Using human factors to enhance drug prescribing safety

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ABSTRACT

Preventing harm by ensuring medications are prescribed accurately for patients on admission to hospital is a patent safety priority and one that should be achievable. A human factors systems analysis of the process of medicines reconciliation revealed some possible solutions to reducing drug prescribing errors for patients admitted to a hospital in England. Medicines reconciliation is a process that ensures the medication prescribed for adults in hospital corresponds to pre-admission. It aims to avoid errors such as unintended omissions, over prescribing, dosing errors or adverse drug reactions. Inadequate medicines reconciliation on admission is commonly identified as a major cause of patient morbidity. Poor access to patients' regular medications lists is recognised as a particularly important factor. The System Engineering Initiative for Patient Safety model was used to analyse the barriers to effective medicines reconciliation in adults on admission. This model clearly recognises the interrelated nature of the five major aspects of work systems: people, tasks, tools and technologies, physical environment and organisational conditions. Adopting this approach enabled a broader, more effective analysis of the problem which identified some fundamental issues with the current process and barriers to effective medicines reconciliation which were otherwise unknown. The findings revealed how work system elements interact and the importance of acknowledging this when trying to resolve a problem like improving medicines reconciliation, rather than focusing on the behaviour of individuals. Dissemination of the findings and implementation of the recommendations arising from these also helped the organisation to appreciate the value of human factors in understanding human performance and enhancing safety.

KEYWORDS

Healthcare, prescribing, safety

Introduction

Medication errors pose a significant threat to patient safety in England and Wales, with over 145,000 medication incidents in the National Health Service (NHS) reported for 2014-15 (National Patient Safety Agency, 2017). Evidence suggests that the process of medicines reconciliation (MR) in adults on hospital admission is inadequate both locally and nationally, posing a significant patient safety risk. Prescribing skills of junior doctors need to be addressed, as a study revealed that prescription errors account for 70% of medication errors that could potentially result in adverse effects (Giampaulo et al. 2009). This paper summarises the initial project but focuses on the actions and impact arising from it. For full information on the project itself, see Carling et al (2017).

The problem

Medicines reconciliation is a process that ensures medication prescribed for adults in hospital corresponds to that which they were taking before admission. It aims to avoid errors such as unintended omissions, over prescribing, dosing errors or adverse drug reaction. When conducted as intended MR is a sound patient-centred, inter-professional process that supports effective prescribing and patient safety.

There are two levels to the MR process. Level One is completed by the admitting doctor and requires taking an accurate drug history. Primary sources of this information include accessing the patients' own medication list or drug boxes, General Practitioner (GP) letters, or the GP's electronic Summary Care Record (SCR) using an NHS Smartcard. 100% of the GPs in the local area have uploaded data to the SCR making it an ideal, up-to-date source of information containing key clinical information on medicines, allergies and sensitivities. This is especially useful as patients are often unable to offer an accurate drug history that includes all the details about drug dose and frequency. Level Two of the MR process is carried out by pharmacists who check and verify the accuracy of the drug history against the current prescription chart, identifying any discrepancies which are then resolved and documented.

Local evidence suggests that Level One MR is undertaken inadequately, despite substantial attempts to improve this and with policies and guidelines being in place, revealing a significant patient safety issue. The limited use of NHS Smartcards and access to the SCR by junior doctors was frequently cited as the key obstacle to effective MR. To rectify this, junior doctors were sent numerous emails reminding them of the MR Trust policy and to use their Smartcards to access the SCR by consultants but this proved ineffective. Prescribing errors were being identified by pharmacists on daily visits to the wards and through audit. Approximately 30 interventions per day per ward were made by pharmacists to correct prescribing errors. However, this information was never shared with the junior doctors, so they were unaware of the scale of the problem and the inadequacy of the MR process. It was apparent that there had been little exploration of the root cause of this non-engagement in the use of Smartcards and accessing the SCR. There needed to be a deeper understanding of this non-compliance in terms of system design and the MR process rather than just focusing on the individuals involved.

An in-depth investigation by the General Medical Council (GMC) into causes of prescribing errors by foundation trainees (GMC, no date) showed that prescribing errors were 70% more likely on admission. This finding strongly supports the MR initiative set out by the National Patient Safety Agency (NPSA) and the National Institute for Health and Clinical Excellence (NPSA, 2007).

Initial investigation and analysis

A human factors analysis of the Level One MR process was undertaken to facilitate a wider, systems-based exploration of why this was not effectively completed rather than focusing on junior doctors and their limited use of Smartcards. The System Engineering Initiative for Patient Safety (SEIPS) model (Carayon, 2006) was used to analyse the barriers to effective MR in one large acute NHS hospital. This model clearly recognises the interrelated nature of the five major aspects of work systems: people, tasks, tools and technologies, physical environment and organisational conditions. Adopting this broader systems approach identified the following fundamental issues that could be addressed to improve the MR process.

Tasks

- Junior doctors received limited training on how to use their Smartcards and also how to access the SCR on the computer systems.

- Accessing information required proved to be difficult and time consuming, resulting in a reluctance to use the system, particularly during busy shifts.

People:

- Some junior doctors were over-reliant on the pharmacists who would complete level two of the MR process and identify any prescribing errors.
- Engaging in the MR process was not an explicit learning outcome for junior doctors and therefore this was not assessed formally by clinical or educational supervisors.
  Evidence from studies which have also explored human factor and ergonomic (HFE) factors associated with prescribing errors, suggest that fatigue, concentration levels and stress may all have an impact on prescribing behaviour (The Health Foundation, 2017). Foundation Year doctors are subjected to unfamiliar rotas and have to adapt to their new role. Additionally, they are often new to organisations which can potentially increase stress levels.

Tools & technology:

- The nature and placement of computer icons used to identify the SCR system differed across the organisation, making easy identification and navigation more challenging.
- Navigation through six screens was required before reaching the SCR.
- The web browser was not compatible with SCR software on some ward computers which further complicated navigating the system.
- The organisation provided identification badge holders that only held a single identification (ID) card, meaning the Smartcard was frequently misplaced.

Evidence suggests that other human factors approaches have been tested to reduce prescribing errors. The most commonly researched strategy involves redesigning equipment and tasks through the use of electronic tools such as e-prescribing and computerised decision support systems which involve the use of alerts and prompts (The Health Foundation, 2017). These studies tend to describe implementation of specific systems and how tools can be used to reduce errors during the prescribing process without acknowledging the wider user or human characteristics at play in effective use of tools and equipment or that the tools themselves can be a causative factor of prescribing errors.

Physical environment:

- Some wards did not have functioning Smartcard readers.
- Smartcard readers differed in appearance so were not easily recognisable or user friendly.
- Access was limited to just a few ward computers that were in constant use for other clinical purposes.
- Work environment was identified as a significant aspect by doctors in a study by Ross et al. (2012) with workload and time pressures being the most commonly mentioned factors.

Organisation:

- Acquiring an NHS Smartcard was complicated, and opportunities limited as appointments were required with only certain personnel able to issue the cards.

The solution

As a result of this initial identification of the barriers to MR and discussion with stakeholders, (which included education and nursing directors) the following initial actions have been implemented:

- A system and software redesign would be the ideal solution but out of scope at present. However, work has begun with information technology staff to standardise the tools and technology required for MR across all wards to enhance usability.
- Teaching on MR, Smartcard use and SCR navigation has now been included in the junior doctors' generic skills programme which is provided on a regular basis by a Senior Pharmacist and Senior Clinical Nurse Lecturer. During this session, doctors are taught how complete the MR process safely. To assist with navigating the six screens to access the SCR, a step-by-step approach is taught ensuring the doctors are more familiar with the system. 'Real life' anonymised examples are shown of potential pitfalls to prescribing if the system is not used effectively.
- Engagement in the MR process is to be included as a learning outcome as part of junior doctors' career progression (after discussion with Northern Foundation School Senior Tutors). This will ensure engagement with MR process is assessed as part of their Annual Review of Competence Progression (ARCP) process. In doing so, it is also raising the profile of the importance of MR to educational and clinical supervisors who are responsible for assessing junior doctors.
- Funding has been secured for ID badge holders that can hold two ID cards.
- More opportunities to physically acquire an NHS Smartcard were offered at more convenient times which has proven successful to date.
- Senior nurses and ward managers were tasked with ensuring all Smartcard readers were functioning on their wards and to contact pharmacy for replacements if required. Junior doctors also advised to contact pharmacy if a Smartcard reader is found to be malfunctioning.
- Director of Nursing/Senior Nurses promote and support MR on their wards by encouraging use of Smartcards and ensuring Smartcard readers are available.

Resolution of the problem

The solution was to take a different wider systems analysis through a human factors lens resulting in better learning and the introduction of more effective interventions. Junior doctors are now more familiar with the importance of the MR process and, in circumstances where patients are unable to give an accurate drug history, are aware of the advantages of accessing the SCR which provides essential, updated and accurate information.

Smartcard readers are now functional on all wards and anecdotally there is a significant increase in the number of junior doctors who have acquired a Smartcard compared to very limited numbers last year. Feedback received following a recent generic skills session was very positive and included the following comments:

> "*Useful for emphasising importance of getting drug history from patient in combination with SCR.*"
> "*It was useful to understand more about how the SCR works, how to access it and how to use it effectively.*"

Further anecdotal evidence received from a senior grade doctor working on the Acute Assessment Unit suggested that there has been an increase in the number of junior doctors accessing the SCR during evening and night shifts when drug history information would be difficult to source otherwise.

Impact and implications

All the initial actions outlined above have been implemented and are now part of normal Trust practice. We are currently evaluating the initial impact/progress of these human factors-based

interventions designed to improve MR. Further audits to objectively establish whether fewer interventions have been made by pharmacists on the wards are planned.

Initially the focus was on improving the MR process with junior doctors but senior doctors have since expressed an interest and the project has now been shared at local meetings with core medical trainees and senior grade doctors.

Future plans aim to include qualified and student nurses in the teaching and provide an inter-professional education session for medical, pharmacy and nursing students on MR and safe prescribing. MR teaching is now also included for final year medical students as part of their Hospital Based Practice placement to enhance their prescribing skills.

We are currently evaluating if there has been an increase in the numbers of doctors accessing the SCR and digital data to enable this is awaited. Collaborative work with pharmacy and ward teams is underway to improve current data capture to enable better evaluation of the impact of these human factors-based solutions to improve the MR process within the Trust.

The costs incurred to date have been £17.99 for 100 dual ID badge holders, in addition to hidden costs in terms of planning and delivery of teaching. Challenges so far include the need to continuously work collaboratively with the postgraduate department to ensure MR remains in the generic skills teaching curriculum for junior doctors. This is essential as the NHS workforce is not static and junior doctors rotate through different wards/hospitals within the region. Also, there is a need to work with finance and procurement to ensure continuing purchase of the dual ID badge holders and improve the current distribution process to enhance sustainability.

Further development, dissemination and spread is underway, with further collaboration with the Northern Foundation School to ensure MR is included as a ARCP learning outcome going forward.

Discussion and limitations

This project has made more visible the complex nature of prescribing errors and the wide range of error-producing conditions associated with tools, technologies, tasks, individuals, patients and the organisation. Addressing training needs has been acknowledged in other HFE studies, with expanding the pharmacists role and delivering one to one teaching to doctors deeming favourable, however this has time and cost implications for organisations with such large numbers of prescribing personnel.

There are limitations to this project as multiple human factors contributory factors were identified. Further work is required to sustain the implemented interventions to date and address other possible human factors aspects of this topic. In addition, the project was based on an analysis using only one of a myriad of human factors models and approaches. This work has also helped raise awareness of limitations of training versus redesign. Finally, the transferable learning from this project may be limited as a result of specific, contextual factors such as widespread use of the Summary Care Record in the region used in this study which is not necessarily mirrored elsewhere.

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