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Original Article

Patient satisfaction with a pharmacist-led best possible medication discharge plan via tele-robot in a remote and rural community hospital

Paula Newman, BSc Phm ACPR[1], Sammu Dhaliwall, Pharm D, ACPR[1], Satvir Bains, BSc Phm BCGP[1], Olena Polyakova, MD PhD[1], Kevin McDonald, BSc Phm ACPR[1]

[1]Northwest Telepharmacy Solutions Winnipeg, Manitoba

Correspondence to: Paula Newman, pnewman@northwest.ca

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Abstract

Introduction: Medication reconciliation (MedRec) reduces the risk of preventable medication-related adverse events (ADEs). A best possible medication discharge plan (BPMDP) is a revised list of medications a patient will take when discharged from hospital; a pharmacist review ensures accuracy. For many hospitals, on-site pharmacists are non-existent. Extension of a visual presence via a mobile robotic platform with real-time audiovisual communication by pharmacists to conduct MedRec remains unstudied. This study explored patient perceptions of a pharmacist-led BPMDP using a telepresence robot. Time requirements, unintentional discharge medication discrepancies (UMD), programme inefficiencies/barriers and facilitators involved in pharmacist review of the discharge medication list and patient interviews were also described.

Methods: This prospective cohort study enrolled adult patients admitted to a 12-bed community hospital at high risk of an ADE. Remote pharmacists reviewed the discharge prescription list, identified/resolved UMDs, and interviewed/counselled patients using a telepresence robot. Thereafter, patients completed an anonymous satisfaction questionnaire. Prescriber discharge UMDs were classified, and barriers/inefficiencies and facilitators were documented.

Results: Nine patients completed an interview, with a 75% interview agreement rate. All patients were comfortable with the robot and 76% felt their care was better. With a median of 11 discharge medications/patient, the UMD rate was 78%; 71% had omitted medications, 43% involved a cardiovascular medication, 88% were due to a hospital system cause, and 43% were specifically due to an inaccurate best possible admission medication history. Median times for interview preparation, interview and UMD/drug therapy problem resolution were 45, 15 and 10 min, respectively.

Conclusion: Using a telepresence robot to provide pharmacist-led BPMDPs is acceptable to patients and an innovative, effective solution to identify/resolve UMDs.

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Keywords: Hospital, medication reconciliation, pharmacist, robot, rural, telemedicine

Résumé

Introduction: Le bilan comparatif des médicaments (BCM) réduit le risque d'événements indésirables liés aux médicaments pouvant être évités. Le meilleur schéma thérapeutique possible (MSTP) désigne une liste révisée de la médication qu'un patient devra prendre au congé de l'hôpital; l'examen du pharmacien en assure l'exactitude. Malheureusement, de nombreux hôpitaux n'ont pas de pharmacien sur place. Aucune étude n'a porté sur l'expansion d'une présence visuelle par plateforme robotique mobile avec communication audiovisuelle en temps réel des pharmaciens pour réaliser le BCM. Cette étude a porté sur la perception des patients à l'égard d'un MSTP dirigé par un pharmacien par l'entremise d'un robot de téléprésence. L'étude s'est aussi penchée sur le temps nécessaire, les erreurs liées aux médicaments, les inefficacités ou obstacles du programme et les modérateurs qui sont intervenus dans le BCM et les entrevues auprès des patients.

Méthodes: Cette étude de cohorte prospective a inscrit des adultes à risque élevé d'événement indésirable lié aux médicaments ayant été admis dans un hôpital communautaire de 12 lits. Des pharmaciens ont révisé à distance la liste des ordonnances au congé, relevé et résolu les erreurs liées aux médicaments et ont interviewé/renseigné les patients à l'aide d'un robot de téléprésence. Les patients ont ensuite répondu anonymement à un questionnaire de satisfaction. Les erreurs liées aux médicaments ont été classifiées, et les obstacles ou inefficacités et les modérateurs ont été identifiés.

Résultats: Neuf patients SE sont soumis à l'entrevue, avec un taux d'acceptation de l'entrevue de 75%. Tous les patients étaient à l'aise avec le robot, et 76% étaient d'avis qu'ils avaient reçu de meilleurs soins. Avec une médiane de 11 médicaments/patient au congé, le taux d'erreurs liées aux médicaments était de 78%; 71% avaient oublié des médicaments, 43% touchaient un médicament cardiovasculaire, 88% étaient causées par le système de l'hôpital et 43% étaient causées précisément par un MSTP inexact. Les délais médians pour la préparation de l'entrevue, l'entrevue, et la résolution des erreurs liées aux médicaments/problèmes de pharmacothérapie étaient respectivement de 45, 15 et 10 min.

Conclusion: Un robot de téléprésence pour réaliser le MSTP dirigé par un pharmacien est acceptable pour les patients et est une solution innovante et efficace pour relever et résoudre les erreurs liées aux médicaments.

Mots-clés: Rural, pharmacien, bilan comparatif des médicaments, télémédecine, hôpital, robot

INTRODUCTION

Up to 67% of patients admitted to a hospital have at least one discrepancy in the hospital documentation of their home medications.[1] Many of these discrepancies remain common at discharge and patients leave the hospital with an inaccurate discharge medication list and an inadequate understanding of their medications.[2-4] Transitional care is a key focus of error reduction[5] as more than 40% of medication errors take place when patients move between different stages and settings of care.[1] For those patients transitioning from hospital to home, medication discrepancies have been linked to increased re-hospitalisation rates.[6]

Medication reconciliation (MedRec) is fundamental to patient safety by supporting safe medication use and reducing the risk of preventable medication-related adverse events (ADEs).[6-9] A formalised process in which health-care providers work together with patients and care providers, MedRec ensures that accurate and comprehensive medication is communicated consistently across all transitions of patient care, at hospital admission, transfer and discharge.[1] The best possible medication history (BPMH) involves a systematic thorough review and documentation of all the medications a patient is currently taking when admitted to a hospital. When the patient is ready for hospital discharge, their BPMH is compared with new medications initiated, discontinued and/or changed while the patient is in hospital to create a revised and updated medication list – the best possible medication discharge plan (BPMDP). It is critical that the BPMDP is accurate, well understood by the patient, and communicated to all their care providers to optimize medication efficacy, safeguard against preventable medication-related ADEs, decrease re-hospitalisation and promote continuity of care.

Identification of patients who may benefit the most from a BPMDP remains unknown. Canadian data collection has identified several factors that are associated with hospital re-admission, including patient effects, hospital effects and community effects.[10] In the medical population, patients who have been admitted to hospital with a primary diagnosis of heart failure, chronic obstructive pulmonary disease (COPD), digestive system disease, arrhythmias and pneumonia represent the highest rates of readmission, 21%, 18.8%, 15.6%, 12.6% and 12.5%, respectively.[10] In a recent study to determine the impact of pharmacist-provided continuous care on readmissions, patients defined as high-risk were those with an active diagnosis on their electronic health record list for heart failure, acute myocardial infarction, COPD, pneumonia or diabetes.[11] The Institute for Safe Medication Practices developed a list of high-alert medications that have a heightened risk of causing significant patient harm when they are used in error.[12] Polypharmacy, defined according to the World Health Organisation criteria as the, 'routine use of five or more medications'[13] has been shown to be 2.3 times more associated with ADEs in geriatric patients.[14]

Through their unique knowledge, skills, and abilities, pharmacists are well-positioned to lead interdisciplinary efforts and assume key roles in MedRec by designing and supporting MedRec processes, educating health-care providers, and serving as patient advocates through all transitions of care.[5,15] Studies have demonstrated that pharmacists improve MedRec completion rates, accuracy, clinical outcomes and reduce health care utilization.[4,15-18] Pharmacist counselling, which often takes place during communication of the BPMDP with the patient, has been associated with a significantly lower rate of preventable ADEs 30 days after hospitalisation.[19] Moreover, the majority of patients in hospital are satisfied with their interaction with their pharmacist.[20]

While Canada is a developed country with a publicly funded universal healthcare system, not all residents have the same access to care: an on-site pharmacist in many small and rural community hospitals is often non-existent. Although telemedicine applications in the Canadian north were initially conducted with some success, barriers and challenges have impeded the adoption of telemedicine as a strategy for the effective and timely delivery of health care.[21-24] Robotic telepresence takes this a step further; the caregiver's physical presence is virtually extended via a mobile robotic platform with real-time audiovisual communication.[25,26]

Experience in a remote Inuit northern community found deploying a remote-presence robot feasible, cost-effective and highly satisfactory by patients, caregivers, nurses and physicians deeming it as improving patient care, workload, and job satisfaction.[27] Pharmacists have a substantial opportunity to extend their care to patients in underserviced community hospitals by using a mobile robotic platform to care for patients. In addition, due to recent changes in pharmacy practice, because of pandemic-related precautions on distancing and shortage of personal protective equipment, exploring the use of a telepresence robot as an alternative to in-person care may lead to less stress to the system. To our knowledge, evaluating the patient experience with a pharmacist using a telepresence robot to conduct a BPMDP in a remote community hospital setting has not been studied.

Our primary objective was to explore high-risk patients' perceptions of pharmacist-led real-time BPMDP using telepresence robot technology during hospital discharge from a small remote/rural community hospital. Our secondary objectives were to report times required for a pharmacist to complete a BPMDP, address discharge medication discrepancies and patient interviews and to classify unintentional discharge medication discrepancies (UMD). Programme inefficiencies/barriers and facilitators were also described.

METHODS

Study design

This prospective cohort pilot study was conducted in a small 12-bed community hospital in Northern

Ontario, Canada from September 2017 to January 2019. During daily routine assessment of admission orders, pharmacists reviewed all patient hospital admissions for study eligibility. A consecutive patient master file was created to track all eligible patients. A nurse provided eligible patients with a letter of information describing the pharmacist BPMDP interview.

The study site's standard hospital patient discharge process involved the creation of discharge prescriptions using the pharmacy software system (Meditech). The physician would handwrite which medications taken prior to hospitalisation were to continue, stop or change, and any new medications started in hospital that would continue on discharge. The discharge prescriptions were then scanned by nursing into the virtual platform (Docuscripts). The pharmacist reviewed the discharge prescriptions then incorporated the changes into the pharmacy software system. Pharmacist review of discharge prescriptions is not currently mandatory in the hospital discharge process; however, if the pharmacist receives the discharge medication prescriptions prior to the patient leaving hospital, the pharmacist will review the discharge prescriptions and address UMDs with the provider. Usual hospital discharge process involves the nurse providing a verbal review of the discharge medication prescriptions with the patient. The discharge prescriptions are then faxed to the community pharmacy and family physician.

For this study, from Monday to Friday, the pharmacist contacted the charge nurse to identify patients who were scheduled for a discharge. Subsequently, nursing staff, in collaboration with the pharmacist and in agreement with eligible patients and their caregivers, set an appointment for the interview before the discharge.

Preceding the patient discharge interview, pharmacists created a BPMDP using the BPMH, hospital medication administration record, and the physician discharge medication list. The pharmacist addressed UMDs before the patient interview. The pharmacist-patient interview used a mobile robotic platform with real-time audiovisual communication (Double Robotics®) in the patient's hospital room or private room. Hospital nursing staff provided support if required and family members/caregivers were invited to participate in the interview. Pharmacists reviewed the patient's discharge medications, provided patient counselling and a hard copy of the BPMDP to the patient, and encouraged patients and caregivers to ask questions about their medications. Immediately following the interview, patients completed an anonymous 10-question satisfaction survey via kiosk on a computer tablet or paper hard copy. Survey questions were adapted, equally phrased as both positive and negative and scored on a 5-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree). Discharge medication discrepancies were classified using a validated instrument for pharmacists to characterise unintentional medication discrepancies.[28] Throughout the study period, pharmacists documented inefficiencies, barriers and facilitators in patient recruitment, interview processes and discrepancy resolution. Pharmacists recorded time requirements for interview preparation (BPMDP), discrepancy resolution and interview with the patient.

Patients

All adults admitted to hospital with an anticipated length of stay >72 h were assessed for eligibility by the pharmacist. Eligible patients were those with a high risk of ADEs (taking more than 5 medications for chronic conditions, on a high-risk medication), or had a principal diagnosis of cancer, a chronic condition: COPD, stroke, heart failure, diabetes, or had a previous hospital admission within the previous 6 months.

Tele-robot

The Double® (robot) is a mobile, self-driving, self-balancing, two-wheeled base that uses the video and wireless connectivity features of the Apple iPad, housed on a metal motorised height-control stem to create a telepresence robot. The robot can be accessed remotely from anywhere via Google Chrome. The robot uses the iPad's audio and visual functions to create a real-time virtual telecommunication experience for the users by wirelessly connecting to the Robot via Bluetooth. Video protocol was standards-based WebRTC (video component in HTML5), video encryption with 123-bit AES end-to-end, not stored or recorded. Network requirements were Wi-Fi or 4G/LTE (cellular network). Internet connectivity was obtained directly from the Wi-Fi router/access point/ repeater directly to the iPad used as the robot's 'head'. The robot was powered by a lithium-ion battery with a charge time of 3–4 h providing 8–10 h of usage.

Data collected

Data collected included patient age, gender, primary reason for hospitalisation, number of medications, and UMDs. BPMDP discrepancies were classified as: medication anatomical main group, type (omission, addition, other) and cause (patient level or medication system level).[28] Pharmacist intervention rate, level of intervention (health-care provider, patient, medication or other) and type (medication started, stopped, dose changed, other) were documented. Time for interview preparation (including the BPMDP interview) and discrepancy resolution time requirements were recorded. Pharmacists documented BPMDP process barriers, inefficiencies and facilitators. Survey responses were collected and collated using Survey Monkey®.

Descriptive statistics were used for data analyses. The collected data were described using relative frequencies (percentage) for categorical variables and medians with interquartile range (IQR) for numerical variables. All completed surveys were included in the analysis. The data were presented as the percentage for each response option. In addition, percentages of all responses that were positive ('Agree' and 'Strongly Agree') were presented along with negative ones ('Disagree' and 'Strongly Disagree'). Computations were performed using MS Excel 2016 (Microsoft Corp. Redmond, Washington).

This study was approved by Research Review Board Inc. December 16, 2016.

RESULTS

Forty-seven of the 368 patients assessed for eligibility were included in the study. Of those, 23 patients were offered a discharge interview, 9 patients were no longer eligible on discharge, 5 presented a language barrier, and an additional 5 who were eligible were not made aware of the opportunity to partake in a pharmacist interview. Of the remaining 24 patients, 15 were excluded: 6 due to technical problems (internet connectivity, robot connectivity), 6 patients declined participation, 2 patients had a language barrier and 1 patient could not be contacted to arrange the interview [Figure 1]. Demographic characteristics of participants are presented in Table 1. The results of the 9 pharmacist BPMDP interviews that were conducted are shown in Table 2. There was an 89% (8 of 9) survey completion rate. Overall, 80% of patient survey results were positive, 13% undecided and 7% negative [Table 2]. The pharmacists found 78% (7 of 9 patients) had at least 1 UMD discrepancy in their BPMDPs. Medication from the cardiovascular system class represented 43% (3/7) of discrepancies [Figure 2a], and most frequently (71% or 5/7) the UMD was due to omission from the BPMDP [Figure 2b]. The medication system level was the attributed cause for most discrepancies (86% or 6/7) compared to at the patient level (14% or 1/7). When the discrepancies due to medication system level causes were characterised, the most frequent cause was incomplete or inaccurate BPMH (43% or 3/7) [Figure 2c]. The discharge medication list required pharmacist intervention in 67% (2/3) of patients, at the healthcare professional level that represents 15% (3/20) of all observed required interventions to solve the UMD [Figure 3]. On a medication level (n = 6), interventions included drug started/stopped (50% or 3/6), dose changed (17% or 1/6) or other (33% or

Table 1: Demographic characteristics of participants (*n*=9)

Characteristics	Value
Gender, *n* (%)	
Males	55
Females	45
Age	
Median (IQR)*, years	76 (73-80)
Primary reason for hospitalisation, *n* (%)	
Cardiovascular	44
Respiratory	22
Musculoskeletal	11
Gastrointestinal	11
Other	11
Number of medications	
Median (IQR)*	11 (9-13)
Rate of eligible patient participation, *n* (%)	37.5

IQR: Interquartile range

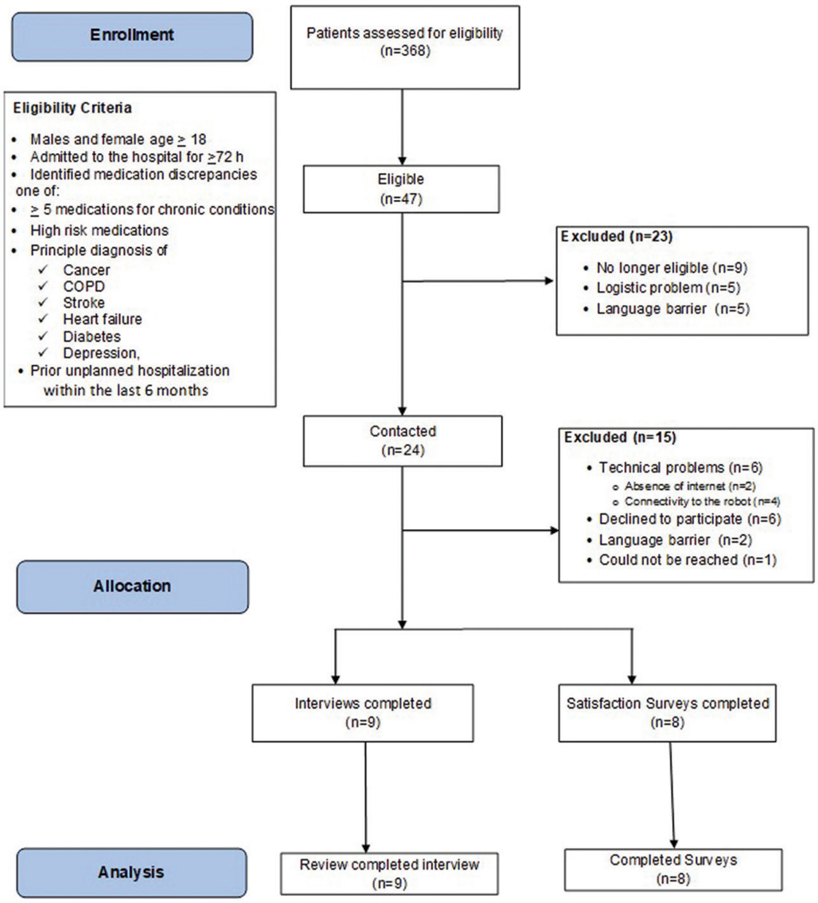

Figure 1: Study flow chart.

2/6). In resolving the BPMDP discrepancies, pharmacists most commonly provided suggestions to, or requested information from, the provider 33% (1/3) and 67% (2/3) of the time, respectively.

The median total time to complete a BPMDP interview was 60 min (IQR 50–80) with preparation, interview delivery, resolution times 45 (IQR 40–45), 15(IQR 10–20) and 10 (IQR 0–13) minutes, respectively. From a pharmacist's perspective, technical issues with robot connectivity (Wi-Fi) and operation, last minute notification of patient discharge and unavailable discharge prescriptions to create a BPMDP were identified as inefficiencies in BPMDP interview completion. Nursing discretion in patient selection (not a mandatory process), inconsistent pharmacy software system's ability to generate discharge prescription lists and lack of on-site support for robot maintenance were described as barriers. Positive nursing/staff support during patient interviews, once the interview time was established, facilitated a successful interview.

DISCUSSION

During their hospital discharge from a small rural community hospital, patients at high risk for preventable ADEs perceived their experience as positive and felt their care was better with a pharmacist-led real-time BPMDP using telepresence robot technology. Our study ascertained most patient discharge medication lists had unintentional discrepancies requiring a pharmacist to intervene to address incorrect discharge medication prescription lists. Pharmacists described conducting interviews as feasible, however, they faced challenges with available technology, bandwidth and lack of on-site support for the robot which often hindered interview success. Although exclusion criteria did not include language barriers, 7 patients were either not offered, or were not scheduled for a pharmacist BPMDP interview determined to be due to a language barrier. Given the pharmacist BPMDP was not mandatory, eligible patient selection for the interview

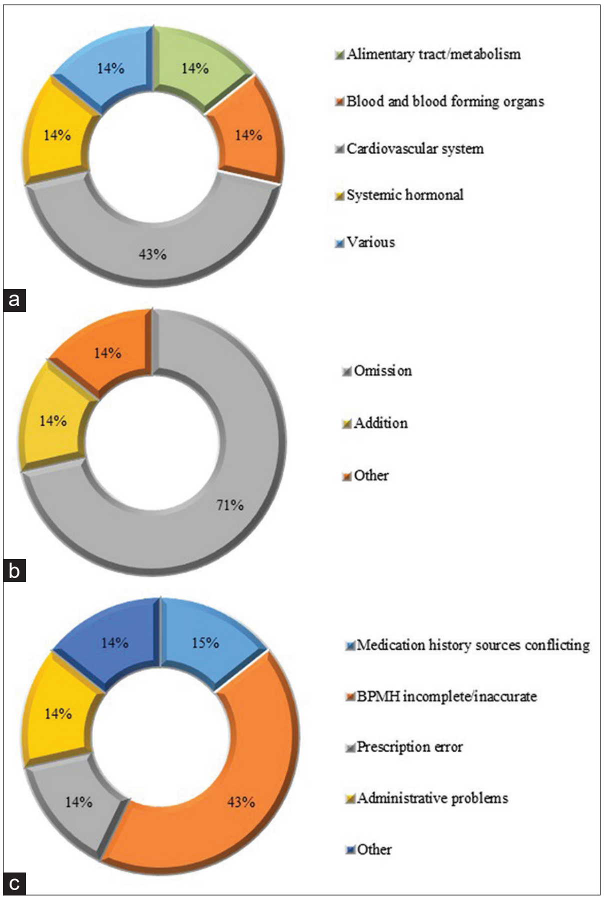

Figure 2: Unintentional discharge medication list discrepancies (n = 7, rate = 0.78). (a) Anatomical main group. (b) Type of medication discrepancy. (c) Discrepancy causes medication system level.

was based on nursing discretion. Mitigation strategies to ensure all eligible patients have the opportunity for a pharmacist BPMDP could be inclusion of the interview as part of the mandatory processes required upon discharge, and identification of patients who may require interpreter assistance (non-English speaking, hard of hearing) on admission, allowing time to ensure interpreter support. Interpreter support could be a pre-identified hospital staff member and/or family members.

Our exploration of patient satisfaction with patient/pharmacist interaction with the telepresence robot discovered an experience similar to reported results of physicians providing health care via telepresence robot in a northern rural community hospital study.[27] As well, the high rate of unintentional admission and hospital discharge medication list discrepancies found in the literature[1-3] resembled our results.

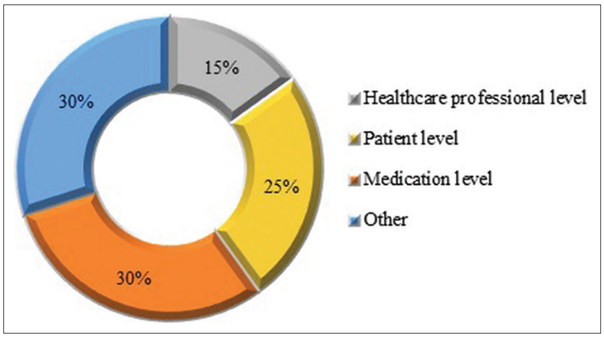

Figure 3: Pharmacist interventions to solve medication list discrepancies (n = 20, rate = 0.67).

Limitations

This study represented a small cohort of patients, and pharmacist BPMDP interviews were not a mandatory part of the patient discharge process. The potential for patient selection bias may have been twofold: patient eligibility was determined by pharmacist risk assessment of potential ADEs and nursing patient selection for interviews grounded on anticipated need or appropriateness. Due to staffing restrictions, patients discharged outside usual workday hours did not have the opportunity to interact with a pharmacist for the discharge medication interview. The study hospital did not have a pharmacist BPMDP interview either in-person or by telephone as part of the routine discharge process. Our study, is based upon a single patient cohort from a single centre. Future studies in a larger patient cohort from multiple centres are needed to validate our observations and conclusions. We are also cognizant that the clinical outcome assessment was not evaluated. The present study was focussed on the patient acceptance of pharmacist-led BPMDP via tele-robot in a remote and rural community hospital along with a description of medical discrepancies found by the pharmacist in a patient's BPMDP.

Assessment of the feasibility and patient satisfaction of pharmacist-enhanced care using a tele-robot, telephone, video or usual nurse medication review may be appropriate for future study.

When compared to interactions via phone, telepresence robot allows sharing of visual stimuli, evaluation of non-verbal responses, encourages recall, thoughts, and improves the collaborative process. Gathering all visual and

Table 2: Survey responses (*n*=8)

Percentage	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
I feel my care is going to be better because the hospital pharmacist uses robot to see me	13	63	13	13	0
I feel comfortable with the hospital pharmacist visiting me using the robot	13	88	0	0	0
I feel that the hospital pharmacist cared less about me by visiting me with the robot instead of in person	13	0	0	63	25
Communication with the hospital pharmacist using the robot is easy	25	63	0	0	13
I support the hospital's use of 'the robot' for the pharmacist to teach about medications	25	50	25	0	0
The robot makes it more difficult for me to communicate the way I would like to	13	0	0	63	25
When the hospital pharmacist is not in the hospital, I prefer to communicate using the phone instead of the robot	0	13	50	25	13
I feel that the robot is annoying	0	0	13	63	25
The use of the robot for hospital pharmacists to interview patients should be a regular practice	25	25	38	13	0
I am concerned the hospital pharmacist cannot properly discuss my medications using the robot	13	0	13	75	0
Overall evaluation					

Evaluation	Percentage
Negative	7
Not decided	13
Positive	80

verbal information during the interview using telepresence may be more accurate and efficient. However, due to internet connectivity issues with the telepresence robot, and often the need for staff escort to ensure appropriate navigation to the correct patient room, interviews via a tablet/iPad or on a patient room telephone may be more reliable and efficient. Addressing technological deficiencies such as increasing hospital Wi-Fi bandwidth may increase the likelihood of successful telepresence interviews.

CONCLUSION

Reduction of ADEs, both in hospital and following discharge, by conducting MedRec, improves patient care and decreases health care utilisation. This creates a tremendous opportunity for pharmacists to broaden their reach and share their skills, abilities and knowledge to lessen the gap in the provision of care for patients in remote, rural and underserviced communities, as well as support hospitals with on-site pharmacists. Our study has demonstrated that pharmacists are able to interact with patients in a hospital setting using a telepresence robot to review their medications upon hospital discharge and that patients view this experience as positive and helpful. Bandwidth and internet reliability in remote locations is clearly a barrier and must be considered for this technology to be effective.

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Conflicts of interest: All authors are employed by Northwest Telepharmacy Solutions however, the matter did not have an impact on the outcome of the study presented.

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