were ESBL-producing organisms, primarily from a urinary source.

The current nested case–control study showed that, in decreasing order of significance, chronic renal insufficiency (eGFR < 60 mL/min per 1.73 m^2), travel to an endemic region in the past 6 months, primary language of Punjabi or Hindi (as a surrogate marker for familial transmission and contact abroad), and male sex were the strongest predictors of ESBL-related urosepsis. Although we had hypothesized that chronic renal insufficiency would be confounded by age, we found that age was not an influential variable in the presence of stronger predictors. Despite renal insufficiency being the strongest risk factor in the current study, there remains inconsistency in the literature with regard to this comorbidity as a risk factor for ESBL-related infections.[7,21,22,27]

The current literature suggests that international travel—particularly to the Indian subcontinent, Southeast Asia, and the Middle East—is a risk factor for fecal colonization and infection by multidrug-resistant organisms, including ESBL-producing bacteria.[9,12-15,28,29] In the COMBAT study, a large-scale longitudinal study, 34.3% of Dutch travellers returning from international travel had newly acquired colonization with ESBL-producing Enterobacteriaceae, and 11.3% of these individuals had persistent colonization at 12 months following return.[24] The authors of the COMBAT study calculated that nontravelling household members had a 12% probability of colonization with ESBL-producing Enterobacteriaceae.[24] Similar to previous studies, we found that international travel was associ-

Table 4. Clinical Outcomes of Patients with ESBL or Non-ESBL Urosepsis

Outcome	Group; Median (IQR) or No. (%) of Patients		*p* Value
	ESBL Urosepsis (*n* = 58)	Non-ESBL Urosepsis (*n* = 118)	
Duration of hospital admission (days)	11 (6–27)	7 (3–13)	0.003
Total duration of treatment (days)	14 (9–28)	13 (9–17)	0.048
Received appropriate treatment within 24 h	48 (82.8)	112 (94.9)	0.012
Time to appropriate treatment (h)	4 (1.5–18)	2.5 (1–7.8)	0.067
All-cause mortality or palliative measures only on discharge	7 (12.1)	4 (3.4)	0.042

ESBL = extended-spectrum ß-lactamase, IQR = interquartile range.

ated with acquiring ESBL infections; notably, however, most of the clinical isolates in those previous studies were obtained from urine only.[12,14,15] In such instances, positive results on urine culture may represent colonization rather than true infection. Because we exclusively evaluated blood isolates, this is the first study (to our knowledge) that attempts to quantify the strength of foreign travel as a risk factor for definitive ESBL-related infections in an ethnically diverse Canadian population.

The Canadian census indicates that about 30% of individuals in the study region primarily speak a migrant language (i.e., a language other than Canada's official languages of English, French, and Aboriginal languages).[30] We examined language as a surrogate marker, hypothesizing that primarily speaking a migrant language might suggest previous residence abroad or contact with visitors from abroad, both of which could be a modality of familial transmission. However, the association between primary language and risk of ESBL-related infection requires further investigation and validation through prospective studies.

The presence of multidrug-resistant organisms is commonly associated with prior hospitalization and is often regarded as "nosocomial" infection.[8,31] An international multicentre study suggested that among nonhospitalized patients, male sex, age 65 years or older, recent antibiotic use, recent hospital admission, and residence in a long-term care facility were independent risk factors for acquiring ESBL-producing organisms; however, for patients with no previous health care contact, these variables showed poor predictive value.[32] Although the patients in the current study had been admitted to hospital, our findings do corroborate the literature. Approximately half of the patients with ESBL urosepsis had no prior hospital admissions, and 82.8% of the ESBL infections were likely acquired in the community. The latter result is consistent with previous literature suggesting the growing prominence of community-acquired ESBL infections.[14,15,33] As a result, the distinction between community-acquired and nosocomial cases may be confounded by colonization and/or horizontal transmission in the general population.

The impact of ESBL infections on mortality remains controversial. Some studies have suggested that ESBL bloodstream infections have been associated with a 2- to 3-fold increase in morbidity and mortality.[17,19] One meta-analysis found that there is often a delay in prescribing effective antibiotics for patients with ESBL bacteremia, which has implications for mortality outcomes.[18] Other studies have demonstrated conflicting mortality outcomes in the presence of inadequate initiation of empiric antimicrobials.[34,35] Length of stay has been studied in previous matched case–control studies, which have shown no differences between ESBL and non-ESBL bloodstream infections.[34,36] Although increases in all-cause mortality and length of stay were observed in our study, the lack of demographic matching and the lack of statistical adjustments limit our interpretation of these findings. All-cause mortality and discharge on palliative measures only were assessed as a composite outcome, because death was deemed imminent for all 3 patients in the ESBL urosepsis group with palliative measures only at discharge.

Delay to effective antimicrobial therapy for patients with ESBL bloodstream infections has been consistently documented in the literature.[18,34,35] As predicted, patients in the current study who harboured an ESBL-producing organism less often received appropriate empiric therapy. However, the median time to receipt of antimicrobial therapy was not statistically different between case and control patients. Clinicians often tailor empiric antimicrobial selection on the basis of previous microbial colonization, but prior colonization with ESBL-producing organisms was not analyzed a priori in the current study. In a post hoc analysis, we found that 14 of the case patients had prior colonization with ESBL-producing organisms. Such prior colonization could have affected the selection of antimicrobials in favour of agents that empirically target ESBL organisms, which would have shortened the median time to receipt of appropriate antimicrobials in the ESBL urosepsis group. Future studies should consider prior colonization as a study variable.

Limitations

This study had several limitations. It was a single-centre study within a unique demographic region; therefore, the results may not be generalizable to other institutions. Moreover, our study primarily focused on *E. coli* urosepsis, and it may not be possible

to extrapolate the risk factors identified here to other Enterobacteriaceae (e.g., *Klebsiella* spp., *Proteus* spp.). The small sample size may have limited the ability to detect a statistically significant difference among variables in the univariate analysis, which were then excluded from consideration in the multivariate regression analysis. Given the retrospective study design, there is the possibility of incomplete data for vital signs and symptoms, adherence history for antibiotics filled before admission, and past medical history. Moreover, without prospective follow-up, the accuracy of travel history as documented at triage may have been variable, which may have affected the accuracy of results. The COMBAT study demonstrated persistence of colonization for as long as 12 months after return from travel,[24] whereas we assessed for travel only in the 6 months before admission; as such, it is possible that the risk of acquiring ESBL-producing Enterobacteriaceae was under-captured in our study. Primary language has not been previously documented or validated as a risk factor for acquisition of multidrug-resistant organisms. Given the retrospective nature of this study, we were unable to gather information on contact with visitors from abroad or household travel history. Furthermore, retention of migrant language is not always reflective of travel history or contact with visitors from abroad; therefore, no conclusions can be drawn regarding language as a surrogate risk factor.

CONCLUSION

Early identification of risk factors associated with ESBL urosepsis is important and may help clinicians to initiate appropriate empiric antimicrobial therapy. This study identified risk factors and quantified the impact of recent travel on the acquisition of ESBL-related urosepsis. Several outcomes were evaluated; however, larger-scale studies with statistical adjustments are required to validate these results. The findings in this single-centre study highlight that sociodemographic risk factors may be just as clinically important as pre-existing comorbidities in the selection of empiric coverage. Institution-specific data support prompt recognition of patients at risk for ESBL infections, facilitate antimicrobial stewardship, and highlight the need to screen for and consider recent travel history when initiating empiric antibiotic therapy in patients presenting with urosepsis.

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ORIGINAL RESEARCH

Quality of Best Possible Medication History upon Admission to Hospital: Comparison of Nurses and Pharmacy Students and Consideration of National Quality Indicators

Ashley Sproul, Carole Goodine, David Moore, Amy McLeod, Jacqueline Gordon, Jennifer Digby, and George Stoica

ABSTRACT

Background: Medication reconciliation at transitions of care increases patient safety. Collection of an accurate best possible medication history (BPMH) on admission is a key step. National quality indicators are used as surrogate markers for BPMH quality, but no literature on their accuracy exists. Obtaining a high-quality BPMH is often labour- and resource-intensive. Pharmacy students are now being assigned to obtain BPMHs, as a cost-effective means to increase BPMH completion, despite limited information to support the quality of BPMHs obtained by students relative to other health care professionals.

Objectives: To determine whether the national quality indicator of using more than one source to complete a BPMH is a true marker of quality and to assess whether BPMHs obtained by pharmacy students were of quality equal to those obtained by nurses.

Methods: This prospective trial compared BPMHs for the same group of patients collected by nurses and by trained pharmacy students in the emergency departments of 2 sites within a large health network over a 2-month period (July and August 2016). Discrepancies between the 2 versions were identified by a pharmacist, who determined which party (nurse, pharmacy student, or both) had made an error. A panel of experts reviewed the errors and ranked their severity.

Results: BPMHs were prepared for a total of 40 patients. Those prepared by nurses were more likely to contain an error than those prepared by pharmacy students (171 versus 43 errors, $p = 0.006$). There was a nonsignificant trend toward less severe errors in BPMHs completed by pharmacy students. There was no significant difference in the mean number of errors in relation to the specified quality indicator (mean of 2.7 errors for BPMHs prepared from 1 source versus 4.8 errors for BPMHs prepared from ≥ 2 sources, $p = 0.08$).

Conclusions: The surrogate marker (number of BPMH sources) may not reflect BPMH quality. However, it appears that BPMHs prepared by pharmacy students had fewer errors and were of similar quality (in terms of clinically significant errors) relative to those prepared by nurses.

RÉSUMÉ

Contexte : L'établissement du bilan comparatif des médicaments au moment du transfert des soins accroît la sécurité des patients. L'obtention d'un meilleur schéma thérapeutique possible (MSTP) exact à l'admission en est une étape clé. Des indicateurs nationaux de la qualité sont utilisés comme critères de substitution pour évaluer la qualité des MSTP, mais il n'y a pas de documentation se penchant sur leur exactitude. Obtenir un MSTP de grande qualité est souvent exigeant sur le plan du personnel et des ressources. Des étudiants en pharmacie se voient maintenant confier l'élaboration de MSTP, une façon peu coûteuse d'accroître les taux de réalisation de MSTP; or, il n'y a que peu d'information pour valider le degré de qualité des MSTP obtenus par des étudiants en comparaison avec ceux produits par d'autres professionnels de la santé.

Objectifs : Déterminer si l'indicateur national de qualité basé sur le recours à plus d'une source de renseignements pour réaliser un MSTP est un vrai marqueur de qualité et évaluer la qualité relative des MSTP de la part des étudiants en pharmacie et du personnel infirmier.

Méthodes : Dans la présente étude prospective réalisée sur une période de deux mois (en juillet et en août 2016), les chercheurs ont comparé les MSTP recueillis auprès du même groupe de patients par du personnel infirmier et par des étudiants en pharmacie qualifiés dans les services des urgences de deux établissements faisant partie d'un important réseau de santé. Un pharmacien relevait les divergences entre les deux versions du MSTP et imputait l'erreur soit au personnel infirmier, soit à l'étudiant en pharmacie ou soit aux deux parties. Un groupe d'experts a étudié les erreurs et leur a accordé une cote selon leur degré de gravité.

Résultats : Des MSTP ont été réalisés auprès de 40 patients. Ceux préparés par le personnel infirmier étaient plus susceptibles de contenir une erreur que ceux établis par les étudiants en pharmacie (171 contre 43 erreurs, $p = 0{,}006$). On a noté une tendance non significative selon laquelle les erreurs commises par les étudiants en pharmacie étaient moins graves. Aucune différence significative n'a été relevée quant au nombre moyen d'erreurs par rapport à l'indicateur de qualité (2,7 pour les MSTP provenant d'une source contre 4,8 pour les MSTP provenant de deux sources ou plus, $p = 0{,}08$).

Keywords: medication reconciliation, best possible medication history, quality indicators, medication safety, medication history, pharmacy students, nurses

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Conclusions : Le critère de substitution (nombre de sources pour le MSTP) pourrait ne pas être représentatif de la qualité du MSTP. Cependant, il semble que les MSTP préparés par les étudiants en pharmacie comportaient moins d'erreurs et étaient de qualité comparable (quant aux erreurs cliniquement significatives) à ceux établis par le personnel infirmier.

Mots clés : bilan comparatif des médicaments, meilleur schéma thérapeutique possible, indicateurs de la qualité, sécurité des médicaments, historique des médicaments, étudiants en pharmacie, personnel infirmier

INTRODUCTION

Medication reconciliation is beneficial for both patients and health care systems. At transitions of care, medication reconciliation increases patient safety through the reduction of medication errors, as well as through reduction of potential and actual adverse drug events.[1,2] It also decreases health care utilization by reducing hospital visits, emergency department visits, and hospital readmissions related to adverse drug events.[3]

A key step in the medication reconciliation process is obtaining a best possible medication history (BPMH), which involves interviewing the patient or a caregiver to obtain a list of the patient's home medications, and then verifying this information against at least one other reliable source, such as the patient's medication vials or the community pharmacy record.

The Safer Healthcare Now! campaign of the Canadian Patient Safety Institute, which was started in 2011, is a national program to increase the safety of health care in Canada.[4] One of the campaign's initiatives is medication reconciliation. Data from across Canada are being collected to allow comparison of local outcomes on a national basis. These data include surrogate measures of the quality of medication reconciliation, specifically BPMH quality, also known as BPMH quality indicators. These indicators include using more than one information source, using a patient or caregiver interview as one source, and ensuring that all pertinent information is available for each medication (i.e., name, strength, dose, route, and frequency).[4] Although these indicators are used by the Safer Healthcare Now! campaign, there is no literature supporting them as accurate measures of quality, nor are there any studies comparing these indicators with an independent BPMH audit.

Therefore, to determine the quality of medication reconciliation, both the National Quality Forum[5] and the Safer Healthcare Now! campaign[4] recommend the independent double-check process of comparing a sample of BPMHs with a "gold standard" BPMH compiled by an independent reviewer (a trained pharmacist or other trained person familiar with the medication reconciliation process). The National Quality Forum recommends that information for 25 patients from each facility be sampled per month (about one patient per weekday) for such comparisons.[5]

Over the 2 years preceding the study, medication reconciliation on admission was implemented in the emergency departments of 2 hospitals in a Canadian health network, and was mainly performed by nurses (i.e., registered nurses [RNs] and licensed practical nurses [LPNs]). These sites were collecting data for the Safer Healthcare Now! quality indicators, but staff members had expressed concern that there were still problems with incomplete or inaccurate BPMHs. Furthermore, before the current study was undertaken, the quality of BPMHs obtained by nursing staff had not been assessed using the independent double-check method at these sites.

Challenges to obtaining a high-quality BPMH, such as lack of clinician training, time, and resources, can often be limiting factors. Studies indicate that BPMHs prepared by pharmacists are more accurate and more complete than those prepared by physicians[6] and other health care professionals,[7] whereas their quality is equal to that of BPMHs prepared by pharmacy assistants.[8] However, because of workload constraints and resource limitations, it is not feasible to have all BPMHs and medication reconciliations performed by a pharmacist, a pharmacy assistant, or a technician. As a result, performing a complete medication reconciliation, including BPMH, is typically a multidisciplinary process. The BPMH may be obtained by an RN, LPN, pharmacist, pharmacy assistant, pharmacy technician, and/or physician.

Pharmacy students are now being incorporated into the medication reconciliation process. They are being assigned to collect BPMH information, resolve discrepancies (instances of disagreement between a patient's home medications and the patient's medications ordered in hospital), and perform medication counselling activities.[9-12]

Available research suggests that pharmacy students are capable of obtaining high-quality BPMHs. In a study by Lancaster and Grgurich,[13] pharmacy students identified more medications per patient than did nurses or physicians. The agreement rate between BPMHs collected by pharmacy students and those collected by nurses and physicians was 57.6%, with 90% of the discrepancies

being related to errors of omission by nurses and physicians (either omission of a medication entirely or omission of dosage form, strength, and/or frequency).[13] In a pilot study conducted in one emergency department, pharmacy students who completed a BPMH identified medication discrepancies for 75% of patients for whom a medication history had already been completed by other clinicians.[14] Similarly, in another study, student-obtained medication histories resulted in the addition of previously undocumented prescription and nonprescription medications for more than 50% of patients for whom medication reconciliation had already been completed by another health care professional, which improved the accuracy of the medication history for 67% of patients.[15] In a retrospective study of BPMHs completed by pharmacy students compared with the usual institutional practice of electronic medication review conducted by physicians and nurses, 27.8% of the BPMHs identified discrepancies, and 49.3% of these required intervention by a pharmacist.[11] Together, these studies suggest that BPMHs collected by pharmacy students may be more complete than those collected by other health care professionals; therefore, involving pharmacy students may alleviate time and resource pressures on nursing and pharmacy professionals. However, these studies did not necessarily specify whether clinicians had been trained to complete the BPMH, a factor that may have confounded the results. Therefore, research that directly compares the quality of BPMHs collected by pharmacy students and by other trained health care professionals is required.

In addition to a potential increase in quality with student-prepared BPMHs, there may be a cost benefit. A study published in 2015 estimated that having a pharmacy student collect BPMHs would save the West Florida Hospital (in Henry Pass, Florida) more than US$2 million per year relative to the current standard of care (with nurses collecting BPMHs), based on the number of patients admitted in 2013, a saving of US$8750 per preventable adverse drug event.[11] Within the health network where the current study was conducted, pharmacy students were not involved in completing BPMHs in emergency departments. Employing this free resource and utilizing pharmacy students' full potential could be a cost-effective means to increase the quality of BPMHs.

The current study had 2 objectives: (1) to determine whether the national quality indicators currently being collected are predictive of the quality of medication reconciliation, regardless of the professional group completing the BPMH, and (2) to determine whether BPMHs collected by pharmacy students had quality equal to that of BPMHs collected by nurses.

METHODS

This study was a prospective comparison of BPMHs obtained by nurses and by trained pharmacy students in the emergency departments at 2 sites within a Canadian health network, a 314-bed urban regional hospital and a 52-bed rural hospital. At the 2 study sites, the process for medication reconciliation on admission had been rolled out in the previous 2 years.

During the months of July and August 2016, a convenience sample of 40 patients newly admitted to the emergency department on weekdays (Monday to Friday) and for whom nursing staff had completed a BPMH, was selected. The total number of patients represented about one patient per workday at each site, based on pharmacy student availability. Selected patients were interviewed twice for their BPMH: the initial BPMH was obtained by nursing staff, as per current practice, with a second BPMH subsequently obtained by a pharmacy student.

Nursing staff consisted of both LPNs and RNs who had completed BPMH training as provided by the health network. Two third-year pharmacy summer students (one at each site) obtained the second BPMH. The students underwent the same training as nursing staff, as part of the health network's medication reconciliation initiative.

In this health network, both RNs and LPNs complete BPMHs in routine care; however, for every patient included in the current study, an RN completed the initial BPMH and a trained pharmacy student completed the second BPMH. The nursing BPMH was conducted first to ensure that physicians would have timely access to the BPMH and to facilitate the prospective medication reconciliation process upon patient admission to hospital. The 2 BPMHs for each patient were obtained independently: the pharmacy students did not review the nursing BPMH before completing their own independent BPMH. Both pharmacy students and nursing staff had access to the patient chart before completing the BPMH.

Intervention

Nursing staff and pharmacy students prepared separate, comprehensive BPMHs. The use of at least 2 sources of information, one of which had to be a patient or caregiver interview, was required by institutional guidelines. Other potential sources of information included the community pharmacy, the family physician, medication administration records from another facility, and prescription vials (i.e., physical evidence of home medications).

For each patient, the 2 BPMH versions were compared, within 24 h of the second BPMH being completed, by an independent reviewer to determine the presence of discrepancies (i.e., differences between the 2 BPMH versions). Several staff pharmacists (including A.S.), all of whom had experience performing medication reconciliation at their respective sites, served as independent reviewers. Any discrepancies between the 2 BPMH versions were investigated by the pharmacist, through review of the patient's medication vials or the community pharmacy medication list/profile, discussion with the community pharmacist, and/or a third interview with the patient or caregiver. The pharmacist then determined the party (nurse, pharmacy student, or both) who had made an error (i.e., had recorded incorrect information) and documented this information, along with a description of the discrepancy.

Outcomes

Errors were classified into 3 categories: errors involving allergies or intolerances, errors involving prescription medications, and errors involving nonprescription medications. In keeping with the Safer Healthcare Now! guidelines, the number of errors recorded was not affected by the number of doses of a medication administered per day.[4] For example, if the dosage was recorded incorrectly in the BPMH, and the drug was ordered for administration 3 times daily, only a single error was recorded, not 3. If the dose to be administered was recorded incorrectly in the BPMH, but the frequency was correct, the error was classified as "incorrect dose"; if the individual dose was recorded correctly, but the frequency was not, the error was recorded as "incorrect frequency".

Once the errors had been identified, a panel of practitioners who were not involved in obtaining or comparing the BPMHs (one pharmacist, one physician, and one nurse) independently determined the potential severity of each error according to the classification of Cornish and others.[16] A class 1 error is defined as unlikely to cause discomfort to the patient or clinical deterioration; a class 2 error has the potential to cause moderate discomfort or clinical deterioration; and a class 3 error has the potential to result in severe discomfort or clinical deterioration. Disagreements were resolved by group discussion, and the consensus severity class of each error was recorded.

The following Safer Healthcare Now! quality indicators were also collected: use of more than one source of information and use of a patient or caregiver interview.

Statistical Analysis

Before comparing the number of errors by nursing staff in relation to the number of information sources used to compile the BPMH (1 source versus 2 or more sources), a Shapiro–Wilk normality text was performed, which showed that data for BPMHs using 2 or more sources were not normally distributed. Therefore, the Kruskal–Wallis nonparametric test was used for this part of the analysis, followed by a Dunn post hoc test. The selection of appropriate statistical tests to analyze the data at hand (i.e., the Kruskal–Wallis nonparametric test and the Dunn post hoc test) ensured that the calculated 90% or 95% confidence intervals represented relatively small errors, acceptable for the true values of the parameters of interest.

Numbers of errors were compared between nursing staff and pharmacy students using a Q–Q plot, which indicated χ^2 distribution of the data. The Kruskal–Wallis test based on pooled variance was used to determine whether types of errors were significantly different. An α value of 0.05 was used for all analyses.

RESULTS

A total of 80 BPMHs (for 40 patients) were evaluated, and pharmacists reviewed discrepancies between the paired BPMHs for 39 of these 40 patients. One participant was discharged before the discrepancy review, and data for this patient were excluded from analysis.

With 95% confidence, the number of information sources used for BPMHs collected by nurses did not affect the total number of errors, the number of errors related to allergy or intolerance, or the number of errors for nonprescription medications. However, the mean number of errors for prescription medications was significantly higher with use of 2 or more sources than with use of 1 source (2.1 versus 0.7 per patient, $p = 0.032$) (Table 1).

When the number of sources used for the BPMH was analyzed, 2 outliers were detected; the first outlier was in the total number of errors with 2 or more sources (with one BPMH having 18 errors), and the second outlier was in the number of errors involving nonprescription medications with 2 or more sources (with one BPMH having 11 errors). Fortunately, as shown in Table 1, the test results were not influenced by keeping or removing these outliers.

It was not possible to determine whether using a patient or caregiver interview as a source of information had any effect on quality of the BPMH, because interviews were used as an information source for all of the BPMHs included in this study.

Table 1. Errors in the Best Possible Medication History in Relation to Number of Information Sources*

Error Category	No. of Sources; Mean Value		*U* Test Value†	χ^2 (df = 1)	*p* Value
	1 Source (*n* = 10)	≥ 2 Sources (*n* = 29)			
All errors	2.7	4.8	With outliers: 3.17 Without outliers: 2.79	With outliers: 3.84 Without outliers: 2.71	With outliers: 0.08 Without outliers: 0.09
Allergy errors	0.3	0.8	0.82	2.78	0.36
Prescription errors	0.7	2.1	4.578	3.14	0.032
Nonprescription errors	1.7	1.9	With outliers: 0.035 Without outliers: 0.002	With outliers: 4.16 Without outliers: 3.66	With outliers: 0.85 Without outliers: 0.97

df = degrees of freedom.
*Data in this table are based on best possible medication histories collected by nurses.
†Based on Kruskal–Wallis test.

Nurses were more likely than pharmacy students to make an error in the BPMH (total number of errors 171 versus 43, $\chi^2_{(df\ 1)} = 7.456$, $p = 0.006$). In terms of error type, nurses made significantly more errors than pharmacy students with allergies and intolerances (27 versus 6, $\chi^2_{(df\ 1)} = 5.859$, $p = 0.015$) and with prescription medications (70 versus 16, $\chi^2_{(df\ 1)} = 6.822$, $p = 0.009$). There was no difference between groups in terms of errors with nonprescription medications (74 versus 21, $\chi^2_{(df\ 1)} = 1.207$, $p = 0.27$).

When the data were analyzed by subcategory of errors, pharmacy students were less likely than nursing staff to omit prescription medications (4 versus 24, $p = 0.036$) or nonprescription medications (10 versus 58, $p = 0.003$). However, there were no significant differences between pharmacy students and nursing staff for all other subcategories (Table 2).

When the data were considered in terms of the severity of errors (mild, moderate, or severe), there was a trend toward fewer errors in each category for BPMHs obtained by pharmacy students, but this trend was not statistically significant for any severity level (Table 3). However, after removal of outliers, nursing staff were more likely than pharmacy students to commit a class 1 error (101 versus 32, $\chi^2_{(df\ 1)} = 23.464$, $p < 0.001$) (Table 3).

DISCUSSION

In this study of BPMH quality, the use of more than one source of information (which is one of the Safer Healthcare Now! quality indicators) did not affect the number of BPMH errors. More specifically, among BPMHs obtained by nurses, there was no significant difference in the number of errors between BPMHs based on 1 source and BPMHs based on 2 or more sources except for prescription medications, for which the number of errors increased when multiple sources were used. Given that the Dunn post hoc test showed conservation of power (i.e., 80%), using the Kruskal–Wallis test was unlikely to change the findings, even with an increased sample size.

Although the quality of information sources was not evaluated in this study, these results suggest that quality may be more important than quantity (i.e., number of sources). In an observational study of pediatric patients published in 2011, completeness scores for various sources used for the medication history ranged from 0% to 100%, with an informed interview determined to be the most complete source of medication information.[17] In a study published in 2009, Kalb and others[18] found that reliance on prescription databases resulted in an incorrect BPMH 60% of the time. Nurses are not exclusively focused on medications, and they face time constraints because of other patient care tasks; as such, they may be less likely to search for additional high-quality sources of medication information, opting to complete the task of BPMH quickly rather than accurately. Nursing staff may need supplementary training on how to identify a good-quality source of medication information and when to look for an additional source. Further research into the quality of information sources is required to test this hypothesis.

In this study, the patient or a caregiver was used as a source of information for all BPMHs, as recommended by another of the Safer Healthcare Now! quality indicators; nonetheless, there

Table 2. Number and Types of Errors for Best Possible Medication Histories

Type of Error	Group; No. of Errors: Nurses	Pharmacy Students	*p* Value
Allergies and intolerances			
Omission of an allergy or intolerance	8	6	> 0.9
Inclusion of allergen to which patient is *not* allergic or intolerant	13	0	0.054
Incorrect description of reaction to allergen	1	0	0.85
No description of reaction to allergen listed	5	0	0.34
Subtotal	27	6	0.015
Prescription medications			
Omission of medication	24	4	0.036
Incorrect medication (not being taken or wrong medication documented)	14	2	0.16
Incorrect dose	26	7	0.13
Discrepant frequency	6	3	0.55
Subtotal	70	16	0.009
Nonprescription medications			
Omission of medication	58	10	0.003
Incorrect medication (not being taken or wrong medication selected)	4	4	0.71
Incorrect total daily dose	10	5	0.70
Discrepant frequency	2	2	0.85
Subtotal	74	21	0.27
Overall total	**171**	**43**	**0.006**

Table 3. Severity of Errors

Severity of Error	Group; No. of Errors		χ^2 (df = 1)	*p* Value
	Nurses	Pharmacy Students		
Class 1	101	32	With outlier: 0.423	0.52
			Without outlier: 23.464	< 0.001
Class 2	60	24	With outlier: 0.588	0.44
			Without outlier: 1.898	0.17
Class 3	10	1	3.203	0.07

df = degrees of freedom.

were still a considerable number of errors, which suggests that this indicator may not necessarily be associated with high-quality medication reconciliation. There may have been differences in the interview process used by nurses and pharmacy students that resulted in differing quality of information gathered. Further research is required to test this hypothesis.

The results of this study show that pharmacy students with suitable training can capably complete the BPMH with fewer errors (and errors of similar severity) than front-line nursing staff. Pharmacy students omitted fewer medications (both prescription and nonprescription) than nurses, indicating that errors by nurses may be driven by omissions. This finding is consistent with the observational trial by Lancaster and Grgurich,[13] in which pharmacy students identified more medications being taken per patient than did either nurses or physicians. Of the medications identified by pharmacy students, 68% were over-the-counter medications,[13] which is similar to the results of this study, in which 70% of the medications omitted by nursing staff (but identified by pharmacy students) were nonprescription drugs.

Although results based on error severity were not statistically significant, they suggest a trend toward fewer clinically significant (class 2 and 3) errors for BPMHs obtained by pharmacy students, which may in turn prevent moderate to severe clinical deterioration or discomfort. Similar results were seen in a randomized controlled trial, published in 2007, in which nurse-generated medication histories were compared with pharmacist-generated medication histories for patients in a surgical preadmission clinic.[19] More medication discrepancies with the potential to cause possible or probable patient discomfort and/or clinical deterioration and affecting more patients were identified in the nurse-generated medication histories. Together, these results suggest that BPMHs generated by pharmacy students are at least no worse than those generated by nursing staff in terms of clinically significant errors. Pharmacy students may therefore represent a cost-effective alternative to other health care professionals in completing BPMHs and may also increase medication safety for patients.

This study had several limitations. Although an increase in sample size would be unlikely to affect the mean number of errors with use of more than one information source, the failure to detect a statistically significant difference in other outcomes may have occurred because of the small sample size. Furthermore, because the use of one or multiple sources of information was not blinded or randomly allocated, a risk of bias or confounding cannot be ruled out.

An additional limitation relates to the study procedure. The order in which the 2 health care professionals (nurse and pharmacy student) obtained the BPMHs for each patient was not randomized. Instead, for each patient, the BPMH was first obtained by nursing staff and then by a pharmacy student. As such, there may have been increased patient recall for the pharmacy student's interview and/or patients may have been more unwell when the BPMH was obtained by nursing staff. This approach was used to ensure that the nurse's BPMH (obtained according to usual practice at the hospitals) was available promptly for the physician to use for admission orders, thus preventing any interruption in work flow or delay in admission. Given the observational nature of this study, this limitation could not be avoided.

CONCLUSION

The Safer Healthcare Now! indicator (using more than one source of information for the BPMH) did not affect the mean number of errors in BPMHs obtained by nurses, which suggests that an independent double-check is likely a superior method for determining BPMH quality. Trained pharmacy students were able to obtain and document a BPMH with fewer errors than nursing staff and were less likely to document errors involving allergy or prescription medications. There was no significant difference in the incidence of errors involving nonprescription medications documented by pharmacy students and nursing staff or in the severity of errors between groups. The use of trained pharmacy students would be a potential solution to improve the completion of timely, accurate BPMH at the authors' facilities.

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Peer-Assisted Learning in General Internal Medicine: Pharmacy Students' Perspectives

Karen Kan, Janet Chow, Karen Ng, Rowena Malik, and Naomi Steenhof

INTRODUCTION

Demand for experiential pharmacy rotations in Canada has been increasing since the Association of Faculties of Pharmacy of Canada mandated that all pharmacy schools should have an entry-level Doctor of Pharmacy (PharmD) curriculum in place by 2020.[1] This change to the PharmD curriculum has meant an increase in mandatory experiential rotation time from 16 to 40 weeks.[2] The response of some hospitals has been to innovate and explore new experiential education strategies, including novel methods of preceptorship, to increase capacity for learner rotations.[3] One such model is peer-assisted learning (PAL), which has been described as "people from similar social groupings who are not professional teachers helping each other to learn and learning themselves by teaching."[4]

Although PAL models are common in medicine and nursing education programs, they have not been widely adopted by pharmacy educators. Leong and others[5] described a pharmacy PAL teaching model in an outpatient hemodialysis setting. The study was exploratory and followed a team of 4 pharmacy learners over a period of 3 weeks. The learners involved in the teaching model were a PharmD student, a pharmacy resident, a third-year co-op pharmacy student, and a fourth-year pharmacy SPEP (Structured Practical Experience Program) student. The clinical rotation involved direct patient care experiences in an outpatient clinic setting for all of the students, as well as teaching-related experience for the senior students. As highlighted by Leong and others,[5] the study limitations included the short duration of the intervention, the small number of students observed, and the practice setting, which was highly specialized. These authors concluded that although the PAL model offered a unique approach, it was unknown "[w]hether this approach would be practical in other settings, such as general medicine".[5] Delgado and others[6] described the expansion of student rotations in a Florida hospital, where PAL was used to facilitate the goal of obtaining pharmacy-generated medication histories and discharge counselling for all admitted patients. Pharmacists supervised a team of pharmacy residents and students in a format similar to the medical training model. In this setting, the PAL model demonstrated the value of additional students and was associated with an increase in the overall number of patient interventions. PAL also allowed for expansion of the discharge prescription program, whereby inpatient staff members worked in coordination with the outpatient pharmacy to offer bedside delivery of discharge medication prescriptions before patients left the hospital.[6] In Alberta, a clinical teaching unit involving PAL was trialled on a general internal medicine unit for 5 student pharmacists, using preceptor–student ratios of 1:2 to 1:5.[7] Students reported that they were "very satisfied" with the overall program experience. This teaching unit showed increased placement capacity without negatively affecting students' learning experience.[7]

Although more pharmacist educators are now utilizing novel experiential education strategies, there is a paucity of data about the student experience in PAL. This paper describes implementation of a PAL model in a general internal medicine program, specifically highlighting the experiences of students over a 2-year period.

DESCRIPTION OF THE PRACTICE SETTING

Entry-level PharmD students from the Leslie Dan Faculty of Pharmacy, University of Toronto, Toronto, Ontario, who were completing Advanced Pharmacy Practice Experience (APPE) rotations between January 2014 and April 2016 in the general internal medicine program of Toronto Western Hospital participated in this PAL model. In this learning model, each student completed 2 consecutive 5-week blocks on a general internal medicine unit, for a total rotation time of 10 weeks,

Table 1. Student Schedule for Advanced Pharmacy Practice Experience, Showing Staggered Rotation Start Dates

Student	Block No. and Timing			
	Block 1 Weeks 1–5	Block 2 Weeks 6–10	Block 3 Weeks 11–15	Block 4 Weeks 16–20
Student A	Starts rotation	Completes rotation		
Student B		Starts rotation	Completes rotation	
Student C			Starts rotation	Completes rotation

with staggered start times as detailed in Table 1. For each 5-week block, 1 pharmacist served as the preceptor for 2 APPE students concurrently. In each block, the more experienced student assisted with orientation of the incoming (less experienced) student to the patient chart and inpatient units (e.g., during block 2, student A oriented student B; see Table 1).

The general internal medicine program was located on 4 different inpatient units throughout the hospital. The program was delivered by 4 general internal medicine teams, 1 hospitalist team, and 1 family medicine inpatient team. Six full-time pharmacists (including all authors of this paper) provided care to the patients, with each of the 6 teams having its own designated pharmacist. The pharmacists spent 80% of their time on clinical duties and 20% of their time on dispensing and administrative responsibilities. The pharmacists had between 3 and 24 years of experience. Each of these pharmacists served as preceptor for students assigned to their respective teams.

Each pharmacist preceptor was responsible for overseeing the work flow of rotations within the team, facilitating group review of patient cases, and leading discussions of therapeutic topics as part of the requirements for the direct patient care APPE rotation. The 2 students on a given rotation would see patients admitted to the same team as the pharmacist preceptor. Students met with their preceptors to review cases either on one of the general internal medicine units or in a common area within the pharmacy department.

There was a need for adequate pharmacist staffing to minimize the need for cross-coverage and to maximize the amount of time spent with learners. The general internal medicine pharmacists decided that pharmacists who were performing preceptor duties would not be asked to provide cross-coverage for another team's pharmacist. Consequently, the cross-coverage time for the remaining pharmacists was increased slightly.

The preceptors participated in training modules through the Leslie Dan Faculty of Pharmacy before taking on preceptorship duties with the APPE students. An orientation manual was developed by the general internal medicine pharmacists and was given to each student on the first day with the team. The orientation manual included a general schedule for daily workflow (e.g., time of inpatient care rounds, time to complete patient care plans, time for patient case review with the preceptor) and a checklist for physical orientation (e.g., location of inpatient units, computer workstations, patient charts). Although the orientation manual did not change throughout the 2 years of the study, the preceptors became more structured in setting student expectations. To facilitate coordination of the PAL rotation, which required that each student be present for 2 consecutive 5-week blocks (in contrast to the traditional scheduling of APPE students for a single 5-week block), advance planning between the site and the faculty was required.

EVALUATION OF THE PROGRAM

Surveys were distributed to the pharmacy students at the end of each block. The survey consisted of Likert-scale and open-ended questions to assess the impact of the PAL model on the quality of the rotation and the learning experience. Students' responses to the survey were evaluated qualitatively to identify any emerging strengths and weaknesses that might help to improve the learning model. This survey was conducted under the authorization of the University Health Network Research Ethics Board, which waived the need for informed consent.

Between January 2014 and April 2016, 10 students completed a total of 12 PAL rotations in the general internal medicine program (with 2 of the students each having 2 rotations in the program). Nine of these 10 students submitted a total of 11 feedback forms, so feedback was available for 92% of the rotations. Within that timeframe, 5 pharmacists served as preceptors for the rotations.

The students were given an opportunity to comment on the strengths of the rotation and to describe areas of improvement for the PAL model (Box 1). The students indicated that they had had a positive learning experience working with their respective peers, and that the learning model had increased their exposure to a greater variety of patient cases than might otherwise have occurred. They perceived that their skills relating to documentation and care plan development were improved, and they saw benefit to working with a peer who had already completed a rotation at the site, because he or she could provide orientation to the patient chart and inpatient units. However, some students felt that having another peer on the rotation divided the preceptor's attention, which meant that not enough time was available to discuss all patient issues with the preceptor. Some respondents also indicated that they would have liked to

Box 1. Selected Student Comments in Response to Open-Ended Feedback Questions

Strengths

- "By sitting in on peer discussion it allowed me to be a part of learning a new topic that wasn't assigned to me"
- "Fostered collaboration between my peer and [me]"
- "Allowed me to adapt my learning style, documentation practices and work-up process above and beyond what I could have accomplished on my own"
- "I could relate with someone from my class with similar experience and skill set/background knowledge"
- "My peer did an excellent job teaching me how to read paper charts, navigate electronic patient record and document"
- "Most importantly, my peer taught me how to present patient cases to preceptors"

Areas of improvement

- "Scheduled time each day set aside for peer discussion of patient cases would be beneficial rather than informal meetings throughout the day"
- "Sometimes led to the preceptor not having enough time for each student to update all the patients"
- "Differences in the skill level of each student would also help in teaching [in the PAL model]"
- "Give student opportunities to shadow other [more experienced] students or residents"

PAL = peer-assisted learning.

have more peer evaluation and feedback built into the rotation, to foster a more collaborative learning environment.

Students were asked to rate their views regarding peer and preceptor interactions as related to activity-specific tasks completed within the rotation using a 5-point Likert scale. Overall, the majority agreed that they felt comfortable having their peer present during therapeutic topic discussions (Figure 1). Similarly, 60% (6/10) of the students strongly agreed and 40% (4/10) agreed that they felt comfortable having a peer present during daily patient reviews.

However, when students were asked about having topic and case discussions in a 1:1 setting with the preceptor, the results were more divergent. Only 1 respondent (9%, 1/11) expressed a preference for 1:1 topic discussions with the preceptor, and only 2 respondents (18%, 2/11) agreed that they would prefer to have 1:1 case discussions with the preceptor (Figure 2).

A majority of the students agreed that their ability to provide constructive feedback, their time management skills, and their confidence had improved since completing the PAL rotation (Figure 3). In total, 73% (8/11) of respondents agreed or strongly agreed that their learning was enhanced.

Overall, 82% (9/11) of the students agreed or strongly agreed that if given the chance, they would elect to participate in a PAL model again; one student was neutral on this question and one student strongly disagreed. The student who was neutral in the first APPE block subsequently agreed to enroll in the model again after the second rotation. The student who strongly disagreed commented that the preceptor's time was divided in half, and the student felt that there was no benefit from being paired with a peer at the same level of education.

IMPLICATIONS AND SIGNIFICANCE FOR PRACTICE

This study evaluated and reported on the quality of a PAL model within a general internal medicine program from the pharmacy students' perspective. The 2:1 learner-to-preceptor ratio provided an opportunity to accommodate a greater number of pharmacy students without sacrificing the quality of learning. Students consistently commented that they preferred reviewing patient cases and having discussions of therapeutic topics with another peer present rather than 1:1 with the preceptor. They felt comfortable presenting cases in front of their peers and felt a greater sense of collaboration rather than competition. Most students appreciated exposure to a greater number of patient cases through the peer presentations, and they learned from the other student's presentation skills.

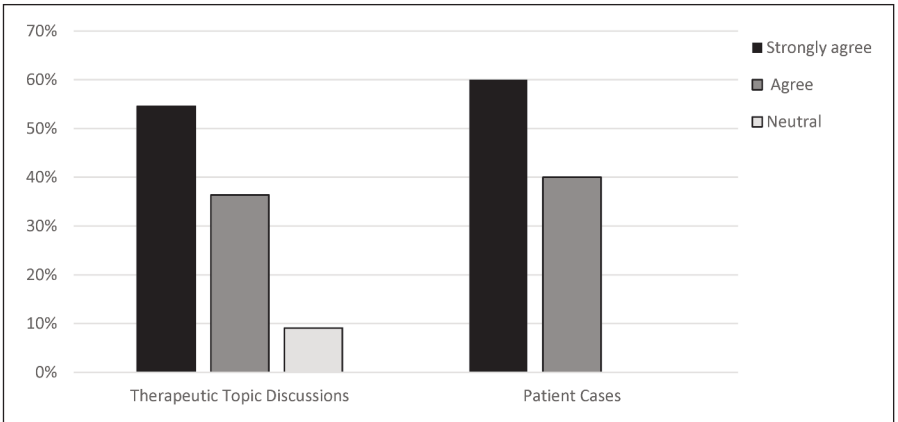

Figure 1. Students' comfort in reviewing therapeutic topics (n = 11) and patient cases (n = 10) in presence of a peer.

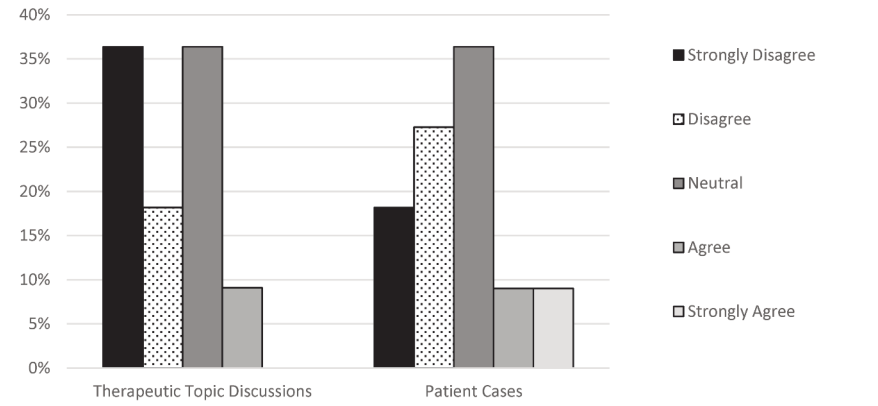

Figure 2. Students' preferences for reviewing therapeutic topics and patient cases 1:1 with preceptor (*n* = 11).

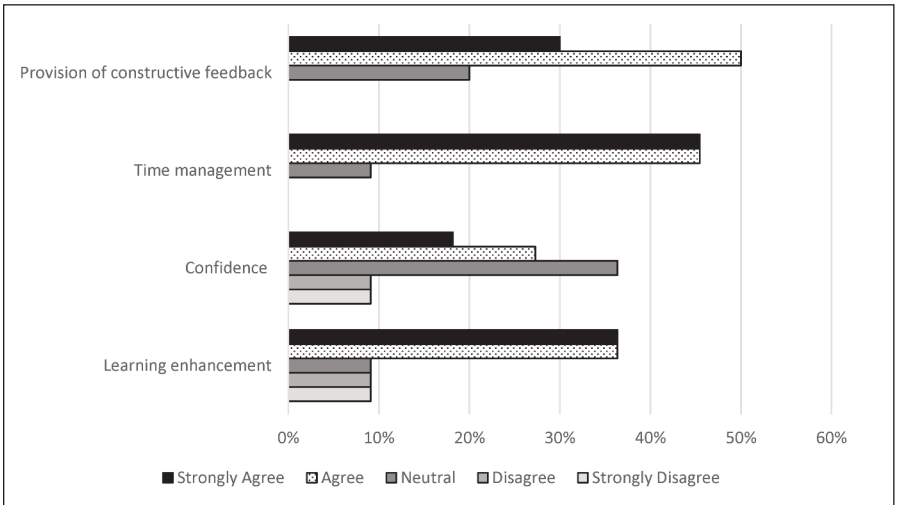

Figure 3. Students' perceptions of increase in various skills (*n* = 10 or 11).

Despite the strengths described, this study had some limitations. The survey was not validated, and some students found the wording unclear. In particular, the statement "the presence of another student within the peer to peer model affected my preceptor's evaluation of me" was found to be confusing and unnecessary. Many students did not feel that their preceptor's evaluation would be affected by the presence of a peer learner. In terms of the PAL model, the role of the "experienced" student in orienting and teaching the new student relied heavily on the first student's leadership skills and initiative. The need for leadership and initiative was not an issue in most rotations, but the expectations for the "experienced" peer learner could have been presented more explicitly (e.g., in an information package) to facilitate consistent orientation. It was also noted that students' feedback on their peers was variable. Such variation can be expected with any new teaching method and would likely diminish with greater experience and standardization of the preceptorship processes within the PAL model.

Given the increasing need for preceptor availability, novel teaching methods are required to give students greater exposure to clinical areas such as general internal medicine.[3] To contrast with the feedback gained from the students' perspective in the study reported here, it would be interesting to evaluate the same model from the preceptors' perspective in the future. Furthermore, this PAL model could be expanded to allow for tiered teaching in the future, whereby an APPE student would be paired with an Early Practice Experience student or a pharmacy resident would be paired with an APPE student.

CONCLUSION

Given students' feedback on this PAL model, a staggered rotation schedule and a 2:1 ratio of learners to preceptors appears promising for enhancing learners' experience in a general internal medicine program.

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Health Care System and Pharmacy Practice in Hong Kong

Chui Ping Lee

INTRODUCTION

Located on the southeast coast of China, Hong Kong is one of the world's major financial centres. It is consistently ranked as a highly competitive economic region. Historical shifts involving Chinese immigration and British colonization left the city with a unique "East-meets-West" heritage. Chinese and English are the official languages of Hong Kong, with English being widely used in the government and by the legal, educational, professional, and business sectors.[1] After the transfer of sovereignty from Britain to China in 1997, Hong Kong became a special administrative region of the People's Republic of China, ruled under the principle of "one country, two systems". This principle ensures that Hong Kong maintains separate political and economic systems from those of China, and that it will have a high degree of autonomy until 2047 (i.e., 50 years after the transfer of sovereignty).[1]

The population of Hong Kong was estimated at 7.39 million in 2017, making it the sixth most densely populated city worldwide.[2,3] In addition to being overpopulated and having the largest number of skyscrapers in the world, Hong Kong is notorious for its high property values and a spectacular night lookout from the Victoria Peak. In terms of population health, the most challenging event in recent history was the epidemic outbreak of severe acute respiratory syndrome (widely known as SARS) in 2003, which led to the deaths of 286 people in Hong Kong, along with pronounced social, economic, and humanitarian repercussions.[4] Although there is some cultural affinity with traditional Chinese medicine, people in Hong Kong see Western medicine as the mainstream of medical care. This paper discusses the unique health care system of Hong Kong, including pharmacy practice in the city, based on the building blocks outlined by the Health Systems Framework of the World Health Organization (WHO).

HEALTH SYSTEM LEADERSHIP, GOVERNANCE, AND HEALTH CARE FINANCING

The delivery of health care services in Hong Kong runs along a dual-track model, with services being provided by both the private sector and the government-funded public sector (Figure 1).[5] As of December 2015, the number of hospital beds in the city was 38 287, comprising 27 895 beds in 42 public sector hospitals, 4014 beds in 12 private hospitals, 5498 beds in 59 nursing homes, and 880 beds in 29 correctional institutions. The bed–population ratio was 5.2 beds per thousand population.[6] The Food and Health Bureau serves as the highest level of health care governance in Hong Kong. This organization is responsible for formulating, coordinating, and implementing policies related to medical and health issues. It drives the allocation of public resources, with the ultimate aim of providing accessible health care to local citizens and improving population health.[7]

The public medical service, provided by the Department of Health and the Hospital Authority, is the cornerstone of health care service delivery because of its ready accessibility and low out-of-pocket cost to all residents. The Department of Health is responsible for executing health care policies set forth by the Food and Health Bureau and for providing a broad range of services with public health objectives, including disease prevention and control, tobacco control, maternal and child health, and promotion of health education.[5,7] In contrast, the Hospital Authority is a statutory body providing inpatient and outpatient medical services through the universal coverage available to all Hong Kong residents.[7] The operation of the Hospital Authority is organized into 7 clusters based on geographic location. Services are delivered through a total of 42 hospitals, 47 specialist clinics, and 73 general outpatient clinics.[8] Through these institutions, the Hospital Authority

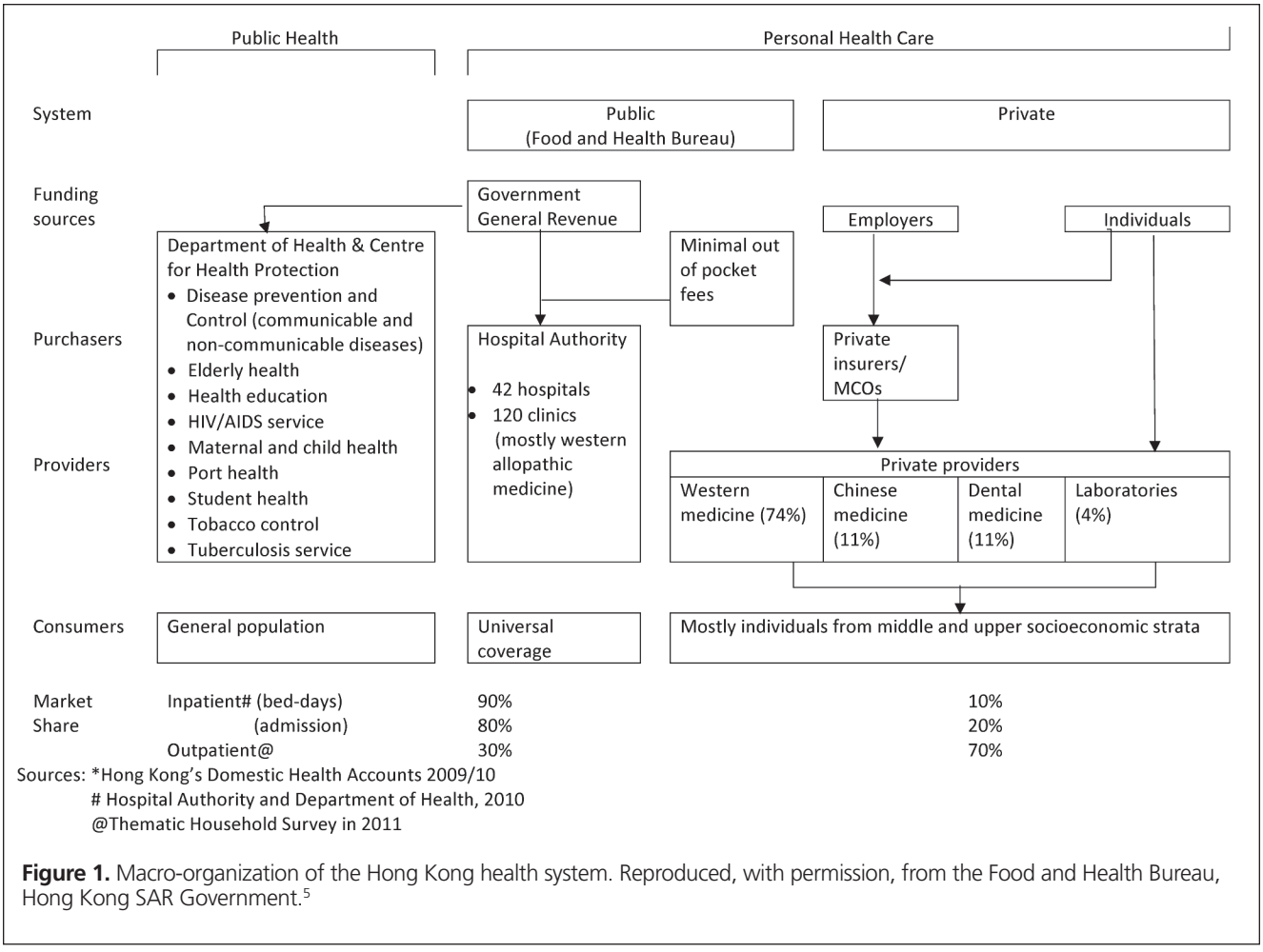

Figure 1. Macro-organization of the Hong Kong health system. Reproduced, with permission, from the Food and Health Bureau, Hong Kong SAR Government.[5]

offers a comprehensive range of services, including physician consultation, pharmacy, rehabilitation, day hospitals, Chinese medicine services, and community outreach services.[7]

As a result of heavy government subsidy, the Hospital Authority can offer relatively high-quality services at minimal charge. Patients have to pay only an out-of-pocket fee of US$13 per day of inpatient stay in Hospital Authority institutions and US$1.30 for each prescription of a formulary drug.[6] Given the much lower cost relative to services provided by the private sector, it is not surprising that Hospital Authority services are strongly preferred by most patients.[9] Indeed, the Hospital Authority provides about 90% of inpatient services and 30% of outpatient services utilized by the population.[5] Considering that a typical public regional hospital in Hong Kong has between 1200 and 1900 beds, with only 20–30 staff pharmacists, it can be deduced that health care staff in the public system have been much overwhelmed by the heavy workload. Meanwhile, patients who do not have an acute illness often experience long waiting times to receive the services they need. Waiting periods of months or years for a consultation or surgery are not uncommon. For example, the average estimated waiting time for cataract surgery ranges from 9 to 27 months, depending on the cluster district where the patient lives.[10] The overstretched public service, rising health expenditures in combination with lagging economic growth, and a rapidly aging population present the important question of whether the current health care system is sustainable in the long run.

In contrast to the situation for the public health care sector, the private health care sector provides much timelier, more flexible, and more comfortable services. In 2010, private hospitals provided about 10% of hospital beds and served 21% of inpatients in Hong Kong.[7] Patients using the private sector also have the luxury of choosing a particular physician or a particular hospital, and they can schedule surgeries or procedures at a convenient time. Brand-name drug products are often used as well. The pricing of services provided in private hospitals and clinics is based on the actual cost of medical services and drug products, which results in prices at least 10 times higher than similar services in public hospitals. Therefore, despite their comparable quality of medical care and much superior customer service, private medical institutions are not necessarily attractive to the upper socioeconomic class because of the much higher prices they charge.[9] Although they are financially independent,

all private hospitals and medical clinics must register under the Medical Clinics Ordinance and are regulated by the Department of Health, which monitors compliance with relevant regulations and handles medical incidents and patient complaints.[7,11]

HEALTH EXPENDITURES

In fiscal year 2016/17, the Hong Kong Government allocated HK$57 billion (US$7.3 billion) to fund medical and health expenses.[12] This means that Hong Kong spends about 5.2% of gross domestic product (GDP) or 16.5% of its annual revenue on public health expenditures.[12] The funding originates from general revenues of the government, mostly comprising general tax and other public revenues.[13] The percentage of revenue spent on health care has increased by 50% since 2010.[14] As evidenced by its longevity, Hong Kong's health care system is perceived to deliver service quality and health outcomes that fare well relative to global standards. The costs of medications used by Hospital Authority patients was HK$5710 million in 2015/16,[15] accounting for about 10% of total Hospital Authority expenditure.

Attempts at Health Care Reform

As alluded to above, the aging population and increasing health care costs threaten the long-term sustainability of the Hong Kong health care system. It is therefore necessary to refine the current system, with priorities placed on improving the quality of health care services and optimizing the utilization of private services. Since the 1990s, multiple rounds of public consultation on health care reform have been conducted to identify ways to recalibrate the balance between the public and private health care sectors.[16] Various proposals have been put forth, including tightening the control of government subsidies, increasing out-of-pocket fees for public health care services, developing a form of social health insurance, and setting up medical savings accounts.[16] Although the public recognizes the need for reform, government proposals have for years failed to draw consensus, and major changes have not been adopted. The most recent plan for health care reform, proposed in 2010, calls for 6 major initiatives (Figure 2),[17] of which the most innovative is probably the launch of the Voluntary Health Insurance Scheme, a voluntary, government-regulated private health

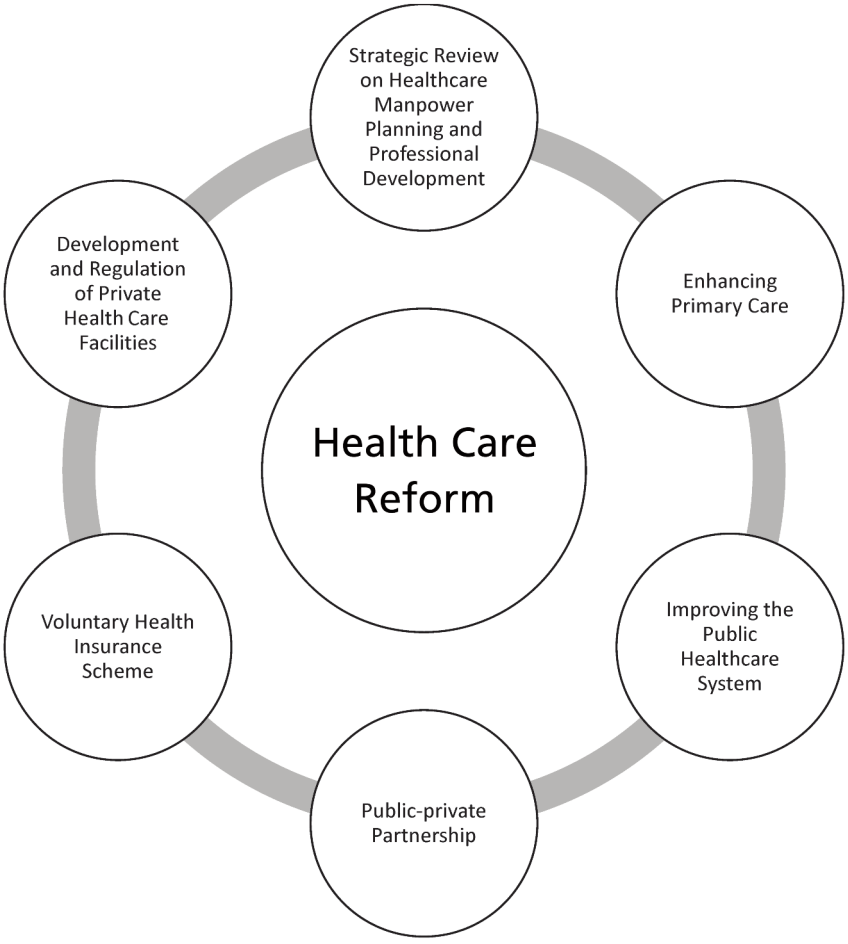

Figure 2. Major initiatives under health care reform in Hong Kong.

insurance scheme that may mandate the shift of heavy public service use to private service.[17,18] It aims to increase the affordability of private health care services through insurance subscription. By requiring all hospital insurance in the market to comply with a set of minimum standards and providing tax reductions for insurance subscription, the accessibility of private health insurance, and thus private health care, is expected to be enhanced.[17,18]

Use of Electronic Medical and Health Records

As in many other countries, medical data are usually created and retained by individual health care providers at different locations in diverse formats. To provide the infrastructure to support health care reform and the development of new health care service models such as public–private partnership, a territory-wide, patient-oriented electronic sharing platform named the Electronic Health Record Sharing System was launched in Hong Kong in 2016.[19] With the patient's consent, the Hospital Authority, the Department of Health, and private health care providers will be able to upload and share patients' electronic health records with other registered health care providers. This scheme will enable more cost-effective use of resources and facilitate decision-making about disease management.

HEALTH INFORMATION

As a result of the well-developed health care system and professional health services, residents of Hong Kong enjoy the longest life expectancy in the world: 87.3 years for women and 81.4 years for men in 2015.[20] The infant mortality rate was 1.4 deaths per 1000 births.[20] Six types of noncommunicable diseases—cancers, cardiovascular diseases, cerebrovascular diseases, chronic obstructive pulmonary diseases, injuries and poisoning, and diabetes mellitus—accounted for 59.7% of all registered deaths in Hong Kong in 2015.[20]

Population Trends

Like many other Asian countries, the issue of a rapidly aging population poses major threats to the health care system in Hong Kong. The ratio of the working-age population (15–64 years) to the elderly population (65 years or older) is currently 6:1, but by 2033, it is projected to decrease to 3:1.[21] This phenomenon is compounded by the large influx of young immigrants from mainland China during the 1960 and 1970s and also the sustained reduction in fertility rate in recent years.[21]

Promotion of Primary Care Concepts and Public Health Strategies

In recent years, the Hong Kong Department of Health has devoted much effort to disease prevention in the primary care setting. One example of a relatively successful strategy is smoking cessation. The prevalence of smoking has declined markedly, from 23.3% in 1982 to 10.5% in 2015 (a 54.9% reduction over 33 years).[22] This significant reduction in the rate of tobacco use can be attributed to the efforts of the Tobacco Control Office of the Department of Health, which has been dedicated in enforcing laws that ban smoking in all indoor public places and in launching educational campaigns. Meanwhile, since 2002, the Hospital Authority has launched a number of Smoking Counselling and Cessation Centres.[23] These services are delivered by registered nurses and pharmacists. No data have been made public regarding the program's success thus far. In the community sector, nicotine replacement therapy is available in different types and formulations at community pharmacies, resembling the practice in most overseas countries. Health care professionals, including pharmacists, have effective channels to provide smoking cessation assessment, counselling, and follow-up.

The WHO has identified antimicrobial resistance as an urgent global threat,[24] and this issue is certainly an alarming public health concern in Hong Kong. In fact, local studies have shown that 23.7% of citizens interviewed had received an antibiotic prescription for uncomplicated upper respiratory tract infection from their primary care physicians.[25] The illegal sale of antibiotics without prescriptions by some pharmacies further adds to the problem.[26] Since the early 2000s, the Hospital Authority has implemented antibiotic stewardship programs in most major hospitals. These programs adopt a multidisciplinary, prospective, interventional approach to optimizing the use of antimicrobials. The multidisciplinary team typically includes a clinical microbiologist, infectious diseases specialist, infection control practitioner, and clinical pharmacist. Every day, the team reviews each patient for whom broad-spectrum antibiotics have been prescribed to ensure optimal selection of agent, dosage, and duration of treatment. The goal of these programs is to achieve the best clinical outcome for the patient, with minimal adverse effects and prevention of subsequent resistance.

Despite these efforts, the number of infections with carbapenemase-producing Enterobacteriaceae spiked to 340 in 2016 (from 19 in 2011) according to Hospital Authority reports.[27] In view of the imminent problem of escalating antibiotic resistance, the Food and Health Bureau has stepped up its effort to combat high drug resistance rates through the Centre of Health Protection. In 2016, this organization established a high-level steering committee, formed by government officials and experts, to tackle the threat of antimicrobial resistance to public health.[27]

Scope of Practice and Prescribing Rights of Pharmacists

The Pharmacy and Poisons Board of Hong Kong is established under the Pharmacy and Poisons Ordinance (Cap. 138,

Laws of Hong Kong) to carry out functions such as registration and licensing of pharmacists, pharmaceutical products, wholesale dealers, and manufacturers.[28] Pharmacists in Hong Kong are not authorized to prescribe or administer vaccines. However, in some public hospitals, pharmacists are allowed to order laboratory tests and change medication dosages according to established protocols. One example of this type of setting is the pharmacist-led warfarin clinic,[29] which provides customized patient-focused services, including monitoring of international normalized ratio, patient counselling, dosage adjustment, and prescribing according to an agreed protocol. A local cost-effectiveness analysis found that the pharmacist-managed anticoagulation service was more effective and less costly than the physician-managed service.[30] In addition, the incidence of bleeding among patients in the pharmacist-managed group was about half that among patients in the physician-managed group.[30] Similar types of protocol-driven clinics will be explored in the future to broaden the scope of pharmacy practice.

HEALTH WORKFORCE

As one of its health care reform initiatives, the Government of Hong Kong formulated a health care workforce strategy to ensure an adequate supply of clinical professionals to meet future challenges. In 2012, a steering committee was established to conduct a strategic review of health care workforce planning and professional development in Hong Kong, and its first report was released in June 2017.[31] According to the report, in 2016 there were more than 99 000 health care professionals in the 13 disciplines that were examined, including physicians (14.1% of total health care workforce), nurses (52.8%), pharmacists (2.7%), and other allied health professionals. For most disciplines, a human resources shortage by 2020 is projected, but the projection for pharmacists indicates that there will be sufficient human resources in the medium term under the existing service level and model. The report recommended that the Hospital Authority should make full use of human resources to plan for new and enhanced initiatives (e.g., clinical pharmacy services) in response to the challenges of an aging population.[31]

Educational Requirements

There are 2 universities in Hong Kong that offer a range of undergraduate and postgraduate pharmacy degrees, including a 4-year Bachelor of Pharmacy, a 2-year Master of Clinical Pharmacy, a Master of Philosophy in pharmacy, and a Doctor of Philosophy in pharmacy.[32,33] One of the universities also offers a Master of Science in Pharmaceutical Manufacturing and Quality.[32] Over the years, the 2 universities have been successful in attracting high-quality students with very high university admission scores. The annual intake for the 2 bachelor-level programs is 90.[32,33] The 4-year curriculum covers basic pharmaceutical science, pharmacy practice and dispensing, pharmacology and therapeutics, and other pharmacy-related aspects; it also includes a 6-month practice- or research- oriented clerkship.[32,33] Graduates then proceed to a 1-year internship before licensure. For training dispensers, programs leading to a higher-level diploma in pharmaceutical dispensing are offered by 2 community colleges.[34,35] The credits obtained from dispenser training are generally not recognized for the local Bachelor of Pharmacy degrees; therefore, those who intend to advance their practice levels will generally have to pursue a Bachelor of Pharmacy degree in another country, such as Australia.

A person who intends to practise as a pharmacist in Hong Kong should first be registered with the Pharmacy and Poisons Board of Hong Kong.[36] To be eligible for registration, the applicant must either hold a pharmacy degree awarded by 1 of the 2 local universities or have completed a pharmacy degree in an overseas tertiary educational institution.[36] Those in the latter category should be registered as a pharmacist in the country where that education was completed. Overseas graduates will also have to pass written examinations in 3 subjects, namely, pharmacy legislation in Hong Kong, pharmacy practice, and pharmacology.[36] Completion of a 1-year period of pre-registration training that involves direct patient care services (i.e., in a community pharmacy or hospital pharmacy) for not less than 6 months is normally required from all applicants.[36]

An annual licence renewal with fee submission is required to maintain the active status of a pharmacist licence.[36] Although no continuing education requirements are mandated by the Pharmacy and Poisons Board of Hong Kong, the Pharmacy Central Continuing Education Committee accredits quality continuing education programs for pharmacists and keeps track of members' continuing education credit records.[37] This committee is a joint collaboration of local pharmacy professional societies and the 2 local universities that train pharmacists.[37]

Residency Training Program

No accredited pharmacy residency programs are offered in Hong Kong. However, the Hospital Authority offers a resident pharmacist position that provides additional pharmacist training in the hospital. Resident pharmacists undergo a structured residency training program during which they rotate through various departments, including outpatient, inpatient, cytotoxic, and other units. These young pharmacists perform professional duties, including dispensing and drug information handling, and they also complete a residency project under supervision. The training period ranges from 2 years to 7 years.

Specialization and Credentialing of Pharmacists

Recognition of advanced specialty practice is an aspiration for many Hong Kong pharmacists. As of late 2017, a total of

117 Hong Kong pharmacists had attained US Board of Pharmacy Specialties (BPS) certification.[38] In September 2010, the College of Pharmacy Practice, an independent, nonprofit professional body, was established with the aim of becoming an independent accreditation-granting authority for the profession in Hong Kong.[39] The criteria adopted for granting specialty status by the College of Pharmacy Practice parallel those of the BPS, with an additional requirement of local practice experience.[39] Accredited pharmacists will also need to fulfil preapproved continuing education credits to maintain their specialist status.[39] At the time of writing, 10 pharmacists had been accredited as oncology or pediatric pharmacists by the College of Pharmacy Practice.[39]

HEALTH SERVICE DELIVERY

Hospital Practice

As mentioned above, Hong Kong has both private and public hospitals. Both of these sectors partner with the Australian Council on Healthcare Standards to adopt the latest evaluation criteria and quality improvement programs for use in accrediting hospitals.[40] Given that the vast majority of services are provided by the public sector, the structure and mode of service delivery of the Hospital Authority will be the focus of the following description.

Pharmacy Service Organizations within the Hospital Authority

The Hospital Authority manages multiple pharmacies in its network cluster of health care facilities, so a combination of centralized and decentralized approaches has been adopted for pharmacy service management. Under this combined approach, decisions on policy and directions for service development are centralized at the head office level, and operations and service delivery are decentralized at the front-line hospital level. This approach demonstrates high efficiency in maintaining uniform practice standards across clusters and optimizes the utilization of expertise and resources. Meanwhile, it allows flexibility at the individual hospital pharmacy level, so that specialized services can be developed to cater to local clinical needs. The head office is responsible for the procurement and management of pharmaceuticals, clinical service and professional development, development and support for Chinese medicine, development of the staff training framework, and the design and implementation of pharmacy information technology applications. At the front-line hospital level, typical pharmacy services include inpatient drug distribution, specialized drug reconstitution, outpatient dispensing and counselling, and clinical pharmacy activities. The pharmacy department of each hospital also provides administrative support to the Medication Incident Reporting Program and the Adverse Drug Reaction Reporting Program. These programs were established centrally to record adverse incidents and to review and analyze their causes, occurrences, and consequences. Furthermore, 2 of the Hospital Authority hospitals are designated as teaching hospitals, collaborating with the 2 local universities on training and academic research.

Local hospital pharmacists have been heavily involved in traditional drug distribution and dispensing duties, which are considered the core functions of a pharmacy. A survey conducted in 2008 found that drug distribution (55.5%), clinical activities (20.5%), and general management (18.6%) constituted the major aspects of hospital pharmacist activities in the public sector.[41] The clinical activities in which greater numbers of pharmacists were involved included drug information services, patient education, and drug therapy monitoring. The survey also indicated a desire to shift from drug dispensing–oriented functions to greater involvement in clinical pharmacy activities.[41] In the past decade, the Hospital Authority has been seeking to expand the clinical services that hospital pharmacists in Hong Kong can offer. A paradigm shift from mere product dispensing to more patient-oriented delivery of pharmacy service has been promoted, albeit under limited resources. Across the 7 clusters, various clinical services such as medication reconciliation, antibiotic stewardship, pediatrics, and oncology services have been developed. A medication compliance clinic, pharmacist participation in ward rounds, and pharmacist participation in risk management are available in most large acute care hospitals.[42] Unfortunately, because of limited human resources and overwhelming workload, most pharmacists who take up clinical duties are still expected to fulfil the front-line dispensing needs. Especially during peak influenza seasons and high staff turnover periods, pharmacists may not be attending to their clinical activities consistently, and it may not be possible to sustain some of these services. As a result of inadequate support and lack of additional incentives, the coverage and quality of services provided are suboptimal, which in turn hinder growth of services in the long term.

Acquisition of a postgraduate professional degree is common among pharmacists in the hospital setting. To date, most junior pharmacists in Hong Kong pursue a master's degree in clinical pharmacy for accelerated career advancement from resident pharmacist to pharmacist. To better prepare pharmacists for clinical duties, the Hospital Authority has developed competency framework and training requirements for pharmacists with various level of experience. With input from the local academic institutions, training programs are designed to encompass a wide range of knowledge and skill set enhancement relating to clinical patient assessment, medication reconciliation, drug therapy assessment, and intensive advanced-topic pharmacotherapy. Overseas clinical placements are also provided to most pharmacists appointed to deliver specialized services.

Pharmacy Automation

Automation systems are strongly embraced by all of the local hospitals. These applications are widely adopted in areas such as procurement and supplies management, maintenance of inpatient medication profiles, automatic refills, top-up system for bar-coded ward stock, computerized physician order entry for inpatient drug distribution, and express dispensing systems for outpatient dispensing. These systems allow high operational efficiency in the face of an overwhelming patient load and allow pharmacists to perform clinical duties in the patient care process. An important byproduct of this approach is the accumulation of an enormous amount of accurate drug data in standardized format. This invaluable information source allows analysis of prescribing patterns, drug consumption trends, and drug histories. The data can also be retrieved for research purposes.

Community Pharmacy Practice

There are 2 main types of community pharmacies in Hong Kong: independently owned pharmacies and chain pharmacies. Because there is still no separation of dispensing from prescribing in Hong Kong, the number of prescriptions received in community pharmacies is small, ranging from 10 to 30 per week. Pharmacists in the community setting are often under-utilized. Their other duties include recommending over-the-counter products, advising on the management of minor aliments, and maintaining sufficient stock levels.

Unfortunately, because drug dispensing regulations are not strictly enforced, patients can often obtain some commonly used medications without prescriptions in some of the independently owned pharmacies through nonpharmacist personnel. Meanwhile, the dispensing of medications in private medical clinics is often not supervised by pharmacists.

Industrial Pharmacy Practice

Most international pharmaceutical companies have country offices in Hong Kong. Although extensive manufacturing, research, and development may not be feasible, the local offices focus on medical affairs, and on sales and marketing of pharmaceutical products in Hong Kong. Besides international companies, more than 30 local pharmaceutical manufacturers are based in Hong Kong; these companies mainly supply medicines to the local and mainland markets.[43]

Good manufacturing practices (GMP) were adopted in Hong Kong in 2002 to facilitate the regulation of the Western drug manufacturing industry and to ensure the quality and safety of pharmaceutical products. In early 2009, a fatal incident involving allopurinol tablets contaminated with *Rhizopus microsporus* during the manufacturing process was reported.[44] This incident, along with other incidents reported in the same year, aroused major media attention and raised the public's concern about quality control of drug manufacturing processes. The Food and Health Bureau and the Department of Health took immediate measures to address these concerns, undertaking a comprehensive review of the existing regime for regulating pharmaceutical products. The Review Committee on Regulation of Pharmaceutical Products in Hong Kong was soon set up.[45]

After 6 months of discussion, the committee put forward 75 recommendations, including upgrading Hong Kong's current GMP licensing standards to meet the *Pharmaceutical Inspection Co-operation Scheme—Guide to Good Practices for the Preparation of Medicinal Products in Healthcare Establishments* within 4 years.[45] The upgrade was intended to enhance the practice standards and production of local drug manufacturers. In subsequent years, the Department of Health and local pharmaceutical manufacturers have been making efforts to ensure compliance with the recommendations. In October 2015, the Pharmacy and Poisons Board of Hong Kong, the licensing body for local manufacturers, officially adopted the Pharmaceutical Inspection Co-operation Scheme guide to GMP as one of the licensing conditions for local manufacturers.[46]

One of the specifications of the Pharmaceutical Inspection Co-operation Scheme guide to GMP requires an authorized person to certify that the production of each batch of drug products is in accordance with quality control standards. The authorized person is normally expected to be a registered pharmacist with at least 3 years of experience in the manufacturing or quality control area of a pharmaceutical manufacturer.[47] Besides practising as authorized persons in this capacity, pharmacists often work in the quality control, regulatory affairs, and sales and marketing arenas in the pharmaceutical industry.

Pharmacists in Academia

Only 2 local universities in Hong Kong provide pharmacy education, so the number of pharmacists working in the academic sector constitutes a very small part of the workforce. Similar to the situation in overseas countries, there are high expectations for pharmacists in academia to perform research, education, and service. Academic staff in Hong Kong are also engaged in various professional activities and local pharmacy conferences. Joint appointments between teaching hospitals and the universities had been explored in the past; unfortunately, such collaboration was not supported because of funding complications. Recently, the issue has been revisited, which carries hope for establishing formal collaborative models.

FUTURE DIRECTIONS

For decades, Hong Kong residents have taken pride in the city's efficient health care system, in which a low percentage of GDP is spent on health care, achieving the top longevity in the

world. Interestingly, this longevity, leading to an aging population and increased medical costs, challenges the sustainability of the already-overloaded and heavily government-subsidized public health care system. In anticipation of future problems, the government has called for health care reform focused on promoting public–private partnership, sharing of electronic health records, and workforce review, among other measures. All of these steps will be instrumental in enhancing utilization of the private health care sector, with the ultimate goal of improving the quality and sustainability of the overstretched health care system. In fact, the pharmacy profession is just as underutilized as the private health care sector, if not more. By supporting government-directed initiatives, the pharmacy profession in Hong Kong is at a watershed moment to seize or create opportunities to revolutionize its professional roles.

An important strength of the Hong Kong pharmacy profession is the talented and passionate professional bodies with which it is gifted. Numerous initiatives to revolutionize pharmacists' roles have been proposed and executed through the relentless efforts of these professional bodies. These initiatives have included accrediting specialist pharmacists, expanding pharmacy services to nursing homes, providing professional continuous education credits, and proposing a pharmacist-incorporated team approach to primary health care. In addition, thanks to the efforts of these professional bodies in delivering extensive public drug education through exhibitions and social media, there has been a shift in public perceptions, with members of the public now able to distinguish pharmacists as medication experts from those who simply dispense medications. In view of the drive for public–private partnerships, the professional bodies have also proposed various ways to involve community pharmacists. Public–private collaborative dispensing or refill programs that incorporate community pharmacist consultation during lengthy intervals between physician visits have been proposed to the government. Despite these efforts, progress in achieving government recognition is rather slow, because of various political considerations and resource implications. Recently, in some good news for the profession, the latest (2017) policy address from the Hong Kong Chief Executive includes a proposal to increase the number of pharmacists in order to strengthen clinical pharmacy services, especially in the public sector. Effort will also be devoted to identifying means for better resource deployment to improve nursing home pharmacy services.[48] This represents recognition at the highest level of the administration, with promising prospects for policy implementation.

Another important aspiration of local pharmacists is to establish the Pharmacy Council, on par with the existing Medical Council and Nursing Council. Currently, the profession's only regulatory body is the Pharmacy and Poisons Board of Hong Kong, which claims a passive, purely regulatory role. Establishing a Pharmacy Council with statutory status and a clear aim of advancing the professional standards of pharmacy practice will be much more effective in nurturing growth of the profession. This council will also position itself as a strong advocate for re-branding of the profession and guiding its further development. In fact, a task force on a pre-pharmacy council has been set up by the universities and professional bodies. The task force has conducted extensive work in terms of proposing the necessary infrastructure, defining roles, and lobbying for government support. Moving forward, the profession will need to make a passionate case to arouse the attention of the public, stakeholders, and government officials to support legislation leading to the establishment of the Pharmacy Council.

In the near future, the profession will continue its pursuit of successful health care reform by making efforts in multiple directions. Pharmacists will also gear themselves toward working constructively with the government and other health care professionals with a common goal of making health care provision in Hong Kong a well-rounded pursuit with optimal utilization of both pharmaceuticals and pharmacists.

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Should Pharmacists Be Allowed to Conscientiously Object to Medicines Supply on the Basis of Their Personal Beliefs?

THE "PRO" SIDE

For decades, conscientious objection has been a topic of intense debate within the sphere of professional health care, including pharmacy. Like physicians, pharmacists are bound by the same ancient yet fundamental Hippocratic principle—*dictum primum non nocere* ("first do no harm")—which at times may be juxtaposed with another important ethical principle, that of respecting patient autonomy (i.e. , respect for patient dignity, self-determination, and privacy).[1] The contention between these 2 major ethical principles creates what is known as an "ethical dilemma", a situation where 2 correct principles pull in opposite directions. When a health care professional objects to the wishes of a patient to avoid causing "harm" (whether for personal, spiritual, or professional reasons), this is recognized as the professional exercising his or her right to "conscientious objection."[2] Conscientious objection may be apparent in, though is not limited to, complex situations such as abortion, contraception, and physician-assisted suicide.

Conscientious objection is defined as follows by the *Code of Ethics for Pharmacists* in Australia[3]:

> [A] practitioner's refusal to engage or provide a service primarily because the action would violate their deeply held moral or ethical value about right and wrong.

In this situation, the Code[3] places a condition on the exercise of the practitioner's right to decline supply of a medication or service. A former president of the Pharmacists Society of Australia described the limitation as follows:

> However … this right should not prevent the consumer from accessing healthcare that they are entitled to. … Therefore in these circumstances the pharmacist should inform the consumer of the objection and appropriately facilitate continuity of care for the consumer.[4]

It is important to emphasize the need for continuity of care, which features in most professional codes of ethics for pharmacists around the world. When invoking one's right to conscientious objection, it remains paramount to ensure that basic professional standards are preserved. For example, like other members of a democratic society, pharmacists who have a moral objection to physician-assisted suicide arguably have the right to refuse to participate in supplying drugs used for such a procedure. Similarly, pharmacists who are fundamentally against participating in a medical action that will end a life by intention should have the freedom to respectfully invoke their right to conscientiously object to participating in such an action. However, the right to conscientious objection by no means entitles them to attempt to paternalistically influence or reject the patient's views, or diminish the patient's dignity and right to self-determination. Rather, this right is actually enacting mutual respect for each other's different perspectives, which may be resolved professionally through the process of providing continuity of care and by offering courteous, responsible, and timely referral to other access points. As described by Hanlon and others,[5] the solution is in "extending the conscience clause of the code of ethics" which "would allow the efficient provision of the pharmaceutical service whilst at the same time respecting the personal beliefs of those who object to cooperating in the taking of a human life."

One way to minimize the complexities of managing pharmacists' right to conscientious objection is to initiate an "opt-in" registration system, a process whereby pharmacists who are willing to supply the medication can register to do so.[6] Such a system is already used for the supply of the abortion medications mifepristone and misoprostol in Australia. The abortifacient combination medication MS-2 Step (MS Health Pty Ltd)—previously known as RU486—is available from community pharmacies that have been nominated by and are in agreement with a certified medical practitioner.[7] To dispense MS-2 Step, a pharmacist must be registered, must ensure that the prescriber is a certified physician, and must confirm that the procedure has been fully explained to and a consent form signed by the patient.

It is also important to consider the benefits of having health care providers who are morally driven and who are willing to validate their moral integrity through conscientious practice of health care provision. Conscientiously practising professionals can signal an interface of advocacy in complex situations and can reduce the risk of conforming with professional pressures that may occur in hierarchical structures within health care fields.[8,9]

The notion of the right of the health carer to conscientious objection is contested by some. For example, Savulescu and Schuklenk[10] have stated "there should be better protections for patients from doctors' personal values and there should be more severe restrictions on the right to conscientious objection, particularly in relation to assisted dying." Eliminating individuals'

right to choose not to participate in an action they find morally confronting, irrespective of their occupation, is a form of conformism, toeing the line of contemporary notions of consumer protection and the influential shift toward empowering patients' right to self-determination. Yet denying providers their right to conscientious objection constitutes a breach of the fundamental human rights that make up the fabric of a democratic society.

Forcing a health care provider to perform and participate in practices to which they object on moral or ethical grounds could instigate subadequate care, which could in turn lead to suboptimal outcomes for patients. Individuals forced to enact a task to which they feel morally or ethically opposed tend to do so reluctantly, with instinctive apathy, functioning at a suboptimal level. Instead, allowing patients to receive care from health care professionals who are willing and not conflicted by their conscience will ensure more favourable patient outcomes and patient care. For the most part, conscientious objection is accepted in pharmacy and the wider medical world, so long as the patient is redirected to appropriate alternative channels of help.

The right to self-determination should be enjoyed by all humans, allowing for a freedom of thought and conscience for each and every individual. However, as pharmacists we should exercise our professional right to conscientious objection responsibly—without harassment, paternalism, or discrimination. The stakeholders involved, including patients themselves, may have various views on what they consider to be the best decision for the patient. It is imperative, however, that all parties respect the others' right to voice their opinions and follow their conscience, with the ultimate intention of providing patients with health care services best suited to their needs.

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THE "CON" SIDE

Patients should have access to any legal medical service for which they meet the criteria, including the service being plausibly in their interests. Whether patients decide to use this access is up to them.

Patients may refuse treatment on moral or religious grounds. For example, Jehovah's Witnesses refuse blood transfusions according to religious belief. These choices may lead to health costs for the patient. It has long been established that the role of health care professionals does not include imposing their judgment onto their patients, but should health care professionals have their own moral and religious beliefs that conflict with those of the patient, conscientious objection allows the professionals to opt out of providing the treatment.

Conscientious objection pits the caregiver's moral beliefs against the patient's access to medicine. There are 2 common regulatory frameworks allowing conscientious objection. The first is to prioritize patient access within the framework for objection, by requiring referral. This is problematic in 2 possible ways. First, it does not succeed in preserving patient access. As an example, consider the "morning-after pill". About 5% of Ontario pharmacists are unwilling to stock the morning-after pill,[1] and about 60% of rural Canadians live further than 5 km from their nearest pharmacy.[2] If contraception failure occurs on a Friday night, a woman may find that her pharmacy is one of the 15% of rural pharmacies that are closed on weekends.[1] If the nearest open pharmacy is among the 1 in 20 that refuse to stock the drug, it is a still longer journey to a third pharmacy. Patients face a variety of practical barriers to gaining access to medication, including having only short breaks from work, lack of a private car, and difficulties paying travel costs. If a medicine cannot be accessed by a real-life patient within its window of efficacy, the end result is no different, from the patient's perspective, from what would occur if the medicine were banned entirely. There are also more insidious barriers to access: if a patient faces shame and humiliation in her quest for legal health care services, the health care system has failed her.

The second problem with the requirement for referral (as many proponents of conscientious objection also point out) is that this framework does not really remove the professional from involvement. Pharmacists may object to dispensing certain types of birth control or drugs for euthanasia. In neither case will they actually administer the drug; another intervening agent will do that. However, adding

one more step to this process—by referring the patient to another agent who the pharmacist knows will dispense the drug—makes little moral difference.

In the second framework for conscientious objection, transfer of care is required only if the patient actively requests it.[3] This does little more than shift the balance further against the patient who is accessing the treatment. If the patient *does* request a transfer of care, the pharmacist must comply, once more putting the objector only a little further along in the chain of agents than was already the case. For the policy to relieve the objector of any involvement would require that the patient not request the transfer of care. This framework uses patient vulnerability to nudge patients away from accessing health care to which they are entitled. Patients may be unaware of their right, or may be too afraid or ashamed to request it. Patient health literacy has been found to have a significant influence on the use of health services.[4] This framework for conscientious objection exploits the existing link between poor patient health literacy and reduced use of health services by putting the onus on patients to prompt the professional to offer a transfer.

Refusing to allow conscientious objection does not imply that the grounds for such objection are unreasonable. Consider the following hypothetical case. Emma, a pharmacist for 10 years, decides to become a committed vegan because she has come to believe that animals have equal moral status to humans. This is a very defensible ethical position.[5] At work, while dispensing a codeine prescription, she realizes that the hospital's entire stock of this drug contains lactose, an animal product. Most would agree that, however strongly held and rational Emma's beliefs are, she should still dispense the medication.

It would be reasonable for Emma, *as a patient*, to refuse to take her own medication if it contained animal products, even if such refusal meant compromising or delaying her medical treatment; however, it would not be reasonable for Emma, *as a pharmacist*, to impose her beliefs on her patients.

When *should* a health care professional take a stand? Two situations come to mind: if a health care professional is asked to do something to which the competent patient does not consent (as was the case for the nurse who refused to force-feed prisoners in Guantanamo Bay)[6] or if there *is no reasonable basis* on which the treatment could be ethically sound. In both of these situations, the health care professional *should* object, but the objection is not against *that individual* being asked to undertake the duty, but rather is an objection to the patient being subjected to the treatment *at all*. This is a more demanding position that cannot be satisfied by conscientious objection frameworks.

There *is* reasonable ethical disagreement over abortion and euthanasia: that is, while those who disagree with these medical actions are reasonable, there are also reasonable ethical arguments in their favour. Not allowing conscientious objection in Emma's case does not depend on her belief being definitively unreasonable, even though many would in fact disagree with her. The principle still stands when it is a matter of human life and death. To take another example, there is reasonable ethical disagreement over distributive justice, the question of which patients should be prioritized when resources (such as organs) are limited and which should inevitably die. Nevertheless, a doctor is expected to follow agreed policies and procedures to assign an organ to a particular patient, even if the doctor's strongly held ethical belief was that the organ should go to another patient.

Values enshrined in law should be debated and reviewed. Health care professionals should of course engage with these issues and participate in such discussions. At the same time, patients have a right to access a certain range of medical interventions from their doctor or pharmacist, when those professions hold a monopoly over the provision of those interventions. But there is no inherent right for an individual to become a pharmacist or an obstetrician or a general practitioner. If the job does not suit, other specialties are available.

Ultimately, there is a balance to be found. Today, pharmacists and doctors can reasonably expect to be able to conscientiously object because the law allows them to do so. They have invested time and money in their training under this belief. But there is no good reason to allow conscientious objection for those now entering the profession. Sweden and Finland have no legal right of conscientious objection and have no problem supplying excellent doctors and pharmacists to the community. It would be better both for the professional and for the patient if those unwilling to provide all the services over which a profession has a monopoly were prevented from entering that profession.

So, the answer would seem to be to change the rules and allow into pharmacy school only those who are willing to dispense the medications necessary for birth control, voluntary euthanasia, and other legal treatments. Those who morally object to roles within that profession may choose another profession or another branch of the same profession, one where they can prioritize the needs of their patients with a clear conscience.

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Stability of Dapsone in Extemporaneously Compounded Oral Suspensions

Dapsone is a sulphone antibiotic with anti-inflammatory properties.[1] It is used as a first-line treatment for multibacillary and paucibacillary leprosy, and its mechanism of action is to reduce the synthesis of dihydrofolic acid.[2,3] Its structure is illustrated in Appendix 1 (available at https://www.cjhp-online.ca/index.php/cjhp/issue/view/126/showToc). It has a solubility of 0.284 mg/mL in water and a pKa of 2.39.[4,5] The very low solubility of dapsone over the acceptable range of pH for an oral preparation does not allow formulation of a solution. In the absence of commercial alternatives, compounded liquid suspensions are required for children and when administration of solid dosage forms is not suitable. Liquid preparations in Ora-Blend (Paddock Laboratories; constituents sucrose, glycerin, sorbitol, flavouring, microcrystalline cellulose, carboxymethylcellulose sodium, xantham gum, carrageenan, calcium sulphate, trisodium phosphate, citric acid, sodium phosphate, dimethicone, methylparaben, and potassium sorbate), SyrSpend (Fagron Inc; constituents modified food starch, sodium citrate, citric acid, malic acid, sodium benzoate, and simethicone), and other noncommercial aqueous vehicles have been reported, with stability of at least 3 months under refrigerated conditions and between 1 and 3 months at room temperature.[6-8]

SyrSpend is not readily available in North America, and there may in future be shortages of (or a patient may be intolerant of) Ora-Blend. Therefore, this study was conducted to assess the stability of dapsone in Oral Mix and Oral Mix SF vehicles, which are suitable as alternative dye-free formulations for children. These agents are easy to work with and are globally available.

Suspensions were compounded on March 29, 2016, from dapsone tablets (5 × 100 mg, Jacobus Pharmaceutical, Princeton, New Jersey; lot 16387, expiry November 2017), which were pulverized with mortar and pestle. Oral Mix (Medisca Pharmaceutique Inc, Montréal, Quebec; lot I185/A, expiry January 2018; constituents glycerin, sorbitol, flavouring, microcrystalline cellulose, carboxymethylcellulose sodium, sodium saccharin, xantham gum, carrageenan, sodium citrate, citric acid, methylparaben, propylparaben, potassium sorbate, and simethicone) or Oral Mix SF (Medisca Pharmaceutique Inc; lot H1136, expiry October 2017; constituents sucrose, glycerin, sorbitol, flavouring, microcrystalline cellulose, carboxymethylcellulose sodium, xantham gum, carrageenan, sodium citrate, citric acid, methylparaben, potassium sorbate, and simethicone) was then geometrically incorporated to a final volume of 250 mL.

Each preparation was packaged in 50-mL amber plastic bottles (6 bottles containing 30 mL per preparation; polyethylene terephthalate [PET] with black phenolic cap, Medisca Pharmaceutique Inc) and 3-mL amber polypropylene syringes (48 syringes containing 1 mL per preparation; PreciseDose syringes with tip cap, Medisca Pharmaceutique Inc). Three bottles of each preparation and 3 syringes for each time point were stored at a mean temperature of 5°C (standard deviation [SD] 2°C) or 25°C (SD 2°C), with relative humidity 60% (SD 5%). At predetermined time points (0, 7, 14, 30, 45, 60, 75, and 90 days), a 1-mL aliquot was retrieved from each bottle and 3 syringes were retrieved from each temperature condition. The bottles and syringes were vigorously shaken until complete resuspension before sampling.

On each study day, the appearance of each test sample was inspected. The pH was evaluated (pH 211 model pH meter, Hanna Instruments, Montréal, Quebec) and concentration was

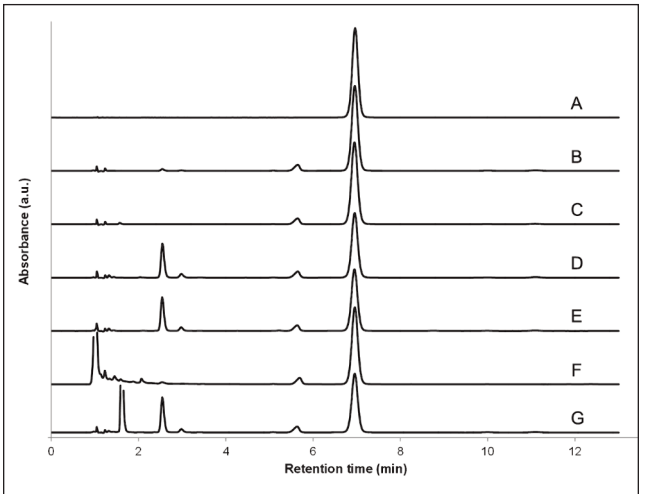

Figure 1. Representative chromatograms of (A) dapsone standard solution in acetonitrile–water (1:4 v/v), (B) dapsone suspension prepared from tablets using Oral Mix vehicle, and (C) dapsone suspension prepared from tablets using Oral Mix SF vehicle. Also shown are representative chromatograms of dapsone suspension in Oral Mix submitted to forced degradation at 60°C for 4 h in (D) water, (E) 3.0% H_2O_2, (F) 1 mol/L NaOH, and (G) 1 mol/L HCl. All sample preparations for injection resulted in nominal dapsone concentrations of 50 µg/mL.

Table 1. Chemical Stability of Dapsone Suspension Prepared from Tablets in Oral Mix and Oral Mix SF*

Study Day	Mean Concentration ± SD (mg/mL) and Mean % Remaining†	
	Packaged in Amber Plastic Bottles	Packaged in Amber Plastic Syringes
Solutions in Oral Mix		
Storage at 5°C, ambient RH		
Initial (day 0)	2.09 ± 0.04 (100.0)	2.11 ± 0.05 (100.0)
7	2.05 ± 0.01 (98.3)	2.06 ± 0.04 (97.9)
14	2.07 ± 0.03 (98.9)	2.03 ± 0.03 (96.4)
30	2.00 ± 0.02 (95.7)	1.99 ± 0.03 (94.7)
45	2.01 ± 0.01 (96.3)	2.04 ± 0.04 (96.8)
60	2.06 ± 0.01 (98.5)	2.04 ± 0.04 (97.0)
75	2.00 ± 0.04 (95.8)	1.97 ± 0.01 (93.5)
90	2.04 ± 0.09 (97.8)	1.97 ± 0.04 (93.5)
Storage at 25°C, 60% RH		
Initial (day 0)	2.09 ± 0.04 (100.0)	2.11 ± 0.05 (100.0)
7	1.79 ± 0.01 (85.6)	1.81 ± 0.04 (85.7)
14	1.79 ± 0.02 (85.6)	1.77 ± 0.04 (83.9)
30	1.70 ± 0.01 (81.4)	1.73 ± 0.04 (82.1)
45	1.74 ± 0.03 (83.4)	1.73 ± 0.02 (82.0)
60	1.74 ± 0.01 (83.2)	1.73 ± 0.02 (81.9)
75	1.73 ± 0.04 (82.8)	1.66 ± 0.03 (78.8)
90	1.67 ± 0.02 (79.9)	1.63 ± 0.02 (77.2)
Solutions in Oral Mix SF		
Storage at 5°C, ambient RH		
Initial (day 0)	2.14 ± 0.05 (100.0)	2.12 ± 0.06 (100.0)
7	2.18 ± 0.02 (102.0)	2.13 ± 0.04 (100.4)
14	2.16 ± 0.02 (101.1)	2.13 ± 0.05 (100.3)
30	2.09 ± 0.14 (97.5)	2.16 ± 0.05 (101.8)
45	2.11 ± 0.03 (98.8)	2.10 ± 0.04 (98.6)
60	2.10 ± 0.06 (98.3)	2.16 ± 0.03 (101.8)
75	2.08 ± 0.10 (97.2)	2.05 ± 0.03 (96.6)
90	2.13 ± 0.06 (99.6)	2.06 ± 0.04 (96.7)
Storage at 25°C, 60% RH		
Initial (day 0)	2.14 ± 0.05 (100.0)	2.12 ± 0.06 (100.0)
7	2.18 ± 0.08 (102.0)	2.17 ± 0.02 (102.3)
14	2.26 ± 0.08 (105.7)	2.18 ± 0.03 (102.7)
30	2.15 ± 0.08 (100.6)	2.16 ± 0.06 (101.9)
45	2.12 ± 0.02 (98.9)	2.16 ± 0.04 (101.7)
60	2.10 ± 0.01 (98.1)	2.17 ± 0.04 (102.1)
75	2.06 ± 0.01 (96.4)	2.03 ± 0.04 (95.6)
90	2.12 ± 0.04 (99.3)	2.11 ± 0.03 (99.4)

RH = relative humidity, SD = standard deviation.
*Nominal concentration: 2 mg/mL.
†Mean concentrations are based on 3 separate samples; the percentage remaining is relative to the initial measured concentration.

assayed using a stability-indicating high-performance liquid chromatography (HPLC) method with ultraviolet detection.

For the HPLC analysis, each test sample (50 µL) was diluted with methanol (950 µL) in a 1.5-mL centrifuge tube, vortexed (20 s) and then centrifuged (10 000*g* for 10 min). The supernatant (150 µL) was further diluted using a mixture of acetonitrile and water (20:80, 150 µL) and vortexed (20 s). These solutions for injection (nominal 0.05 mg/mL) were analyzed immediately after preparation using an HPLC system (Prominence UFLC, Shimadzu, Laval, Quebec) equipped with an LC-20AD binary pump, a DGU-20A5 solvent degasser, an SPD-M20A multiple-wavelength photodiode array detector set at 290 nm, an SIL-20AC HT refrigerated autosampler set at 5°C, a CTO-20AC column oven set at 40°C, and a Kinetex XB-C18 column (4.6 × 100 mm, 5 µm, Phenomenex Inc, Torrance, California). An isocratic method (acetonitrile–aqueous KH_2PO_4 10 mmol/L, 12:88, 1 mL/min) was used. The dapsone peak eluted at approximately 7.1 min; the peak area was used to perform the

quantification. Injections (10 µL) were performed in duplicate for test samples and in triplicate for standard samples.

To perform the calibration, standard suspensions of dapsone bulk powder (AK Scientific, Union City, California; lot 90411H, expiry May 2019) in Oral Mix and Oral Mix SF were prepared as described above, diluted to concentrations of 1.6, 1.8, 2.0, 2.2, and 2.4 mg/mL (80% to 120% of the target concentration), and analyzed by HPLC (r^2 not less than 0.999). The 2 mg/mL standard was also injected after every 24 injections of test solution to ensure system stability. The highest intraday coefficient of variation observed was 1.65% (n = 3), and the highest interday coefficient of variation was 1.82% (over 3 days; $n = 3 \times 3$) at the target concentration.

Forced degradation at 60°C for 3 h in one volume each of purified water, hydrogen peroxide 3%, sodium hydroxide 1 mol/L, and hydrochloric acid 1 mol/L resulted in recoveries of 76%, 73%, 91%, and 69%, respectively. No peak overlap of dapsone with excipients, impurities, or degradation products was observed. All non-dapsone peaks eluted between 1 and 5 min. Dapsone peak purity index calculated between 260 and 320 nm was not less than 0.9999 in all cases.[3] Representative chromatograms are presented in Figure 1.

For all suspensions, no notable changes in odour or colour were observed after storage under different conditions for 90 days. The suspensions remained opaque beige with a sweet aroma, but settling was observed after a few days. As shown in Table 1, the concentration of dapsone was not less than 90% of the initial concentration for all preparations at each tested condition, except suspensions in Oral Mix stored at 25°C for 7 days or longer. The difference in pH relative to the initial pH was not more than 0.5 unit for all preparations at all tested conditions (mean initial pH 4.18 [SD 0.03] for suspensions in Oral Mix and 4.43 [SD 0.03] for suspensions in Oral Mix SF).

The instability of dapsone suspensions prepared in Oral Mix and stored at 25°C may be explained by a Maillard reaction between the sucrose in the vehicle and the amino groups of the dapsone.[9] Storage under refrigeration prevented this reaction. Therefore, to avoid the Maillard reaction, Oral Mix SF should be preferred over other sugar-containing vehicles.

The results of this study have demonstrated the stability, for up to 90 days, of dapsone suspensions (2 mg/mL) prepared from commercial tablets in Oral Mix SF and stored at 5°C and 25°C or prepared in Oral Mix and stored at 5°C, in amber plastic bottles and amber plastic syringes. These suspensions should be shaken before use.

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Lost in Translation: Expanding Clinical Pharmacy Services through a Universal Language

Clinical pharmacists are key members of the health care team who "provide patient care that optimizes medication therapy and promotes health, and disease prevention."[1] Currently, pharmacy stakeholders and leaders use drug therapy problems (DTPs) and key performance indicators (KPIs) to communicate the impact of clinical pharmacy services on patient outcomes. KPIs are evidence-based, quantifiable measures of quality that result in a positive outcome for a patient.[2] A group of Canadian hospital pharmacists has developed a set of clinical pharmacy KPIs that support improvement in the quality of patient care and advance evidence-informed clinical pharmacy practice.[3] These measures include activities such as planning pharmaceutical care, resolving DTPs, providing patient education, attending interprofessional patient rounds, and performing medication reconciliation.[3] To date, KPIs have been instrumental in demonstrating the positive impact that interventions by clinical pharmacists have on patient outcomes. They have been key measures in expanding the role of clinical pharmacists, yet there are some limitations to their application. One limitation is that KPIs and DTPs are well understood only by pharmacists and are not always meaningful to other health care professionals or hospital administrators. A second limitation is that key stakeholders and decision-makers communicate their performance in terms of hospital metrics, but clinical pharmacy KPIs do not directly translate to these hospital metrics. Therefore, a common language for communication must be developed to advocate effectively for continued expansion of clinical pharmacy services. Use of a common language will help to ensure that nonpharmacist stakeholders and key decision-makers appreciate the significant impact that clinical pharmacists have on patient outcomes.

The benefits of KPIs and DTPs have become ingrained in pharmacists' understanding of modern clinical pharmacy practice. The current obstacle lies in translating the benefit of these measures to nonpharmacist stakeholders and leaders. In a recent study, Mourao and others[4] gathered feedback on clinical pharmacy KPIs from pharmacists, patients, and nonpatient stakeholders. They found substantial differences between pharmacist and nonpharmacist respondents in rating the highest-priority KPI, and most of the nonpharmacist stakeholders did not understand certain KPIs, such as the task of developing and implementing a pharmaceutical care plan.[4] These results illustrate the differing priorities and interpretations of clinical pharmacy KPIs by pharmacists relative to nonpharmacist stakeholders.

To properly demonstrate the benefit of clinical pharmacy services and continue to grow the role of clinical pharmacists, pharmacists must improve their communication with other health care professionals and administrators. Although KPIs remain fundamental to assessing the benefit of clinical pharmacy practice, we propose that understanding and participating in initiatives based on hospital metrics will be the solution to ensuring that the message is not lost in translation. Hospital metrics can be broadly classified as operational, clinical, and financial measures. They include outcomes such as actual length of stay, emergency department wait times, readmission rates, and disease-specific outcomes, such as *Clostridium difficile* infection rates.[5] For example, pharmacists can recommend using narrower-spectrum antibiotics or shortening the duration of therapy to target a reduction in rates of *C. difficile*; they can provide education to patients at high risk of medication non-adherence as a way to target readmission rates; or they can perform medication reconciliation on admission to improve patient flow and emergency department wait times. These approaches would ensure that pharmacists and key decision-makers are working toward common goals. Additionally, they would ensure that the hospital as a whole can be compared with other hospitals (rather than comparing data between individual pharmacists), which is what hospital administrators rely on to make financial decisions. Although it is crucial to maintain evidence-based outcomes as the focus of clinical pharmacy practice, these outcomes can improve hospital metrics, which are also clinically significant for patients.

If key pharmacy stakeholders could translate the benefits in patient outcomes demonstrated by clinical pharmacy KPIs to improvements in general hospital metrics, the evidence for expanded clinical practices would be strengthened. In a manner similar to how clinical evidence might be prioritized according to a hierarchy of outcomes (e.g., improvements in mortality prioritized over surrogate markers), high-quality outcomes that are

relevant to key decision-makers should be used to assess and translate the value of clinical pharmacy services. Although KPIs have successfully contributed to the advancement of the profession, pharmacy needs to move beyond KPIs, in the direction of hospital metrics, which are more relevant to a broader audience. Once all parties are able to speak the same language, the benefit of continuing to expand the role of clinical pharmacists will become clear to everyone.

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Connaître la situation de la pharmacie hospitalière

par Douglas Doucette

Dernièrement, une conseillère en expérience patient a été affectée à notre service de pharmacie régional. Retraitée et profane dans le domaine professionnel de la santé, elle n'avait jamais côtoyé de pharmaciens du milieu hospitalier. J'ai donc eu le privilège de lui présenter bon nombre des membres de notre personnel au cours de quelques visites de nos établissements; j'ai ainsi été témoin de sa prise de conscience des rôles de la pharmacie hospitalière.

Pendant ses visites, elle a appris qu'il y a peu les pharmaciens d'hôpitaux se trouvaient dans les services souterrains et qu'ils y travaillaient surtout à la distribution de médicaments et à la préparation de produits stériles sans l'aide de personnel de soutien. Les pharmaciens s'aventuraient dans les unités de soins seulement pour enquêter sur des anomalies d'inventaire, pour retrouver des ordonnances égarées ou pour porter des médicaments à des patients en congé temporaire. Aujourd'hui, la profession a évolué au point où les pharmaciens d'hôpitaux travaillent au sein de bon nombre d'équipes de soins; ils y offrent des renseignements sur les médicaments et collaborent à la gestion et au suivi de la pharmacothérapie des patients afin d'optimiser les résultats. Ces rôles comptent sur l'appui des techniciens en pharmacie, qui ont assumé une plus grande responsabilité quant à la distribution des médicaments dans les établissements de santé.

Notre conseillère était impressionnée par l'ampleur de la présence de l'informatisation et de la robotique dans nos services et par le personnel qualifié veillant sur ces technologies. Comme bien d'autres services modernes de pharmacie hospitalière, le nôtre compte sur les médicaments commercialisés, les machines d'emballage et les logiciels d'aide à la décision pour gérer les stocks et la consignation et pour réduire le nombre d'erreurs. Ces outils permettent aux équipes de pharmacie de travailler plus efficacement, mais le poids de la responsabilité des décisions cliniques ne peut reposer sur la technologie.

La conseillère et moi avons quitté la pharmacie principale pour rendre visite aux pharmaciens de l'unité des soins intensifs, du service des urgences et des unités de médecine familiale. Elle a été impressionnée de constater combien les services de pharmacie ont évolué, les pharmaciens étant maintenant en mesure de prescrire des médicaments et des examens de laboratoire. La transition vers la réglementation de la profession de technicien en pharmacie et l'intégration des étudiants et des résidents en pharmacie dans des rôles plus axés sur les soins directs aux patients ont aidé nos services à croître encore plus.

Bien que les pharmaciens demeurent parmi les professionnels qui inspirent le plus confiance au Canada, ils ne doivent pas s'asseoir sur leurs lauriers. De nombreux services de pharmacie n'ont pas suffisamment de ressources et ils doivent choisir, selon les priorités, quelles unités de soins ou quels patients recevront des services. Bien des patients hospitalisés ne reçoivent pas des soins pharmaceutiques complets pendant leur séjour. Il n'est d'ailleurs pas toujours possible de trouver des remplaçants pour les vacances ou les congés de maladie. La plupart des unités de soins intensifs bénéficient de pharmaciens seulement les jours de semaine, et ce, malgré le fait que les patients connaissent des problèmes pharmacothérapeutiques à n'importe quel moment du jour et de la semaine.

Les équipes de pharmacie hospitalière peuvent accroître leur capacité à prodiguer des soins de première qualité à chaque patient dont ils s'occupent grâce aux approches suivantes :

- Centrer les soins sur le patient en l'incluant dans les décisions concernant ses traitements.
- Collaborer en travaillant avec les autres personnes qui participent aux soins du patient.
- Être visible en étant sur place lorsque les décisions concernant les soins sont prises et en consignant les plans de soins pharmaceutiques dans le dossier médical.

L'évolution des équipements, des systèmes et du champ de pratique professionnel a permis à la pharmacie d'être reconnue comme un élément efficace et digne de confiance du système de santé en établissement au Canada. Notre profession doit être conséquente dans ses efforts de sensibilisation des autres professionnels de la santé, des patients et des profanes afin de leur montrer les avantages des services de pharmacie en ce qui concerne l'amélioration des soins aux patients et des résultats thérapeutiques. Sensibilisons les opinions à la valeur de la pharmacie tout au long de l'année et non seulement au cours de notre campagne annuelle!

[Traduction par l'éditeur]

Douglas Doucette, B. Sc. (Pharm.), Pharm. D., FCSHP, est président désigné et agent de liaison externe de la Société canadienne des pharmaciens d'hôpitaux

Hospital Pharmacy's Situational Awareness

Douglas Doucette

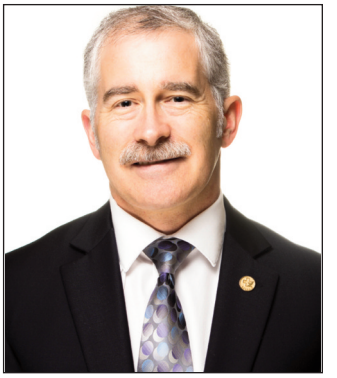
A patient experience advisor was recently appointed to our regional pharmacy service. A retired layperson, she had no prior contact with pharmacists in hospital settings. I had the privilege of introducing her to many of our staff on a couple of site visits, which allowed me to witness her blossoming awareness of hospital pharmacy roles.

During her visits, she learned that not long ago, hospital pharmacists worked in subterranean departments focused almost entirely on dispensing medications and preparing sterile products, without any support personnel. The pharmacists ventured to patient wards only to investigate inventory discrepancies, retrieve missing order sheets, and deliver medications to patients going out on pass. Today, the profession has evolved to the point where hospital pharmacists serve on many patient care teams, providing drug information and collaborating to manage and monitor patients' drug therapy with the goal of optimizing outcomes. These roles are supported by pharmacy technicians, who have taken on greater responsibility for medication distribution in health care institutions.

Our patient advisor was impressed with the degree of computerization and robotics in our departments, and with the skilled workforce overseeing these operations. Like many other modern hospital pharmacies, ours relies on commercial pharmaceuticals, packaging machines, and decision-support software for managing inventory and documentation and for reducing errors. These tools allow pharmacy teams to do their jobs more efficiently, but technology cannot be held responsible for clinical decisions.

The patient advisor and I moved from the central pharmacy to visit pharmacists in the intensive care unit, emergency department, and family medicine units. She was impressed to learn how pharmacy services have evolved, with pharmacists now able to prescribe medications and order tests. Transition to the regulation of pharmacy technicians and the integration of pharmacy students and residents into more direct patient care roles have helped our services grow further still.

Although pharmacists are perennially among the most trusted professionals in Canada, care should be taken to avoid complacency. Many pharmacy departments remain under-resourced and must prioritize which units or patients receive services. Many hospitalized patients do not receive comprehensive pharmaceutical care during their stay. Services cannot always be replaced during vacation or sick time. Most critical care areas have pharmacists available only on weekdays, despite the fact that patients experience drug therapy issues 24/7.



Hospital pharmacy teams can improve their ability to deliver high-quality care to each patient entrusted to their care through the following approaches:

- Be patient-centred, by involving patients in decisions about care.
- Be collaborative, by working with others in the patient's circle of care.
- Be visible, by being physically present when care decisions are made and by documenting pharmacy care plans in the medical record.

Advances in equipment, systems, and professional scope of practice have supported pharmacy in reaching its current place as a trusted and effective element of institutional health care in Canada. As a profession, let's try to be consistent in efforts to educate other health care professionals, patients, and laypersons about the benefits of pharmacy services to improve patient care and health outcomes. This will help to maintain an element of pharmacy awareness year-round, not just during our annual "awareness" campaign.

Douglas Doucette, BSc(Pharm), PharmD, FCSHP, is President Elect and External Liaison for the Canadian Society of Hospital Pharmacists.

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- favorisent la collaboration à des projets, à des recherches et à des programmes éducatifs pour répondre aux besoins des membres des RSP
- proposent des occasions supplémentaires aux membres d'agir à titre de leaders d'opinion et de ressources clés pour le Conseil de la SCPH sur des questions de pratique spécialisée, dont la rédaction de déclarations de principes, de lignes directrices et des documents d'information pertinents

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