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RESEARCH ARTICLE

A feasibility study of interdisciplinary collaboration in the provision of a pharmacist led discharge medication reconciliation service at an Irish hospital

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Abstract *Background* Medication reconciliation is a basic principle of good medicines management. With the establishment of the National Acute Medicines Programme in Ireland, medication reconciliation has been mandated for all patients at all transitions of care. The clinical pharmacist is widely credited as the healthcare professional that plays the most critical role in the provision of medication reconciliation services. *Objectives* To determine the feasibility of the clinical pharmacist working with the hospital doctor, in a collaborative fashion, to improve the completeness and accuracy of discharge prescriptions through the provision of a pharmacist led discharge medication reconciliation service. Setting 243-bed acute teaching hospital of Trinity College Dublin, Ireland. *Method* Cross-sectional observational study of discharge prescriptions identified using non-probability consecutive sampling. Discharge medication reconciliation was provided by the clinical pharmacist. Non-reconciliations were communicated verbally to the doctor, and documented in the patient's medical notes as appropriate. The pharmacist and/or doctor resolved the discrepancies according to predetermined guidelines. Main outcome measures number, type and acceptance of interventions made by the clinical pharmacist in the resolution of discharge medication non-reconciliations. Number of discharge medication non-reconciliations requiring specific input of the hospital doctor. *Results* In total, the discharge prescriptions of 224 patients, involving 2,245 medications were included in the study. Prescription non-reconciliation was identified for 62.5 % (n = 140) of prescriptions and 15.8 % (n = 355) of medications, while communication non-reconciliation was identified for 92 % (n = 206) of prescriptions and 45.8 % (n = 1,029) medications. Omission of preadmission medications (76.6 %, n = 272) and new medication non-reconciliations (58.5 %, n = 602) were most common type. Prescription non-reconciliations were fully resolved on 55.7 % (n = 78) of prescriptions prior to discharge; 67.9 % (n = 53) by the doctor, 26.9 % (n = 21) by the clinical pharmacist, and 5.2 % (n = 4) by the joint input of doctor and pharmacist. All communication non-reconciliations were resolved prior to discharge; 97.1 % (n = 200) by the pharmacist, and 2.9 % (n = 6) by both doctor and pharmacist. *Conclusion* This study demonstrates the how interdisciplinary collaboration, between the clinical pharmacist and NCHD, can improve the completeness and accuracy of discharge prescriptions through the provision of a pharmacist led discharge medication reconciliation service at an Irish hospital.

Keywords Clinical pharmacy · Discharge prescription · Hospital pharmacy · In-patient · Interdisciplinary · Ireland · Medication reconciliation · Patient safety

Impacts on practice

- All patients discharged from acute hospital care in Ireland should have their medications reconciled, as mandated by the Irish government.
- Medication reconciliation at discharge has the potential to enhanced on-going patient care by ensuring medicines are prescribed accurately and completely, and through the provision of up-to-date information to primary care health professionals.
- Collaboration between clinicians facilitates the delivery of discharge medication reconciliation services.

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- An area of research which is relatively new in the Irish setting has been addressed in this study and baseline data has been established.

Introduction

AQ2 For all those committed to excellence in the provision of healthcare services, patient safety and quality are at the heart of their delivery, and medication safety remains a priority for all healthcare professionals (HCP). In Ireland, a major emphasis has been placed on patient safety by the Commission on Patient Safety and Quality Assurance [1]. The National Acute Medicines Programme has been established and medication reconciliation has been mandated for all patients at all transitions of care. While the doctor retains the legal prescribing responsibility of medications at hospital discharge, the clinical pharmacist is recognised as the HCP who plays the most critical role in the provision of medication reconciliation services [2]. Medication reconciliation is a basic principle of good medicines management [3]. The American Institute for Healthcare Improvement has defined medication reconciliation as:

> the process of creating the most accurate list possible of all medications a patient is taking—including drug name, dosage, frequency, and route—and comparing that list against the doctor's admission, transfer, and/or discharge orders, with the goal of providing the correct medications to the patient at all transition points within the hospital [4].

American studies have reported that more than 40 % of medication errors are believed to result from inadequate reconciliation during admission, transfer and discharge of patients. Of these, about 20 % are believed to result in harm. These studies conclude that many of these errors would be averted if medication reconciliation processes were in place [5, 6]. Research has demonstrated that systematic medication reconciliation can indeed reduce medication errors and improve medication appropriateness at transfer into and out of hospital [7–10]. The prioritisation of formal medication reconciliation systems at all points of transfer of care has been endorsed both nationally and internationally [1, 3, 4, 11].

A significant proportion of patients experience adverse outcomes following hospital discharge which are attributable to their healthcare. One study reported 19–23 % of adults experience an adverse event following hospital discharge, most commonly an adverse drug event [12]. An Irish study has also demonstrated the existence of this problem at hospital discharge, identifying medication non-reconciliation for 50 % of patients [13]. The early post discharge period is thought to be most critical since many patients have had a recent change in health status and frequently have several prescription changes. Problems with the communication of medical information to primary care professionals at discharge also exist and may contribute to drug related problems such as confusion, misuse, error or patient harm [14].

All patients discharged from acute hospital care in Ireland should have their medications reconciled. The clinical pharmacist is acknowledged as the key HCP with responsibility for medication reconciliation in Irish hospitals. In the hospital setting the process of medication reconciliation can be improved by coordinating the activities of various HCP, for example the hospital doctor and clinical pharmacist. Practitioners from both disciplines can draw on their own individual training and skills to make significant contributions to patient care. Pharmacists, for example, can provide the medical team with expert knowledge of medicines, while the doctor, who retains the legal prescribing responsibility, can utilise this knowledge in their prescription writing in order to improve the completeness and accuracy of their patient's prescriptions. Factors such as the presence of considerable medication-related morbidity and mortality, rapid advancement and innovation in the field of medicines, a tendency towards earlier discharge from acute hospitals, and the need for pharmaceutical care for an aging population point to the need for this type of increased collaboration between pharmacists and doctors. To optimise their relative contributions, both professions need to establish successful working relationships in order to work in a collaborative manner as members of an interdisciplinary team.

Aim of the study

The aim of this study was to determine the feasibility of the clinical pharmacist working with the hospital doctor, in a collaborative fashion, to improve the completeness and accuracy of discharge prescriptions through the provision of a pharmacist led discharge medication reconciliation service.

Ethical approval

This study was approved by the Ethical Review Panel of the School of Pharmacy and Life Sciences at Robert Gordon University, Aberdeen, Scotland as well as Naas General Hospital (NGH) Ethics Committee.

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Method

Setting

This research was undertaken in an acute teaching hospital of Trinity College Dublin. NGH is a 243-bed general hospital, serving a predominately rural community to the west and south-west of Dublin. The annual number of inpatient discharges is in the region of 12,000 patients.

The standard of care at NGH dictates that inpatients bring their own medicines to hospital where possible, and admission medication reconciliation is provided to all patients by a clinical pharmacist within 24 h of their admission (48 h at weekends). Neither dispensed medicines nor medication reconciliation services are provided to patients at discharge. A hand-written prescription is provided to the patient, which can be dispensed at the patient's community pharmacy of choice. A copy of this prescription, along with a hand-written discharge summary letter is later forwarded to the patient's GP.

Patient recruitment

All medical and surgical inpatients ≥16 years were eligible for inclusion in the study if they had a gold standard preadmission medication list (GSPAML) documented at admission, and were provided with a discharge prescription with at least three prescription medications at the time of discharge [15]. Patients specifically excluded were those discharged directly from the Emergency Department, and those transferred to another healthcare facility.

Study design

A cross-sectional observational study was designed. Data collection tools were designed, piloted, and validated prior to commencement of data collection with a sample of 22 patients. Pilot data was excluded from the full study.

Sample size was determined prior to initiation of data collection through the use of a sample size table for proportions which took account of the number of patients discharged from NGH in a similar period the previous year. This was used to determine the population from which the sample would be drawn, and the ultimate sample size [16]. It was established that a sample of 224 patients would yield ±0.05 degree of accuracy and 95 % confidence level. Non-probability consecutive sampling was employed because of the need to address medication non-reconciliations in a timely and meaningful fashion for patients [17]. Random sampling, although acknowledged at the outset as preferable, was not achievable since a full list of patients discharged each day was only available retrospectively.

Definitions

Gold standard preadmission medication list

A list which accurately reflects the medications the patient was actually using prior to admission to hospital, taking into account any non-compliance and non-prescription medications [18]. At NGH this list is obtained by the clinical pharmacist using at least two reliable sources of information. One-to-one patient interview is considered the primary source where possible. Common secondary sources include patients own drugs, relative/carer, GP practice/letter, community pharmacist. The medication list is captured manually in a hand-written format.

Gold standard discharge medication list

A list which accurately reflects the medications it is expected the patient will continue to use after discharge from hospital, taking into account any inpatient medication changes, non-compliance and non-prescription medications. During the study, this list was compiled in a hand-written format by the clinical pharmacist, having reviewed each patient's discharge prescription, inpatient medication prescription chart and medical notes. The prescribing doctor was contacted to clarify outstanding issues as necessary in the compilation of this list.

Discharge prescription

A hand-written, paper list of a patient's prescribed medications at the time of their discharge from hospital, written by the hospital doctor.

Controlled drug (CD)

A prescription medicine which is controlled under Irish Misuse of Drugs legislation. Legal controls govern their production, supply, storage, and prescription in a more stringent way than other prescribed medications.

Medication non-reconciliation

An unintentional discrepancy between the patient's discharge prescription and gold standard discharge medication list (GSDML), taking into account changes made during the inpatient stay. Medication non-reconciliation was further categorised in the study as prescription or communication non-reconciliations, as demonstrated in Fig. 1.

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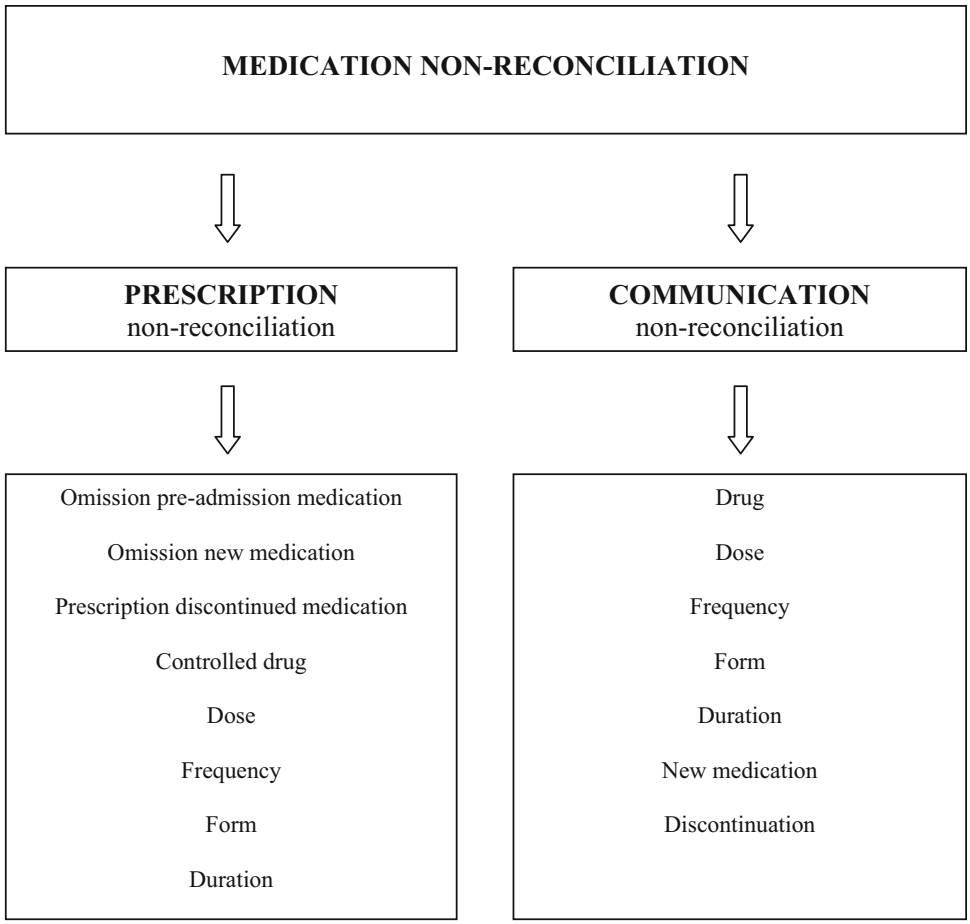

Fig. 1 Categories of medication non-reconciliation

Prescription non-reconciliation

Prescription non-reconciliations reflect non-reconciliations which arise from the manual prescribing task of prescription writing, and prevent that prescription item being accurately dispensed by the community pharmacist. These non-reconciliations were further sub-categorised:

- *Omission pre-admission medication*: medication patient was taking prior to admission to hospital, not charted on discharge prescription, with no known explanation for its omission.
- *Omission new medication*: medication patient was commenced on during inpatient stay, not charted on discharge prescription, with no known explanation for its omission.
- *Prescription discontinued medication*: medication patient taking prior to admission to hospital/commenced on during inpatient stay that was subsequently stopped, and then included on their discharge prescription, with no known explanation for its inclusion.
- *CD non-reconciliation*: Prescription of a CD which did not meet all the appropriate legal and clinical prescription requirements.
- *Dose non-reconciliation*: Prescription of a non-CD which lacked sufficient details with regard to its dose to allow the community pharmacist to accurately dispense the medication.
- *Frequency non-reconciliation*: Prescription of a non-CD which lacked sufficient details with regard to its frequency to allow the community pharmacist to accurately dispense the medication.
- *Form non-reconciliation*: Prescription of a non-CD which lacked sufficient details with regard to its form to allow the community pharmacist to accurately dispense the medication.
- *Duration non-reconciliation*: Prescription of a non-CD which lacked sufficient details with regard to its duration to allow the community pharmacist to accurately dispense the medication.
- *Other non-reconciliation*: Any other anomaly relating to the prescription of medicines not categorised in the above categories.

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Communication non-reconciliation

Communication non-reconciliations relate to instances where the provision of further information by the prescriber, in the "communication box" section of the discharge prescription, could potentially enhance the patient's on-going care at primary care level if it had been provided. These non-reconciliations do not preclude accurate dispensing of the prescribed item by the community pharmacist. Communication non-reconciliations were sub-categorised:

- *Drug non-reconciliation*: "As required" medication patient taking prior to admission to hospital not charted on discharge prescription, with no likely explanation for its omission. Unintentional nature of discrepancy confirmed with prescriber. Information communicated by pharmacist. Prescriber not asked to amend prescription.
- *Dose non-reconciliation*: medication charted on discharge prescription without provision of supplementary information about dose change which had potential to affect external HCPs provision of on-going patient care.
- *Frequency non-reconciliation*: "As required" medication patient taking prior to admission to hospital charted as regular medication on discharge prescription, with no likely explanation for its increased frequency. Unintentional nature of discrepancy confirmed with prescriber. Information communicated by pharmacist. Prescriber not asked to amend prescription.
- *Form non-reconciliation*: medication charted on discharge prescription without the provision of supplementary information about the form which had potential to affect external HCPs provision of on-going patient care.
- *Duration non-reconciliation*: medication charted on discharge prescription without the provision of sufficient information about duration, which had potential to affect external HCPs provision of on-going patient care.
- *New medication non-reconciliation*: medication commenced during inpatient stay, without the provision of information at discharge about the indication for its initiation.
- *Discontinuation non-reconciliation*: medication patient taking prior to admission to hospital stopped during their inpatient stay, without the provision of information at discharge about the reason for its discontinuation.

Non-consultant hospital doctor

NCHD is a term specific to the Irish setting, describing doctors undergoing post-graduate training who have not yet reached the rank of hospital consultant.

Outcome measures

- Number, type and acceptance of interventions made by the clinical pharmacist in the resolution of discharge medication non-reconciliations.
- Number of discharge medication non-reconciliations requiring specific input of the hospital doctor.

Data collection

Data collection took place over a 6 week period and was collected from patients who had been admitted under the care of a general medicine or general surgical consultant. Data was collected during the provision of discharge medication reconciliation by the clinical pharmacist, once the patient's discharge documentation was completed by the NCHD.

While data collection was ongoing, the exact nature of the study, the data collection process, and the data collection period were not disclosed to staff at NGH, to minimise reactive bias [17]. The patient's discharge prescription was compared to the pharmacist compiled GSDML. The patient's inpatient medication prescription chart, medical notes and discharge prescription were reviewed to clarify discrepancies as necessary. Persisting discrepancies were communicated verbally to the NCHD, and documented in the patient's medical notes as appropriate. The pharmacist and/or the NCHD resolved the discrepancies according to predetermined guidelines.

Data analysis

A password protected database was established. Data were coded and entered into SPSS® version 18 for windows for analysis. Data cleaning, including range and consistency check, was performed and frequencies were run for all variables to identify outlying data prior to initiation of data analysis. Descriptive statistics were calculated to represent process and patient outcome measures. Associations between categorical data were examined using the Chi square test (p value <0.05).

Results

Study population

The discharge prescriptions of 224 patients were included in the study. The majority of patients (79.5 %, $n = 178$) were under the care of a medical consultant. Characteristics of the study population are shown in Table 1.

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Table 1 Characteristics of the study population

Median age (years)	71 (17–93)
Male patients (%, *n*)	42 %, 94
Median number admissions in previous year	1 (1–15)
Median number co-morbidities	3 (1–13)
Median number medications	9 (3–26)
Median length hospital stay (days)	7 (1–200)

Discharge prescriptions

The 224 discharge prescriptions reviewed in the study, involved 2,245 medications. An overview of the discharge prescriptions is shown in Table 2.

Number of medication non-reconciliations at discharge

A prescription non-reconciliation was identified on 62.5 % ($n = 140$) of prescriptions and for 15.8 % ($n = 355$) of medications. The total number of non-reconciliations per prescription ranged from 1 to 14, and the median was 1. The discharging consultant (i.e. group of NCHD assigned to a consultant at the time of the study, and responsible for writing the discharge prescriptions for that consultant's patients) was identified as a decisive factor in identifying at least one prescription non-reconciliation on a patient's discharge prescription (χ^2 (10) = 18.58, $p < 0.05$).

A communication non-reconciliation was identified on 92 % ($n = 206$) of prescriptions and for 45.8 % ($n = 1{,}029$) medications. The total number of non-reconciliations per prescription ranged from 1 to 16, and the median was 4. A communication non-reconciliation was more likely to occur on the prescription of patients discharged on a Thursday than any other day (χ^2 (4) = 12.93, $p < 0.05$). Thursday was identified in the study as the day on which the majority of patients were discharged from NGH (26.8 %, $n = 60$), and the prescription writing workload of the NCHD was therefore potentially greatest.

Type of medication non-reconciliations at discharge

Omission of preadmission medications accounted for the majority of prescription non-reconciliations (76.6 %, $n = 272$). Over half of these omissions related to regular medications (54 %, $n = 147$), 45.6 % ($n = 124$) related to '*when required*' medications and 0.4 % ($n = 1$) related to a short course of treatment. Other prescription non-reconciliations accounted for a relatively small number of medications (Fig. 2).

The type of communication non-reconciliations identified are summarised in Fig. 3.

New medication was the most common type of communication non-reconciliation (58.5 %, $n = 602$). Drug and discontinuation non-reconciliations were also significant at 20.9 % ($n = 215$) and 14.0 % ($n = 144$) respectively.

Table 2 Overview of discharge prescriptions

Written by intern (%, *n*)	11.2 %, 25
Written by senior house officer (%, *n*)	84.8 %, 190
Written by registrar (%, *n*)	4 %, 9
Signed (%, *n*)	98.7 %, 221
Dated (%, *n*)	97.3 %, 218
Allergy status documented (%, *n*)	64.3 %, 144
Mean time pharmacist review discharge prescription (min)	6.34 (5–30)
Most commonly prescribed medications (per BNF chapter [19])	
Cardiovascular (%, *n*)	60.2 %, 678
Central nervous system (%, *n*)	22.1 %, 497
Gastrointestinal (%, *n*)	12.8 %, 287
Most commonly prescribed medications (per class)	
Proton pump inhibitors (%, *n*)	7.48 %, 168
Antiplatelets (%, *n*)	5.97 %, 134
Non-opioid analgesics (%, *n*)	5.66 %, 127
Medications prescribed at discharge	
Preadmission (%, *n*)	71.6 %, 1,608
New (%, *n*)	28.4 %, 637
Controlled drugs (%, *n*)	1.3 %, 29
Controlled drug legal requirements observed per prescription	19 %, 4

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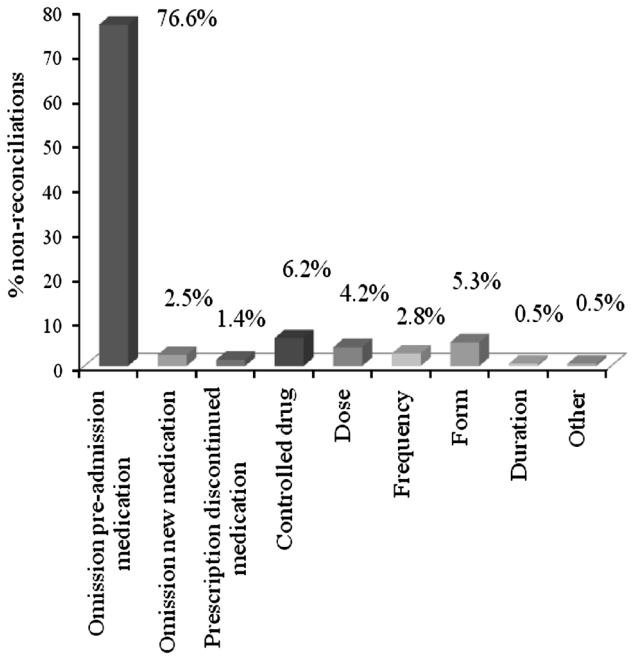

Fig. 2 Type of prescription non-reconciliations

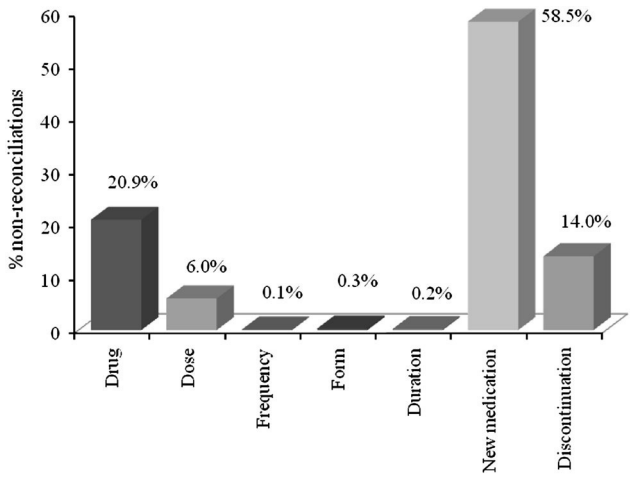

Fig. 3 Type of communication non-reconciliations

Acceptance of interventions by clinical pharmacist

All interventions made by the clinical pharmacist in the resolution of discharge medication non-reconciliations were accepted by the NCHDs. Due to the time-consuming practicalities involved, all prescription non-reconciliations relating to "as required" medications were confirmed with the prescriber to be unintentional in nature, this information was communicated by the pharmacist via the prescription "communication box", but the prescriber was not asked to amend the prescription. This is reflected in the results which show prescription non-reconciliations were

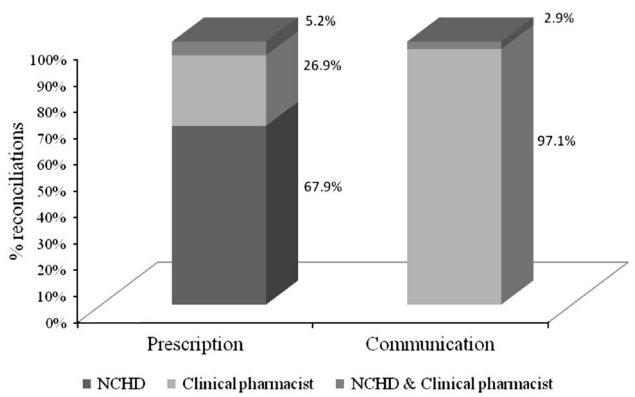

Fig. 4 Resolution of medication non-reconciliations

fully resolved on 55.7 % ($n = 78$) of prescriptions prior to discharge. All communication non-reconciliations were resolved prior to discharge; 97.1 % ($n = 200$) by the pharmacist, and 2.9 % ($n = 6$) by both NCHD and pharmacist (Fig. 4). The pharmacist has a significant role to play in the communication of information at discharge.

Number of medication non-reconciliations requiring NCHD input

While a pharmacist led medication reconciliation service is described in this research paper, the crucial contribution of the hospital doctor is demonstrated by the finding that prescription non-reconciliations were fully resolved on 55.7 % ($n = 78$) of prescriptions prior to discharge. 67.9 % ($n = 53$) of these required the input of a NCHD, 26.9 % ($n = 21$) were addressed by the clinical pharmacist, and 5.2 % ($n = 4$) required the joint input of NCHD and pharmacist. While the pharmacist has a limited role in clarifying or expanding on the prescribing instructions of the doctor, the doctor retains the legal prescribing responsibility.

Discussion

This study demonstrates how interdisciplinary collaboration has the potential to contribute to the delivery of a discharge medication reconciliation service at an Irish hospital. The findings relating to the number and nature of medication non-reconciliations are comparable to those of Irish and international literature [7, 13, 14, 20]. A measure is provided of the demand for a discharge medication reconciliation service since a discrepancy between the patient's GSDML and discharge prescription, which required intervention, was demonstrated for almost all patients included in the study. The medication non-reconciliation service provided by the clinical pharmacist has led

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to the identification of a significant number of non-reconciliations that would have gone undetected has the usual standard of care been implemented. Investigation of the relative contributions of the clinical pharmacist and NCHD to the resolution of these non-reconciliations is a novel aspect of this research and as such is not directly comparable to other studies in the field.

Substantial changes to patient's medications during their inpatient stay and a clear absence of complete and accurate information about many of these changes at discharge has been demonstrated in this study, as is widely documented in research literature [13, 21, 22]. Through review of discharge prescriptions, the clinical Pharmacist identified prescription non-reconciliations on 62.5 % of prescriptions and for 15.8 % of medications, and communication non-reconciliations on 92 % of prescriptions and for 45.8 % of medications. Without the input of the clinical pharmacist, these non-reconciliations would have gone unaccounted for at discharge. The most common type of prescription non-reconciliation was omission of preadmission medications. Errors relating to medications made at admission to hospital are carried on throughout the inpatient stay and beyond the point of discharge, consistent with research in other settings [14, 23, 24]. Failure to complete admission medication reconciliation in the first instance, and later discharge medication reconciliation, perpetuates these errors. Neglecting to communicate information regarding new or discontinued medications accounted for the majority of communication non-reconciliations. Poor communication between primary and secondary HCPs is not a new phenomenon, and reliable exchange of information remains a challenge in both directions. Doctors sometimes omit details from prescriptions at hospital discharge which they think another HCP will '*work out for themselves*', particularly when their workload is high [25]. However, lack of explicit communication about changes to medications during an inpatient hospital stay can potentially lead to continuation of inappropriate medications, inadvertent discontinuation of appropriate medications, treatment failure and early hospital readmission [21, 26, 27].

The feasibility of an interdisciplinary team approach to discharge medication reconciliation has been clearly demonstrated in this study. The clinical pharmacist contributed to the identification of medication non-reconciliations, but prescription of medications is not within their scope of practice. The crucial role of the NCHD is evident since the NCHD remains the legal prescriber of medications at hospital discharge in Ireland [28]. Additionally, the pharmacist can contribute to the transfer of clear, precise and comprehensive information to the primary care HCP, to supplement the prescribing instructions of the doctor. The study demonstrates that through collaborative, interprofessional working relationships the NCHD and pharmacists can combine their knowledge and skills to produce a more complete and accurate discharge prescription than the input of the doctor alone, which is the current standard of care at NGH. This is one of the first published studies in the Irish setting to establish how the provision of an interdisciplinary approach to a discharge medication reconciliation service can contribute to medicines management. The methodological approach and findings are generalisable to medical and surgical patients in the acute hospital setting, and provide an evidence base for adherence to the principle that decision making must be governed by high quality evidence [1]. However, the findings are limited by the use of non-probability consecutive sampling. Medication non-reconciliations require input in a timely fashion to ensure continuity of patient care. Random sampling is the preferred method to ensure representative sample selection, but was not employed in this study since a full list of patients for discharge could only be obtained retrospectively. Consecutive sampling offered a pragmatic means to select patients, but limits the external validity of the findings. The study was powered at the outset to produce statistically significant findings. The reported statistical significance and the demonstrated clinical effects indicate the important, real effects of medication reconciliation at a clinical level. Furthermore, data was collected exclusively by the researcher, using specifically designed, validated and piloted data collection tools, thus ensuring a systematic and consistent approach and minimising observer bias.

The finding that omission of preadmission medications was the most common prescription non-reconciliation indicates the need for stringent medication management strategies at hospital admission as well as discharge. Almost half of these omissions related to '*when required*' medications; often judged to be of lesser importance, particularly since the patient may not be actively using them at the time of admission or during their hospital stay. A potential barrier to the prescription of a complete and accurate medication list may be the high transcription burden associated with the hand-written prescription process, which NCHDs often perceive as a labour intensive, manual, transcription task rather than complex prescribing [29]. At all points of transfer of care, the patient's medication list should reflect all of the medications the patient is using on an on-going basis. Further studies should investigate the potential benefit of a computerised application to facilitate electronic medication reconciliation and enhance prescription accuracy. Electronic systems are generally associated with more accurate information, fewer medication non-reconciliations, and facilitate easier retrieval of information [24, 30]. As well as reducing the transcription burden for doctors, an electronic system would facilitate

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reconciliation between the PAML and DML, and readily identify any changes to the patient's medications prior to discharge. The value of delivering such a service to patients at primary care level in the Irish setting should be investigated.

Conclusion

Interdisciplinary collaboration, between the clinical pharmacist and NCHD, can improve the completeness and accuracy of discharge prescriptions through the provision of a pharmacist led discharge medication reconciliation service. This alliance should be optimised to deliver this service in Irish hospitals.

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Conflicts of interest The author declares no conflicts of interest.

References

1. Madden D. Building a culture of patient safety. Report of the commission on patient safety and quality assurance. Department of Health, Ireland; 2008.
2. Royal College of NCHDs of Ireland/Irish Association of Directors of Nursing and Midwifery/Therapy Professions Committee/Quality and Clinical Care Directorate, Health Service Executive. Report of the National Acute Medicine Programme 2010 (internet). http://www.hse.ie/eng/services/Publications/Hospitals/AMP.pdf.
3. National Prescribing Centre. medicines reconciliation: a guide to implementation. Good practice guide, 5 min guides; 2008.
4. Institute for Healthcare Improvement. How-to guide: prevent adverse drug events by implementing medication reconciliation (internet). http://www.ihi.org/resources/Pages/Tools/HowtoGuidePreventAdverseDrugEvents.aspx.
5. Rozich DJ, Howard RJ, Justeson JM, Macken PD, Lindsay ME, Resar RK. Patient safety standardisation as a mechanism to improve safety in healthcare. Jt Comm J Qual Saf. 2004;30(1):5–14.
6. Gleason KM, Groszek JM, Sullivan C, Rooney D, Barnard C, Noskin GA. Reconciliation of discrepancies in medication histories and admission orders of newly hospitalised patients. Am J Health Syst Pharm. 2004;61(16):1689–95.
7. Vira T, Colquhoun M, Etchells E. Reconcilable differences: correcting medication errors at hospital admission and discharge. Qual Saf Health Care. 2006;15:122–6.
8. Scullin C, Scott MG, Hogg A, McElnay J. An innovative approach to integrated medicines management. J Eval Clin Pract. 2007;13(5):781–8.
9. Murphy EM, Oxencis CJ, Klauck JA, Meyer DA, Zimmerman JM. Medication reconciliation at an academic medical centre: implementation of a comprehensive program from admission to discharge. Am J Health Syst Pharm. 2009;1(66):2126–31.
10. Greenwald JL, Halasyamani L, Greene J, LaCivita C, Stucky E, Benjamin B, et al. Making inpatient medication reconciliation patient centred, clinically relevant and implementable: a consensus statement on key principles and necessary first steps. J Hosp Med. 2010;5:477–85.
11. National Institute for Health and Clinical Excellence/National Patient Safety Agency. Technical patient safety solutions for medicines reconciliation on admission of adults to hospital. PSG001; 2007.
12. Kripalani S, Jackson AT, Schnipper JL, Coleman EA. Promoting effective transitions of care at hospital discharge: a review of key issues for hospitalists. J Hosp Med. 2007;2007(2):314–23.
13. Grimes TC, Duggan CA, Delaney TP, Graham IM, Conlon KC, Deasy E, et al. Medication details documented on hospital discharge: cross-sectional observational study of factors associated with medication non-reconciliation. Br J Clin Pharmacol. 2011;71(3):449–57.
14. Wong JD, Bajcar JM, Wong GG, Alibhai SMH, Huh JH, Cesta A, et al. Medication reconciliation at hospital discharge: evaluating discrepancies. Ann Pharmacother. 2008;42(10):1373–9.
15. Bolas H, Brookes K, Scott M, McElnay J. Evaluation of a hospital-based community liaison pharmacy service in Northern Ireland. Pharm World Sci. 2004;26(2):114–20.
16. Zemke R, Kramlinger T. Figuring things out: A trainer's guide to needs and task analysis. Reading: Addison-Wesley Publishing; 1986.
17. Bowling A. Research methods in health: investigating health and health services. 3rd ed. Berkshire: Open University Press; 2009.
18. Fitzsimons M, Grimes T, Galvin M. Sources of preadmission medication information: observational study of accuracy and availability. Int J Pharm Pract. 2011;19(6):408–16.
19. British Medical Journal/Royal Pharmaceutical Society of Great Britain. British national formulary 62. London: BMJ Group & RPS Publishing; 2011.
20. McMillen TE, Allan W, Black PN. Accuracy of information on medicines in hospital discharge summaries. Intern Med J. 2006;36:221–5.
21. Wilcock M, Lawrence J. Medication at discharge: is enough information provided? Med Manag. 2008;5:19–22.
22. Glintborg B, Anderson SE, Dalhoff K. Insufficient communication about medication use at the interface between hospital and primary care. Qual Saf Health Care. 2006;16:34–9.
23. Tam VC, Knowles SR, Cornish PL, Fine N, Marchesano R, Etchells EE. Frequency, type and clinical importance of medication history errors at admission to hospital: a systematic review. Can Med Assoc J. 2005;173(5):510–5.
24. Grimes TC, Duggan CA, Delaney TP. Pharmacy services at admission and discharge in adult, acute public hospitals in Ireland. Int J Pharm Pract. 2010;18(6):346–52.
25. Tully MP, Cantrill J. What hospital doctors think GPs need in a discharge summary? Conference of the European society of general practice/family medicine. Wonca Region Europe, Finland; 2001.
26. Witherington EMA, Pirzada OM, Avery AJ. Communicating gaps and readmission to hospital for patients aged 75 years and older: observational study. Qual Saf Health Care. 2008;17:71–5.
27. Moore C, Wisnivesky J, Williams S, McGinn T. Medical errors related to discontinuity of care from an inpatient to an outpatient setting. J Gen Intern Med. 2003;18:646–51.
28. Medical Council. Guide to professional conduct and ethics for registered medical practitioners (internet). http://www.medicalcouncil.ie/News-and-Publications/Publications/Professional-

Journal : Large 11096 | Dispatch : 31-12-2014 | Pages : 10
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MS Code : IJCP-D-14-00083 | CP | DISK

Conduct-Ethics/Guide-to-Professional-Conduct-and-Behaviour-for-Registered-Medical-Practitioners-pdf.pdf.

29. Dean B, Schachter M, Vincent C, Barber B. Causes of prescribing errors in hospital in-patients: a prospective study. Lancet. 2002;359(9315):1373–8.

30. Barnsteiner JH. Medication Reconciliation. In: Hughes RG, editor. Patient safety and quality: an evidence based handbook for nurses. Rockville: Agency for Healthcare Research and Quality; 2008.

Journal : Large 11096 | Dispatch : 31-12-2014 | Pages : 10
Article No. : 59 | ☐ LE | ☐ TYPESET
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