# Implementing an emergency department pharmacy service and its effect on medication safety

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Abstract

Objectives

This service innovation project examined the effect an Emergency Department (ED) pharmacy service had on medication related safety markers.

Methods

A pre-test/post-test design captured medication-related safety markers on admission data at ward level after patients had been seen in the ED. The markers were, medication omitted, incorrect medicines prescribed and the number of incorrect doses or frequency of doses.

Key findings

All three safety markers saw reductions. Mean (SD) medications omitted were reduced from 2.19 (±3.01) to 0.48 (±1.3), incorrect medication from 0.35 (±1.11) to 0.08 (±0.36) and the number of incorrect doses or frequency of doses from 0.38 (±0.69) to 0.13 (±0.38) per patient. All differences were statistically significant (p=0.00).

Conclusions

The service reduced medication error and the findings allowed a permanent pharmacy service to be introduced.

Keywords: emergency department, safety, errors, pharmacy

Introduction

Pressures on Emergency Departments (EDs) are well documented. Medication errors frequently occur in ED, due to its unique operating characteristics[1,2] A variety of methods have been suggested for the identification and reduction of medication errors in ED, but pharmacy has infrequently been highlighted as a solution.[3-4] However, there is emerging international evidence highlighting a growing presence of ED pharmacists where medicine-related activities have shown improved patient outcomes and decreased medication errors.[5-7]

The Lancashire Teaching Hospitals (North West of England), comprising approximately 1000 beds over 2 sites and with over 100, 000 yearly ED attendances identified increasing pressure on the ED service especially in the early evenings (10% of all attendances occurred between 5 and 7.30pm). An ED pharmacy service, consisting of one Pharmacist Independent Prescriber (IP), a Clinical Pharmacist (CP) and a Pharmacy Technician (PT) was put in place at these times between Monday and Friday. This approach differed to previous reported ED pharmacy involvement in that it involved more than just an ED pharmacist. Prior to the service, pharmacy only had a medicine supply function to ED, but with its introduction all duties associated with the patient's medication (other than administration) were provided by the pharmacy team, i.e. medication history confirmation and documentation, medication review, prescribing regular medication and medication ordering.

This initiative was timely, as in May 2018, the independent regulator of health and social care in England, The Care Quality Commission, recognised that alternative solutions to manage increased demand in EDs were needed.[8]

The aim of the initiative was to determine if an ED pharmacy service could contribute to decreasing medication-related error rates.

## Methods

The study ran between October 2017 and June 2018 and adopted a pre-test/post-test design. Firstly, before the service was introduced (October-December 2017) providing baseline data, secondly whilst the service ran (January 2018-April 2018), and lastly, when ED returned to usual operating practice (May-June 2018). As the project was a pragmatic real-life service innovation no specific sample size calculations were determined and data was collected over unequal time periods.

Three patient safety markers which could be routinely collected through normal working practices were selected by the authors based on the Trusts error reporting system and consultation with the medication safety officer for the Trust.

These were: the number of medications omitted; the number of wrongly issued medications; and the number of medicines with the wrong dose or frequency of doses.

Patients attending ED were seen by at least one member of the pharmacy team who performed varying tasks commensurate with their skill set within the wider multi-disciplinary team. For example, the PT conducted medicine histories and ordering, the clinical pharmacist could perform all roles other than prescribing, and the prescribing pharmacist could undertake any role. Where all three were on duty at the same time duties were shared as a team mindful of the best use of skill mix.

However due to the busy and unpredictable ED environment, ED doctors and nurses would sometimes conduct pharmacy service team member roles when no pharmacy

service team member was available (that would revert back to ‘usual care’ when no pharmacy service was present).

Data relating to the chosen safety markers was captured at ward level once ED patients had been admitted by attending ward pharmacists using paper collection forms, and inserted into SPSS 26.0. Bootstrapped paired and independent sample t-tests were performed for statistical comparisons on the medication safety markers. Bootstrapped multivariate analysis was performed for comparisons between pharmacy staff.

Lancashire Teaching Hospitals’ Centre for Health Research and Innovation deemed this a service evaluation (Ref: SE-242) and therefore did not require ethical review. Funding for the project was through a grant from Health Education England North West.

## Results

Data from wards was collected for 73 patients prior to service implementation, 480 patients whilst the service ran and 70 patients after the service ceased. Whilst the service operated a total 72 ED shifts were carried out. Twenty-four shifts comprised the full team (IP+CP+PT); 8 shifts were conducted by an individual IP; a further 8 shifts by a CP; 21 shifts by an IP and a PT; and 11 shifts by a CP and PT.

All three medication safety markers were significantly lower when the pharmacy team operated in the ED. Mean (SD) medication omissions were reduced from 2.19 (±3.01) to 0.48 (±1.3) per patient, incorrect medication from 0.35 (±1.11) to 0.08 (±0.36) per patient, and the number of incorrect doses or frequency of doses from 0.38 (±0.69) to 0.13 (±0.38) per patient. All differences were statistically significant ($p=0.00$).

Figure 1 highlights ward error rates before service introduction, during the service and once ED resumed without the pharmacy service. Note pre and post-service medication safety markers were not found to be significantly different ($p>0.05$).

To see which pharmacy team member had the most impact in reducing medication errors, safety marker rates were compared between team members. Errors identified at ward level showed that the IP pharmacist made the least errors, with 0.27(±0.12) medications omission errors, 0.06(±0.04) incorrect doses/frequency errors and 0.03(±0.03) incorrect medication errors charted per patient, followed by the CP with 0.55(±0.12) medication omission errors, 0.17(±0.04) incorrect doses/frequency errors and 0.07(±0.04) incorrect medication errors charted. Higher error rates were made by the PT, with 0.85(±0.13) medication omission errors, 0.22(±0.04) incorrect doses/frequency errors and 0.18(±0.04) incorrect medications errors charted (Figure

2). The differences between pharmacy team members were statistically significant for each medication error ($p<0.05$).

## Discussion

Results indicate embedding a pharmacy service in to this hospital ED was possible, and reduced medication errors, which increased to pre-pharmacy service levels after the service ceased, suggesting that the effect was real and associated with the pharmacy team. These positive results were deemed successful enough by the Trust to fund a permanent service comprising of 2 IP pharmacists and 2 PT as the best combination of productivity and reducing error rates.

However, we cannot generalise our findings in to other ED environments, but given ED pharmacy services are still relatively new, other organisations who do not offer such a service, could look to replicate this type of study, Our study was limited financially, which meant that all team members were not present for all shifts requiring, at times, ED doctors and nurses had to perform medicines management functions. It was not possible to identify when this occurred and therefore the data is presented as one dataset. Given that baseline data and data gathered after pharmacy service withdrawal saw higher error rates it is reasonable to postulate that the results presented possibly under-report the effect the pharmacy service had. Furthermore, although errors decreased when the pharmacy team was present the study did not capture the nature of error and whether these were different or similar to those made when the pharmacy service did not operate.

These findings are consistent with other studies where medication error rate was reduced when ED pharmacists were present.[9-10] However, in this study, rather than

utilising pharmacists to ‘intervene’ the pharmacy team were responsible for the medicine-related care of the patient. This approach appears to be becoming more prevalent in UK EDs. A 2019 survey showed that more than half of IP pharmacists acted as the designated healthcare provider (i.e. the person with overall clinical responsibility for the patient).[7] However, this survey only considered the IP pharmacist in ED and did not report on other pharmacy team members contribution. Our findings indicated that all members contributed to reductions in error rates, but the level of experience and specialisation of staff appeared to be an important factor of service success, with the IP pharmacist outperforming the CP and the PT and the CP outperforming the PT.

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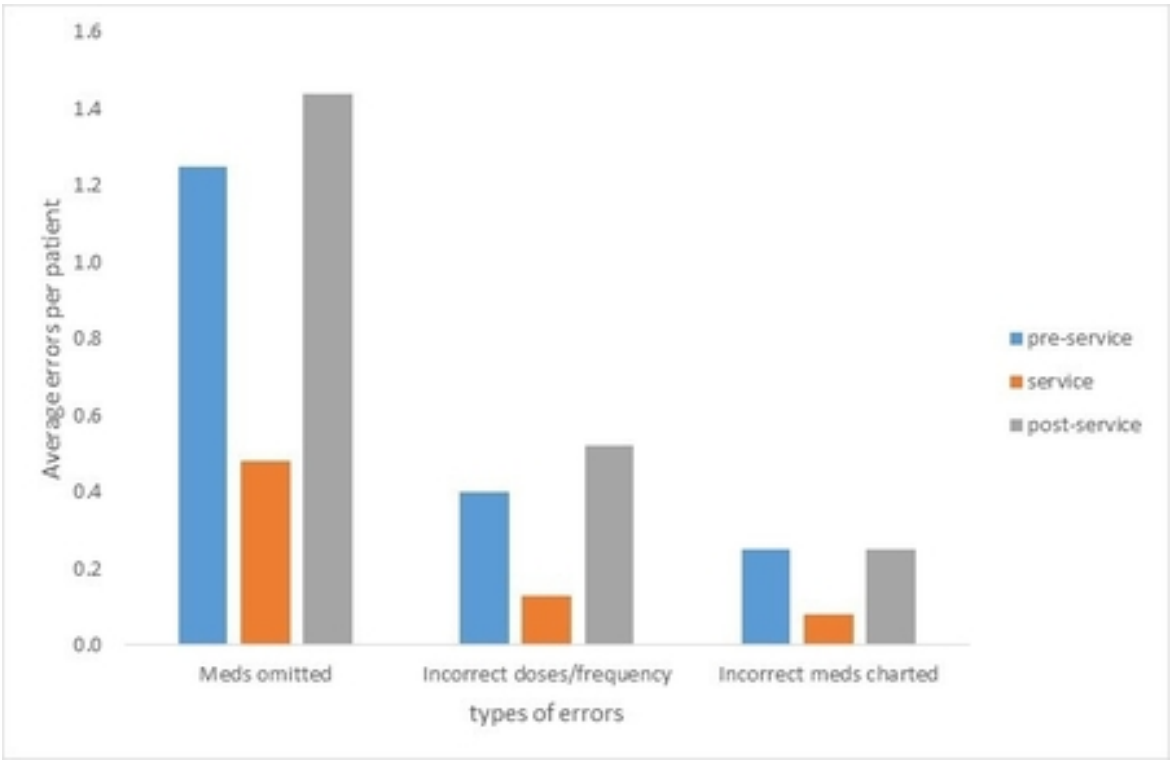
Figure legends

Figure 1 Average prescribing errors made per patient prior to service implementation, whilst the service was running and when the service stopped

Figure 2 Average errors made per patient by the IP, the CP and the PT for each safety marker investigated (IP= Independent Prescriber, CP= Clinical Pharmacist, PT= Pharmacy Technician)


1.6
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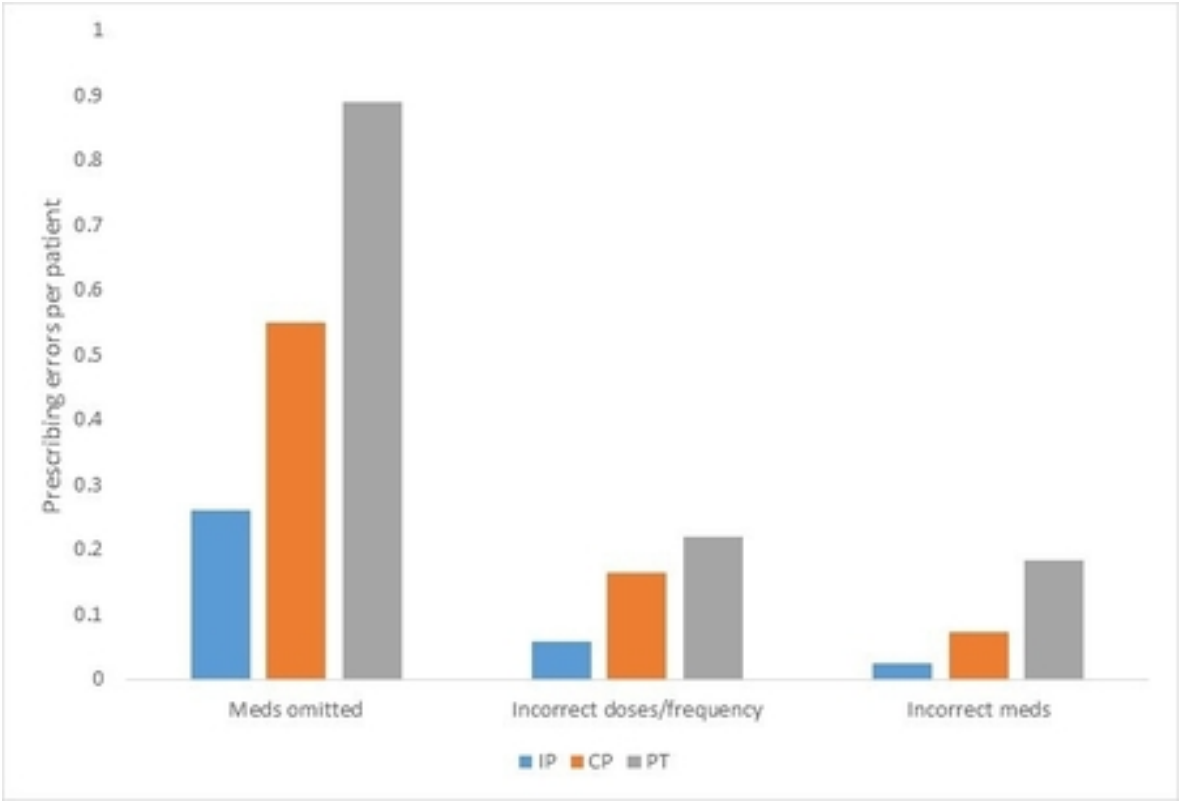
Average errors per patient
pre-service
service
post-service
Meds omitted
Incorrect doses/frequency
Incorrect meds charted
types of errors


1
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Prescribing errors per patient
Meds omitted
Incorrect doses/frequency
Incorrect meds
IP
CP
PT