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RESEARCH ARTICLE

Opportunities for pharmacists to optimise quality use of medicines in a Sri Lankan hospital: an observational, prospective, cohort study

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Abstract

Background: Quality use of medicines (QUM) has been identified as a priority in Sri Lanka.
Aim: To identify opportunities to optimise QUM, and evaluate medication appropriateness and medication information exchanged with patients and carers on discharge in a Sri Lankan tertiary care hospital.
Methods: An observational, prospective, cohort study of patients systematically sampled from two medical wards. A research pharmacist determined their pre-admission medication regimen via interview at time of discharge. Issues of poor adherence and discrepancies between the pre- and post-admission medication regimens were recorded. Drug-related problems were categorised into opportunities to optimise drug therapy. The appropriateness of discharge medications was evaluated using a validated tool. The patient or carer was interviewed after discharge regarding the quality of medicine information exchanged in hospital.
Results: The 578 recruited patients were taking 1756 medications prior to admission, and 657 (37.4%) of these medications were not continued during admission. Opportunities to optimise drug therapy were identified on 1496 occasions during admission (median, 2.0 opportunities/patient), 215 opportunities, (14.4%) were resolved spontaneously by the medical team prior to discharge. The median score for appropriateness of medications on discharge was 1.5 per patient (interquartile range, 0.0–3.5). Of 427 patients surveyed after discharge, 52% recalled being asked about their medications on admission to hospital, 75% about previous adverse medication reactions and 39% recalled being informed about changes to their medications on discharge.
Conclusion: Significant opportunities exist for pharmacists to enhance quality use of medicines for patients in the current hospital-based healthcare system in Sri Lanka.

Keywords: quality use of medicines, rational drug use, quality of care, clinical pharmacy, pharmacists, hospital pharmacist, health professionals, drug provision, drug policy.

INTRODUCTION

Background

The World Health Organization (WHO) defines quality use of medicines (QUM) as patients receiving an appropriate medicine, at the right dose, for the right duration,

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and at the lowest cost to them and their community.[1] Each medicine should be judiciously prescribed, safe and appropriate for the individual patient and their condition, and effective enough to change their health outcome. Ensuring medication accuracy at transitions of care (medication reconciliation) is a QUM measure that has been prioritised by the WHO as a global patient safety initiative.[2]

In Sri Lanka, access to medicines has been largely addressed by free public health services and affordable medicines sourced within the region. Previous studies identified a requirement for better resources to support patient understanding and health professionals' prescribing and dispensing.[3,4] In 2005, Sri Lanka's National Medicinal Drug Policy highlighted that improving QUM and development of the pharmacy profession as a member of the healthcare team should be prioritised.[5]

Clinical pharmacy is defined as 'the practice of pharmacy as part of a multidisciplinary healthcare team directed at achieving QUM'.[6] Evidence from randomised controlled trials demonstrates that clinical pharmacy services add value to patient therapy and improve safety and economic outcomes.[7,8] Clinical pharmacists working within a multidisciplinary healthcare team have been shown to improve the identification, management and prevention of medicine-related problems.[7–12] In Sri Lanka, hospital pharmacists are predominantly occupied with ensuring medication supply for both the inpatient and outpatient settings. Assessing the potential impact of introducing clinical pharmacists is important for national medicine policy translation and QUM.

Objectives

To identify gaps in QUM in a tertiary hospital in Sri Lanka that could be addressed by clinical pharmacists working with medical and nursing teams.

METHODS

Study Design

An observational, prospective, cohort study which followed systematically sampled patients admitted to the Professorial Medical Unit (PMU) was conducted at a large tertiary care hospital in Colombo, Sri Lanka over an 8-month period from March to November 2012. As a referral centre, the PMU received patients from different regions of Sri Lanka and included one male ward (65 beds) and one female ward (45 beds). Medical staff consisted of six consultants, three registrars and four junior house officers.

Participants

Patients eligible for recruitment were those admitted to the PMU, older than 12 years of age, without cognitive impairment, and being discharged during project operating hours (Monday to Friday, 8.30–17.00 h, excluding public holidays).

Figure 1 illustrates the systematic sampling and recruitment process utilised. Hospital staff remained blinded to patients sampled.

Main Outcome Measures

1 Drug related problems (DRPs): opportunities to optimise drug therapy by minimising risks and increasing effectiveness, including accurate continuation of medications on admission to hospital.
2 Medication appropriateness index (MAI): appropriateness of medications on discharge
3 Post-discharge survey regarding medication information exchanged: patient self-reporting of medicine information requested and provided by hospital staff throughout their hospital admission.

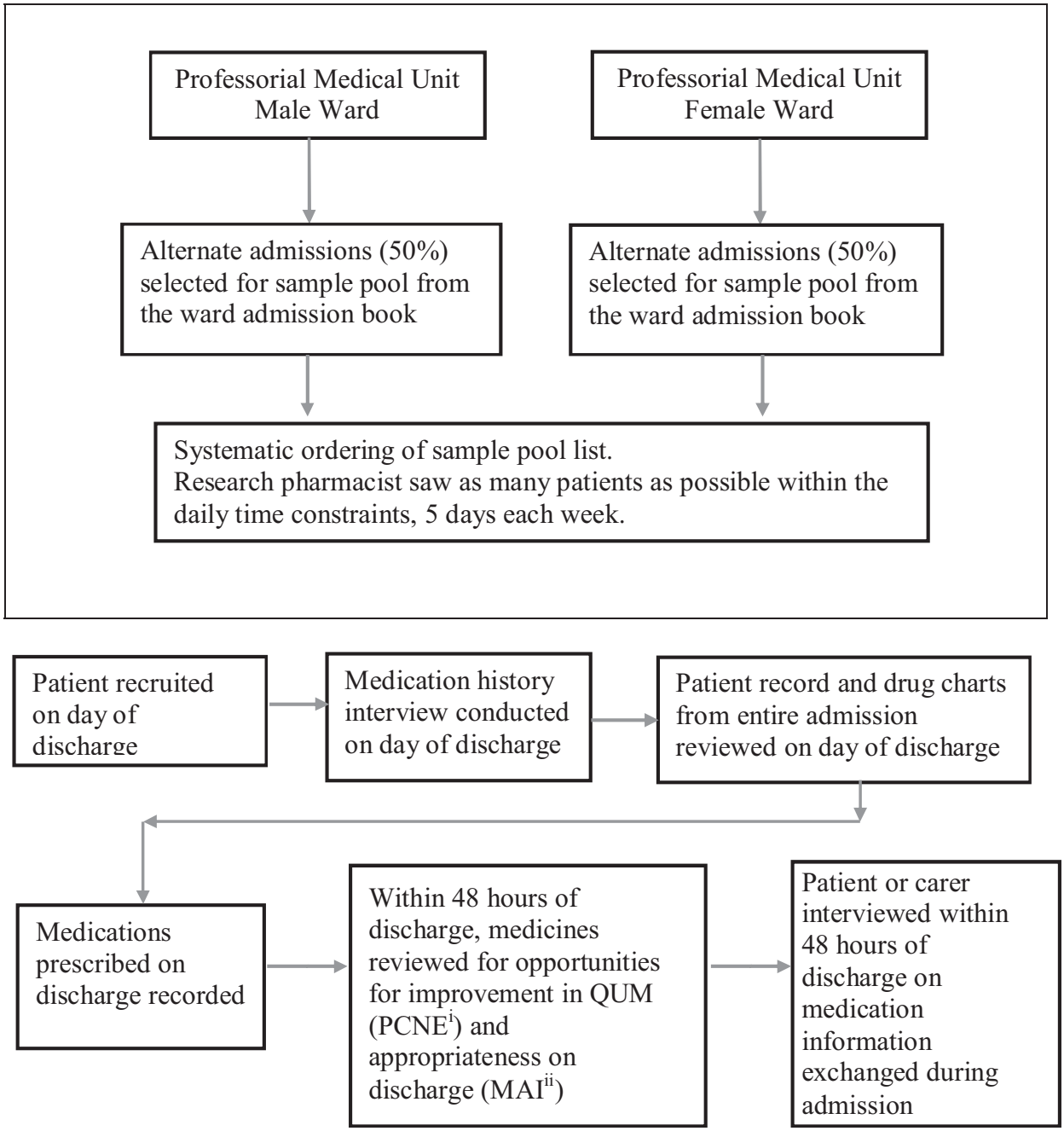
Data Sources

Data relating to the presenting complaint, past medical and medication history, relevant pathology results, interventions made to drug therapy during the admission and ongoing medical plans were obtained from the patient record.

A comprehensive medication history interview, including level of adherence and recent changes prior to admission was conducted with the patient and/or carer on the day of discharge by the research pharmacist. Sources to assist confirmation of this information included the patient or carer's recollection, personal patient record or own medicines. Patients and carers were asked about side effects, adverse drug reactions (ADRs) and ongoing concerns regarding their medicines.

The inpatient medication chart and changes documented in the patient record were reconciled with medicines taken prior to admission to identify unintentional discrepancies. Medicines prescribed on discharge prescriptions or discharge medication plans and information provided regarding medicines intended to be continued after discharge, including their duration, were recorded by the research pharmacist.

All medications prescribed during admission were reviewed in context of the patient's medical and medication history for potential DRPs, while discharge medications were scored on appropriateness using the MAI (Figure 2). Evidence-based resources including the



[i]Pharmaceutical Care Network Europe (Version 4.0)[12]
[ii]Medication Appropriateness Index[13]

Figure 1 Selection protocol and study design.

British National Formulary®, Australian Medicines Handbook®, Australian Therapeutic Guidelines® and local guidelines were used to assist the research pharmacist determine appropriateness of medications for individual patients.

The medication information exchange survey conducted 48 h after discharge established:

1 whether patients recalled being asked about their previous medication history at any time during their admission
2 whether patients recalled being asked about their ADR history on admission to hospital, and
3 if they were provided with information about medicine changes that had occurred in hospital

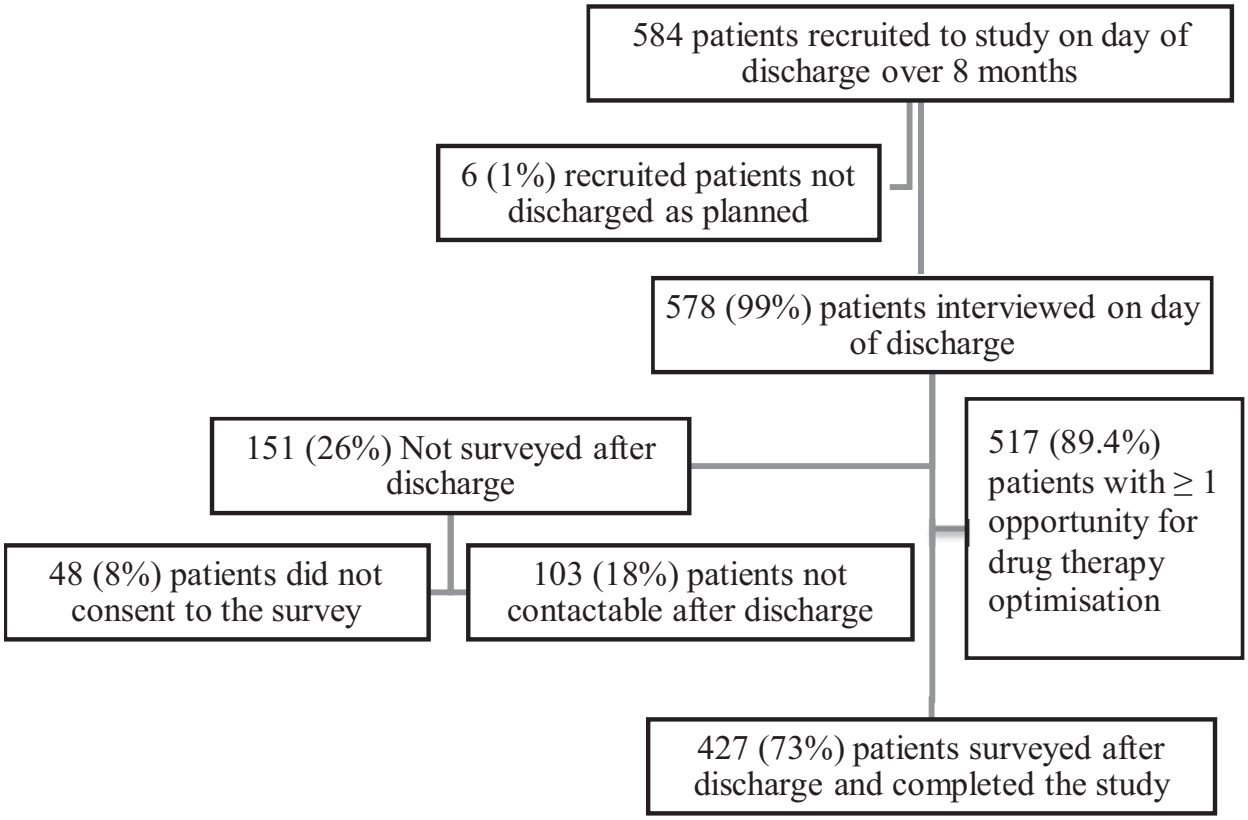


Figure 2 Recruitment and follow up (percentages expressed as proportion of initial recruitment total).

and given the opportunity to ask questions about their medicines prior to discharge.

The patient was told to exclude their interaction with the research pharmacist on discharge day from their answers.

Data Assessment

Discrepancies between medications taken prior to admission and medications prescribed in hospital with no documented or apparent reason for change were identified.

Potential DRPs were recorded and categorised as opportunities for drug therapy optimisation. The classification scheme to categorise DRPs was adapted from Version 4.0 of the Pharmaceutical Care Network of Europe classification system (PCNE).[13]

Each medicine prescribed on discharge was reviewed by the research pharmacist in context of past and current medical problems and compared with evidence-based resources and scored via the MAI.[14,15] The MAI evaluates the appropriateness of a drug regimen at a single moment in time. Medicines prescribed at discharge were selected as an indicator of the ongoing medication management plan.[16–18] An individual discharge medication was allocated a score from zero to 18: the higher the score, the more inappropriate the medication regimen. The sum of scores for each medication gave a total weighted score for each patient (Table 1).

TRAINING AND QUALITY ASSURANCE OF DATA COLLECTION AND ASSESSMENT

Data collection was conducted by a Sri Lankan BPharm graduate (TG). This pharmacist underwent 6 weeks of intensive training in the PMU by an experienced Australian clinical pharmacist (DP) prior to and for 1 month after commencement of data collection. This training included piloting, reviewing and refining data collection and interview techniques, and regular quality checks of medication reviews.

To establish a consistent approach to data collection, identification of DRPs and application of MAI scoring, progress reports containing case examples and questions were discussed at fortnightly teleconferences with Australian clinical pharmacist researchers (JC and CL). An

Table 1 Medication appropriateness index score system[13,14]

Criteria	Available score
Indication	0 – Indicated
	1.5 – Marginally Indicated
	3 – Not indicated
Effectiveness	0 – Indicated
	1.5 – Marginally Indicated
	3 – Not indicated
Dosage	0 – Indicated
	1 – Marginally Indicated
	2 – Not indicated
Directions	0 – Indicated
	1 – Marginally Indicated
	2 – Not indicated
Practicality	0 – Indicated
	0.5 – Marginally Indicated
	1 – Not indicated
Drug–drug interactions	0 – Indicated
	1 – Marginally Indicated
	2 – Not indicated
Drug–disease interactions	0 – Indicated
	1 – Marginally Indicated
	2 – Not indicated
Duplication	0 – Indicated
	0.5 – Marginally Indicated
	1 – Not indicated
Duration	0 – Indicated
	0.5 – Marginally Indicated
	1 – Not indicated
Cost compared to equal alternatives	0 – Indicated
	0.5 – Marginally Indicated
	1 – Not indicated

average of four cases (10% of sample) was selected purposefully on perceived complexity by the research pharmacist and reviewed at each teleconference throughout the study period. Variance in scores was resolved by consensus. A single, on-site audit evaluated the DRPs and MAI scores for 38 (approximately 10% of sample) randomly selected patients and was conducted by two experienced Australian clinical pharmacists (CL and NP) mid-way through the study period.

Two separate site visits for additional training were conducted during the study period by members (IC, JC, CL, NP) of the research team from Australia.

Statistical Methods

All data were de-identified and entered into a Microsoft Excel spreadsheet by the research pharmacist. Results were reported using descriptive statistics using SPSS statistical software version 21 (SPSS Inc., Chicago, Illinois, USA).

The authors received ethics approval and funding from their institutions.

RESULTS

Five hundred and eighty-four patients were recruited to the study on day of planned discharge. Figure 2 describes the follow up and outcome for these patients.

Table 2 illustrates patient demographics, medications prescribed before and after admission, medication discrepancies, opportunities for drug therapy optimisation, MAI scores and patient self-reports of medication information exchanged.

Opportunities for Drug Therapy Optimisation During Hospital Admission

Table 2 highlights the frequency of identified opportunities for drug therapy optimisation. The most frequently identified opportunity for optimisation related to dose and duration (513; 34%) and drug choice (359; 24%). Drug choice predominantly related to untreated indications (231; 15.4%), unnecessary treatment (93; 6.2%) and duplication (25; 1.7%) of therapy. Table 3 highlights case examples from each category.

The most commonly identified drug group with opportunities for optimisation were gastrointestinal drugs (440; 29.4%). For example, the indication for continuing a treatment dose regimen of proton pump inhibitors after 8 weeks was often not clear. Opportunities not specific to a drug class were the second most frequent (423; 28.3%). These included enhanced education of patients who could not describe the name of the medicine, why they were taking it, or those who showed evidence of non-adherence or poor medicine administration technique (in particular, use of metered dose inhalers, eye drops or medicines that required dose titration).

Of the DRPs identified, 215 (14%) were resolved by the treating medical team prior to discharge, without any intervention from the pharmacist.

MAI

Of the 578 patients discharged as planned, 74 patients (12.8%) were not prescribed any medicines. An MAI score was therefore calculated for 504 patients' (87.2%) medications on discharge. The discharge regimen was considered to be appropriate in 139/504 (27.3%) patients. The median MAI score (including those equal to zero), per patient was 1.5. The distribution frequency was heavily skewed toward the lower end of the range (0–38) with an interquartile range of 0.0–3.5.

Of the 2417 medicines scored using the MAI, the criteria most frequently scoring some degree of inappropriateness were dosage (391; 16.2%), indication (167; 6.9%), cost effectiveness (89; 3.7%) and practicality (82; 3.4%).

Table 2 Patients, medications and opportunities for optimisation

Demographic data for patients recruited and discharged as planned n = 578	
Mean age in years (SD, range)	47 (19.7, 12–93)
Proportion of recruited patients who were female	309 (53.5%)[b]
Median number of medicines prescribed pre-admission to hospital (per patient)[c]	2.0 (0–5)[c]
Median number of medicines prescribed on discharge from hospital (per patient)[c]	4.0 (2–6)[c]
Median number of medication changes the patient is required to implement after discharge	4.0 (2–6)[c]
Medication on admission prescribed for 578 patients	
Number of pre-admission medicines taken by patients and identified in the pharmacist medication history interview at time of discharge	1756
Number of pre-admission medicines taken by the patients and continued on admission	1099[a]
Number of 'potentially' unintentional medication discrepancies on admission	657 (37.4%)[b]
Opportunities for drug therapy optimisation during admission	
Patients in whom ≥1 opportunity for drug therapy optimisation	517 (89.4%)
Opportunities for drug therapy optimisation identified by pharmacist	1496
Median number of opportunities for drug therapy optimisation per patient	2.0 (1–4)[c]
Drug-related problems resolved by treating team without pharmacist intervention	215 (14.4%)[b]
Medication appropriateness on discharge (n = 2417) medications in 504 patients on discharge	
Patients with nil medications prescribed on discharge	74 (12.8%)
Median MAI score per medicine	0 (0–1)[c]
Median MAI score per patient	1.5 (0–3.5)[c]
Patient self-report of medicine information exchanged	
Consented to survey and contactable post-discharge	427
Asked about pre-admission medication regimen	222 (52.2%)
Asked about previous adverse drug reactions to medicines	322 (75.4%)
Informed about changes to medicines prior to discharge	164 (38.6%)

[a]Prescribed the same medicine name, dose and frequency on the hospital drug chart as taken prior to admission.
[b]Number (percentage).
[c]Median (interquartile range).

Patient Medicine Information Exchange Survey

Of the 578 patients recruited and discharged, 530 (91.7%) patients or carers consented to be surveyed after discharge. One hundred and three (18%) were not able to be contacted and 427 (80.6%) patients or carers were surveyed after discharge.

Two hundred and twenty-two of the 427 (52.0%) surveyed patients or carers recalled being asked about their pre-admission medicine regimen. Of these, 216 (97%) believed they were asked by the hospital doctor. Three hundred and twenty-two (75%) patients recalled being asked about their ADR history, and 164 (39%) surveyed patients remembered someone explaining the changes that had occurred to their medicines in hospital.

DISCUSSION

Previous research to describe drug-related problems, to identify opportunities for drug therapy optimisation, and to quantify medication appropriateness on discharge and investigate patient or carer's recall of medication information exchanged, has not been undertaken in Sri Lankan public hospitals. Similar research has been conducted in India[9] and insert: this study concluded that clinical pharmacists could improve QUM.

In this study, a trained and mentored research clinical pharmacist was able to identify a large number of potential gaps in the QUM that were not explicitly recognised in the patient record. Opportunities exist for a pharmacist to obtain complete medication histories (including previous ADRs), optimise drug therapy and prevent drug-related problems during admission and discharge in collaboration with the medical team, and provide an explanation of the changes to ongoing medicine regimens to patients and carers.

The Patient

The study identified that many patients had a poor understanding of their medicines. A detailed medication history interview by a pharmacist can provide pre-admission medication regimens and identify drug-related problems, which may assist medical officers in understanding a patient's reasons for presenting to

Table 3 Case examples for opportunities for drug therapy optimisation

Identified opportunity for drug therapy optimisation	Case examples
Optimise drug choice	Untreated indication A 51-year-old man admitted for 6 days presented with third nerve palsy, eye pain, headache and diplopia. He had a history of type-2 diabetes and cirrhosis complicated by portal hypertension and ascites. Two of his pre-admission medicines propranolol and spironolactone were not prescribed on admission, documented as being ceased, or continued on discharge. His patient record did not suggest a possible reason (e.g. bradycardia, hypotension, hyperkalaemia) for these medicines to be withheld, suggesting that they had been omitted and subsequently ceased unintentionally.
Optimise dosing	Inappropriate dose Use of treatment (1 mg/kg twice daily) dose of enoxaparin rather than a prophylactic dose where prophylaxis was intended. 60 mg subcutaneously twice daily prescribed instead of 40 mg once daily.
Ensure safe and effective drug administration	Non-adherence to medications A 59-year-old woman presented with worsening heart failure and asthmatic symptoms. The pharmacist interview identified that the patient had been obtaining ampicillin tablets from her local pharmacy as needed for shortness of breath without prescription. It was also identified that the patient had poor adherence to all her medications, with minimal understanding about what medicines she was supposed to be taking and why.
Prevent, identify or mitigate adverse reactions	Previous history of allergy to penicillins A 56-year-old female patient presented with chest pain, fever and cough. She had a documented history of allergy to amoxicillin (rash). She was prescribed amoxicillin/clavulanic acid on discharge.
Prevent, identify or mitigate clinically significant drug interactions	Drug–disease interaction A 68-year-old female patient presented with vomiting, diarrhoea, acute renal impairment and feeling faint. The calculated creatinine clearance was 30 mL/min. The patient was continued on digoxin 250 micrograms daily, as per pre-admission dose regimen, despite having signs and symptoms of toxicity (vomiting, diarrhoea and feeling faint). A digoxin level was not taken.
Other	Unintentional drug error A 65-year-old male patient had been prescribed tolbutamide and metformin prior to admission at an outpatient clinic. The patient had unintentionally self-ceased the tolbutamide tablets as they looked identical to the metformin tablets. The tolbutamide tablets were not labelled with the name of the medicine. He thought the tolbutamide tablets were the same medicine as the metformin tablets.

hospital, and ensure continuity of appropriate pre-admission medications during and following their hospital stay.

Patients' poor understanding of medicines taken prior to hospital admission could be explained by poor labelling (often lacking name, strength and dose instructions) as previously described in a Sri Lankan public hospital which showed that inadequate drug labelling, inadequate explanation of dosage regimen, precautions and clinically important side effects correlated with poor patient knowledge of correct medicine doses.[3]

Drug administration issues accounted for 22% of opportunities to optimise the drug therapy regimen. These opportunities included educating patients about how to take medications in relation to meals, use metered dose inhalers, instil eye drops and improve medication adherence. The post-discharge survey identified the need to increase communication between patients, carers and the healthcare team with regard to their previous medication history, history of ADRs and changes that have occurred to their medication regimen during the admission.

The Healthcare Team

Currently in Sri Lanka, doctors bear the burden of obtaining and documenting medication histories, including ADR history, and educating patients about their medicines and medicine changes. Our study highlighted gaps and inconsistencies in completing these tasks. The PMU has a challenging patient load that may limit opportunities for such interventions. Each junior doctor was responsible for approximately 50 patients at any one time.

Previous studies have called for improved adherence to accepted prescribing guidelines and greater support and education of junior doctors in quality prescribing.[4] However, unbiased, up-to-date information about drug doses, drug interactions, standard treatment guidelines, generic names for branded medicines as well as adverse effects, is not readily available for prescribers in Sri Lankan government hospitals. The MAI results in this study indicate that only 28% of medication regimens prescribed on discharge were considered appropriate.

Results from the patient survey identified opportunities for drug therapy optimisation and highlighted the need for increased support for Sri Lankan doctors and nurses.

The Role of Clinical Pharmacy

At least 25% of hospital prescribing errors have been linked to incomplete medication histories taken on admission, resulting in 46% of medication errors in the acute hospital admission.[19] It has also been shown that prescribers in emergency departments may take less accurate medication histories when compared to that recorded by a clinical pharmacist.[20–23] Lack of prescriber familiarity with medication generic names and brand equivalents, medication appearances and dose forms available, may limit the completeness and accuracy of medication histories taken by medical staff.[20–23] Pharmacist reconciliation of a thorough medication history against a hospital medication chart and the patient's past and current medical problems, can identify and resolve unintentional medication discrepancies early, while ensuring appropriate continuity of regular medications.[21–24]

During admission, and particularly on multidisciplinary ward rounds, the clinical pharmacist can review and collaborate with prescribers to resolve drug-related problems and tailor treatment to the needs of the patient.[10,11,21–24]

In preparation for discharge, the clinical pharmacist can assist with the provision of medication counselling, providing a written medication list, including the changes that have occurred in hospital, education regarding administration of medicines, intended durations of therapy, assistance with communicating medication changes to local doctors, and ensuring that the patient leaves the hospital with a supply of clearly labelled medications. Pharmacists can also help identify barriers to adherence (including cost, complexity of drug regimen, apathy toward medicines) and tailor strategies to suit the individual patient.[6,7,17,18]

Pharmacy Service in Sri Lanka and the New Undergraduate Course

Pharmacists do not currently work at a ward level in collaboration with medical teams in government hospitals in Sri Lanka. They predominantly undertake a supply and dispensing function with minimal interaction with doctors and little provision of information to patients and carers.[3] In 2006, the Sri Lankan government introduced new Bachelor of Pharmacy degree courses in order to develop a workforce capable of providing additional clinical services. These programs are producing graduates with the requisite skills to improve QUM in the health system in Sri Lanka.[25]

Extensive discussion about the multiple barriers to implementing a clinical pharmacy service in Sri Lanka is beyond the scope of this paper. However, current barriers include a lack of funded positions, minimal acceptance of an expanded role by some members of the medical, nursing and pharmacy profession, a previous lack of local role models and minimal awareness of the impact of such services in a hospital ward setting.[26,27] These hospital-specific factors would be the main limitations to the generalisability of the results from this research across other hospitals in Sri Lanka.

Limitations

This was a large study, with 427 subjects; however, as it was a single-centre study in an urban teaching hospital, the findings are not necessarily generalisable to other sites, in particular rural hospitals.

The study had the capacity to employ one recently graduated pharmacist, whose time was divided between data collection, medication reviews and data entry. While the pharmacist was supported by utilisation of standard tools, reference guidelines and mentoring, this only partially compensated for lack of experience. This lack of experience may have produced a lower level of identification of potential issues during patient interviews. However, the use of validated standardised measures to evaluate the significance of identified issues, combined with quality assurance of 10% of the sample of patients' episodes, provides context for the potential gaps found and suggests significant opportunities for improvement in QUM do exist.

Medication histories would have been more accurate if local pharmacies kept a record of what was dispensed for an individual patient. Without dispensing records, assumptions were made about the identity of poorly labelled medications and patient adherence to prescriber intentions. Unlike Australia or the UK, primary care medical staff were not contacted to identify what was prescribed. Electronic dispensing records are a critical facilitator of improved QUM in Sri Lanka, in both the community and hospital sector.

Whenever asking patients to recall what happened during their admission, there is potential for recall bias by those who may not remember whether they were asked about their previous medications, ADRs or medication information exchanged.

Documentation in the patient record (bed head ticket) was often limited, necessitating assumptions regarding prescribers' intentions for medication management during and after an admission. A more accurate picture

could have been obtained if the research pharmacist discussed cases with the treating medical officers. However, discussion was not permitted as it would introduce bias into the study methodology, potentially influence prescriber behaviour, and would not ensure consistent treatment of each patient's case.

The MAI captures the appropriateness of medications prescribed at a particular moment in time. Limitations of the MAI include the inability to capture untreated indications, patient limitations with adherence and technique, inappropriate medications prescribed at other times prior to discharge, as well as unintentional discrepancies with pre-admission medicines. The validity of the MAI scores would have been enhanced if the review team had included a physician. For this reason, the opportunities for drug therapy optimisation based on the PCNE drug-related problem classification system (Version 4·0) were included to ensure all issues were identified.

As this study represents a practice change for pharmacists in Sri Lanka, it would have been an opportunity to survey patients and their carers as to whether they saw this as the responsibility of pharmacists.

CONCLUSION

Significant opportunities exist for graduates from Sri Lankan university Bachelor of Pharmacy courses to work with doctors, patients and their carers to improve QUM in Sri Lankan hospitals. These opportunities centre on addressing gaps in continuity of medicines on admission to hospital, increased support for doctors to optimise medicine management and educating patients and carers about their prescribed medicines before discharge. A controlled trial evaluating the quantitative and qualitative impact of a ward-based clinical pharmacy service on QUM in Sri Lanka is now underway.

Key Messages

- Significant opportunities exist for graduates from Sri Lankan University Bachelor of Pharmacy courses to work with doctors, patients and their carers to improve QUM in the current government-funded, hospital-based healthcare system in Sri Lanka.
- These opportunities centre on addressing gaps in continuity of medicines on admission to hospital, patient education about their prescribed medicines and increased support for prescribers to optimise medicine management.

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ETHICS

Ethics approval was obtained from Kelaniya University Ethics Review Committee. Verbal consent was obtained for the medication history interview in hospital on the day of discharge. Written informed consent was obtained for the follow-up survey after discharge. Patients could consent to be in the study and choose not to undertake the follow-up survey post-discharge.

Competing interests

None declared.

AUTHOR CONTRIBUTIONS

DMPP: study concept, design, methods, researcher training, tutoring, fortnightly mentoring, site visits, data analysis, manuscript writing, manuscript revision; JAC: study concept, design, tutoring, fortnightly mentoring, site visits, data analysis, manuscript writing, manuscript revision; LGTS: data collection, manuscript revisions; AD: Study concept, design, methods, manuscript revisions; CL: study concept tutoring, fortnightly mentoring, site visits, manuscript revision; FM: study concept, design and planning, data audit, manuscript revision; HADeS: study concept, design and planning, manuscript review; SFJ: study design, data collection, manuscript revision; NBP: tutoring, mentoring, site visits, manuscript revision; BM: study tutoring, mentoring, site visits, manuscript revision; IDC: Study concept, design, methods, data analysis, manuscript writing, manuscript revision.

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