Impact of an integrated medicines management service on preventable medicines-related readmission to hospital: a descriptive study

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ABSTRACT

Background Medication contributes to 5–20% of hospital admissions, of which half are considered preventable. An integrated medicines management service (IMMS) was developed at a large general hospital in London to identify and manage patients at risk of a preventable medicines-related readmission (PMRR) to reduce the risk of PMRR.

Objective To investigate the effect of the pharmacy IMMS on the rate of PMRR within 30 days of the first discharge.

Method 744 patients were identified between October 2008 and October 2014, using the PREVENT tool. Patients at risk were managed by the IMMS with medication reconciliation, review, consultation and follow-up, as required.

Results Of 744 patients, 119 were readmitted within 30 days of discharge, with a PMRR for 2 patients (1.7%). The main reason for referral to the service was to assess the need to start a compliance aid. Most interventions involved communication: 84% included patient consultations with 50% involving discussion with the patient's community pharmacist and 32% with their general practitioner surgery.

Conclusions An IMMS may be an effective method of reducing the rate of PMRR. Further work is needed to establish the cost-effectiveness of the service.

INTRODUCTION

The National Audit Office emergency admission report stated that there were 5.3 million emergency admissions to hospital in England between 2012 and 2013, costing about £12.5 billion.¹ Hospitals will now face financial penalties if patients are readmitted as an emergency within 30 days of being discharged. Therefore in England this is a key quality outcome measure for hospital services.² Local data indicate a readmission rate of 6.4% at our hospital (personal communication, Rob Hurley. Contracts information manager, London North West Hospital Trust. February 2015).

Hospital admissions and readmissions have been linked to adverse reactions to medication for between approximately 6% and 21% of patients, with up to half being considered preventable.^{3–4} Factors that influence preventable medicines-related admissions and readmissions include specific high-risk medication, non-adherence to medication and lack of monitoring.^{5–6} Poor communication at care transitions is also a key factor.^{7–8} Data on predictive tools to enable the targeting of patients at high risk

of readmission have been published, but there is no nationally accepted method at present.^{9–11} We have devised a referral tool PREVENT (online supplementary appendix) which identifies key factors, which if not managed could influence a preventable medicine-related readmission (PMRR).^{3–8}

An integrated medicines management service (IMMS) has been described as one method of reducing PMRR. In 2006 Schnipper *et al* conducted a randomised trial of 178 patients discharged from a teaching hospital in the USA. The study showed reduced adverse drug events at 30 days after discharge when patients received full medicines support, including medicines reconciliation, help with adherence, discharge medicines review and a follow-up phone call by the community pharmacist.¹² Similarly, in 2007, Scullin *et al*¹³ conducted a randomised controlled trial in a Northern Ireland general hospital of a medicines management service which included interventions at admission, while inpatients, and at discharge this demonstrated an increase in time to readmission, fewer readmissions and shorter inpatient stays. This, in turn, helped to reduce cost in comparison with standard care, mainly owing to avoidance of readmissions.

Gillespie *et al*¹⁴ in Sweden demonstrated a reduction in overall hospital readmission and emergency room visits with a significant decrease in drug-related admissions with IMMS, and Hellström *et al*¹⁵ reported similar benefit in relation to drug-related admissions and readmission reductions.

The IMMS was introduced in 2008 to a 658 bedded district general hospital. The team comprised one whole time equivalent experienced pharmacist (provided by two half time pharmacists) and was supervised by a consultant pharmacist (for older people); the service was provided during weekday working hours. A service policy and procedure was developed and the key components of IMMS were:

- medicines reconciliation on admission;
- medicine optimisation—for example, stopping or starting medicines, titrating medicines to clinically effective doses;
- patient-centred medicines consultations, including discussion of newly prescribed, stopped and changed medicines (all members of the team received formal training in health coaching during 2014);
- full documentation of changes to medicines and monitoring required on the discharge notification sent to general practitioners and/or pharmacies;

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Figure 1 Bar chart showing the reasons for readmission within 30 days of discharge for 119 patients. Note some patients had more than one reason for readmission.

- ▶ medicines-related discharge planning with patients, carers, health and social care teams in primary and secondary care, including medicines compliance aid assessment where appropriate and medication counselling;
- ▶ pre-discharge referral to primary care health and social care professionals as well as carers, where necessary, including referrals to community pharmacists to undertake community medication review services, where appropriate;
- ▶ post-discharge telephone follow-up with patient and/or carers to support medicines-related care.

OBJECTIVE

To describe the effect of IMMS on PMRR within 30 days of the first discharge.

METHOD

All pharmacy staff were trained on the PREVENT referral tool used to identify patients at risk of a PMRR on their induction to the trust.

Patients meeting the referral criteria for a PMRR from any ward were referred to, and managed by, the IMMS team, following the standard operating procedure outlined above. Patients who had risks not modifiable by the pharmacy were referred to the appropriate service.

Retrospective data were collected on the 744 patients referred to the IMMS between October 2008 and October 2014. Full-year data were available from October 2008 to March 2010, followed by non-randomised samples of data thereafter owing to information technology problems.

30-Day readmission data were obtained from the trust for the periods studied using the hospital admissions programme. The electronic discharge summary was reviewed for those patients who were readmitted as an emergency (excluding elective and accident and emergency visits with no admission) by two senior members of the IMMS pharmacy team. The reason for readmission was classified as clinical, social and medicines related and as preventable or non-preventable. A patient might have had more than one classification for readmission (see online supplementary appendix 1).

All medicine-related hospital readmissions were then peer reviewed by a consultant geriatrician not involved in the service and blinded to the cause of readmission as identified by the pharmacist. The consultant geriatrician also classified the cause of readmission as clinical, social or medicine-related and as preventable or non-preventable.

In addition the consultant geriatrician reviewed a sample (1 in 10) of all patients readmitted and classified them according to the same criteria.

A flow chart to illustrate hospital data collection is presented in the online supplementary appendix.

The study was assessed by the Trust Governance Committee and was deemed to be service improvement and did not need ethical approval.

RESULTS

The patient's age was only available for 557/744 patients owing to a change in information technology in the early part of the service. Of the 557 patients seen, 78% were aged over 70 years and taking seven to nine medicines (mode) after IMMS review.

Readmissions

Seven hundred and forty-four patients were seen by the IMMS team, of whom 119 (16%) were readmitted within 30 days of discharge, with two of the 119 (1.7%) readmissions being identified as a PMRR (figure 1).

Referrals

The main reason for referral to the service was to assess the need to start a compliance aid (figure 2).

Interventions

Most interventions involved communication: 84% included patient consultations, with 50% involving discussion with the patient's community pharmacist and 32% with their general practitioner (GP) surgery (figure 3). Common themes of discussion included highlighting ongoing medication concerns and describing interventions made during admission as well as recommendations for follow-up by the community pharmacist.

Cost

The cost of providing the service was £49 974 a year.

The majority of patients (>95%) seen by IMMS are older people and the average length of stay on care of older people wards is 19 days at a cost of £444/day (non-elective emergency

Figure 2 A bar chart to compare the reason for referrals via the PREVENT checklist to the integrated medicines management services (IMMS) team. Note some patients had more than one reason for referral.

Figure 3 Interventions by integrated medicines management services (IMMS) pharmacy staff.

admission). One preventable medicines-related admission therefore potentially costs $\pounds 444 \times 19 \text{ days} = \pounds 8436$.

DISCUSSION

Based on the fact that approximately 5–20% of hospital admissions are considered to be medicines related, of which half are considered preventable, extrapolation would suggest that we might have expected between 18 (2.4%) and 74 (10%) patients to have been readmitted with a PMRR during the evaluation period. Our observation was that while providing IMMS during this period the number of PMRR was 2/744 (0.3%)

It is estimated that an average IMMS-completed patient episode takes 4 hours and we would expect one whole time equivalent pharmacist (46 weeks/year) to see 460 patients annually. On the basis of the readmission rates found in this study, for every 460 patients we would expect only one patient to be a PMRR.

This finding is in line, but with a lower return on investment, with data reported from other IMMS sites, where savings calculated including opportunity costs suggested a return of between $\pounds 5$ and $\pounds 8$ for every $\pounds 1$ spent on service provision.¹⁶ Reasons may be that other studies included costs associated with admission and outside hospital costs, rather than the cost of staff alone and readmissions were assessed over a longer period.

Previous studies have described a service of this type. For example, Scullin *et al*¹³ provided an IMMS to hospitalised patients aged over 65 years who were taking at least four regular medicines, had a high-risk medicine and had had a hospital admission within the previous 6 months. Interventions were similar, including medicines reconciliation, patient consultation and transfer of care communication on discharge. For every 12 patients receiving the service, one readmission was prevented. Variations of this service now exist in Europe and Scandinavia and our data are consistent with results from IMMS in other centres, supporting generalisability across centres.^{14 15} The descriptive data given here concur with findings from these other centres. A pilot study of this service, compared with a control site, has been published in abstract form elsewhere.¹⁷

Quality and safety of service

The Royal Pharmaceutical Society from 2013 provides guidance on medicines optimisation and transfer of care to

improve patient safety and quality of care.¹⁸ A large part of IMMS is to optimise the medication with the prescriber and patient to reduce polypharmacy while still remaining clinically effective.

The pharmacists providing IMMS identify and manage a large number of problems that can contribute to preventable medicines-related admissions and readmissions. Given that patients are often prescribed new medicines on discharge from hospital, it is not surprising to find that there are medication problems, such as concerns about the benefits and risks of these new medicines, as well as problems with the management of, and adherence to, medicines.¹⁹ The IMMS team at the annotated discharge provided notifications to highlight medication changes and recommendations to facilitate safe transfer of care. They also provided medication counselling before discharge.

Interventions: medicines adherence

It is estimated between 33% and 50% of all medicines prescribed for long-term conditions are not taken as recommended. This can lead to treatment failure and, ultimately, exacerbation of the condition and admission to hospital.⁶ Our data showed that medication compliance aids were initiated for 36% of patients and these interventions were often combined with other strategies to support medication usage. Where the compliance aid was for use by the patient or informal carer, patient consultations often involved patients' health and medication beliefs, and educating the patient/carer about prescribed medicines, including indication, side effects and the necessary monitoring and follow-up required.

The IMMS pharmacists provide coaching to support medicines adherence, which follows National Institute of Health and Care Excellence (NICE) adherence guidance recommendations.⁶

INTERVENTIONS: CROSS-SECTOR COMMUNICATION

Communication between the health and social care team across the care interface is a key factor in minimising risks associated with medicines management.^{7 8 20} Common interventions centred on communication with the patient, community pharmacist and GP. Studies have shown that referral to community pharmacists after discharge as part of the medicines optimisation process significantly reduce readmission rates, with a two-thirds reduction in bed days and a 50% reduction in length of stay (personal communication, Rachel Howard. Isle of Wight

Medicines optimisation in vulnerable patients project. January 2015). Discussion with social care was an important feature of the service for some as patients with complex social needs requiring assistance with washing and dressing may also require assistance with medication^{8 21}; this is reflected in other recently published work.^{22 23} Lai *et al*²² describe a cross-sector service identifying patient needs for medication support. They note that many health professionals refer patients for compliance aids when alternative and bespoke support is required and this was commonly found by the IMMS team.

Within the hospital, the IMMS team worked with the medical and nursing team to discuss the appropriateness of medication and optimising therapy and with the social care team to discuss how medicines might be incorporated into the patient's package of care. Within the primary care sector, the team communicated with the GP surgery, sending a detailed electronic discharge summary, including information on the medicines support aids initiated in hospital and medication changes and recommendations. Telephone calls after discharge were targeted at those patients/carers who requested follow-up or where the pharmacist deemed that an additional consultation was required to ensure that the patient was managing at home after intervention. This approach is in line with work by Garcia-Caballeros *et al*,¹⁹ who conducted a review of drug-related problems in older people after hospital discharge and found that the most effective interventions in reducing drug-related problems should focus on a combination of discharge planning and home follow-up.

Studies have shown that post-discharge follow-up helps to promote patient satisfaction^{22 24} and reduce admission to hospital.^{25–28} In this study the community pharmacist was contacted to support adherence and provide community pharmacy medication services as appropriate.

Data from this study suggest that, in line with findings from other studies, causes of readmission are multifaceted, emphasising the need for multidisciplinary involvement of medicines management services in reducing overall readmissions to hospital. The pharmacists who delivered IMMS, while being experienced hospital pharmacists, used generic skills of good pharmaceutical care and medicines optimisation to deliver the service. The multidisciplinary links made by IMMS are part of the usual National Health Service hospital and primary care set up in the UK. These have important implications for generalisability: a number of other similar services have also shown various benefits of IMMS-style support.^{13–15 22 23} This study, demonstrated the financial and patient benefits of the service and adds weight to the suggestion that IMMS-style support should become more widely available to hospitalised patients to reduce risk of PMRR within 30 days of hospital discharge. Future local work will include using admission coding to identify patients at risk, exploring patient experience and collaboration with other centres to deliver equitable services across the UK.

Limitations/bias

As the service has developed over a number of years and many aspects of healthcare provision have changed, patients receiving the service at the start might have received different care between 2008 and 2014. Our service has developed in response to these changes—for example, NICE medicines adherence guidance, Royal Pharmaceutical Society medicines optimisation guidance and provision of a health coaching training course for IMMS pharmacists in 2014.

While national data describe avoidable medicines-related admissions, it was not possible to find any reports on methods

of reducing PMRR. It is recognised in this work that the data gathered were not continuous owing to information technology problems with data collection and recording. Also, the number of patients in the first year of service might have been lower as the service was in its infancy. The use of a standard procedure and forms was adopted to minimise variation in practice; however, the nature of the service is that it provides bespoke care, which limits the potential for standardisation.

We were able to review local readmission data for 2014 and compare them with national data; however, we did not review annual readmission rates for the duration of the study to detect trends in readmission changes.

Data on 30-day readmissions were collected as these were relevant to the local organisation and are widely used in the literature. However, a longer time period might have disclosed more information about PMRR and related costs.

The classification of reasons for referral had a subjective element, which might have been influenced by the experience of the referrer. There is a possibility that the results obtained may underestimate the number of medicine-related readmissions and contribute to an explanation of why these data show a lower return on investment than other studies.

Finally, the PREVENT checklist has not been formally validated to identify patients at risk of preventable medicines-related problems or readmission. Validation of content to date includes a thorough literature review and the content has been validated by peer review and comparison with other tools developed and used separately in the UK.

CONCLUSION

This study focused on the provision of an IMMS to deliver holistic pharmaceutical care, identifying and managing patients at high risk to try to reduce PMRR. Results of this work suggest that an IMMS team may be an effective method of reducing PMRR. Further work is needed to establish the cost-effectiveness of the service.

What this paper adds

What is already known on this subject?

- ▶ Approximately 5–20% of all hospital admissions are medicines related, of which half of are preventable.
- ▶ Integrated medicines management services (IMMS) have been described as one method of dealing with reducing preventable medicines-related readmission (PMRR) and thus cost.
- ▶ Scullin *et al*¹³ provided an IMMS to patients 'at risk' of a PMRR and for every 12 patients receiving the service, one readmission was prevented.

What this study adds

- ▶ This study describes the development and roll out of a locally developed tool to identify patients at risk of PMRR and the effect of an IMMS on readmission rates at 30 days.
- ▶ These results support findings from previous studies suggesting the benefit of such targeted services to help to reduce PMRR.

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