Automated dispensing — does it improve patient safety?

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Background
A number of hospital dispensaries have implemented automated item picking systems following the recommendation by the Audit Commission that they are effective in reducing dispensing errors and improving patient safety. However only a small number of studies are available reporting the impact of these automated systems on dispensing errors.

Aim and objectives
To establish whether patient safety can be improved by implementing an automated item picking system within a hospital dispensary. The objectives were to:

- Describe the number and types of dispensing error near misses pre- and post-implementation of an automated item picking system.
- Determine whether the implementation of an automated system led to an increase or decrease in dispensing error near misses.
- Determine whether the implementation of an automated system led to an increase or decrease in dispensing error near misses for all or some of the main dispensary issue types.

Methods
Analysing dispensing error near misses is the most suitable means of evaluating the potential impact of an automated system on decreasing dispensing errors. Therefore a retrospective analysis of near misses was undertaken for two years before and two years after the implementation of an automated item picking dispensing system. The data collection for this study was undertaken using reporting forms, which were completed at the time of error discovery, making error-reporting part of the routine dispensing process. The completed reporting forms were collated and analysed on a four-week basis. The local regional ethics committee confirmed that no formal ethics approval was needed for the study.

Results
Automation of the item picking stage of the dispensing process did not significantly decrease the overall occurrence of dispensing error near misses (95% confidence interval –11 to 35). Figure 1 (below) shows that post-automation there was a significant rise in the rate of errors associated with the inpatient type of dispensary issues (33.33%; P<0.01), but a significant decrease in the rate of errors associated with outpatient dispensary issues (–52.08%; P<0.001). These changes were accompanied by a post-automation rise in the number of errors associated with medication labelling (11.09%) and a significant decrease in item picking associated errors (–43.14%; P<0.001). Figure 2 (pS2) provides more detail of the changes post-automation in the specific error types.

Discussion
The development, application and analysis of the near miss reporting system within this study supports the recommendations of the Audit Commission and the National Patient Safety Agency in reporting errors to appraise medication processes for the purpose of improving patient safety. There are, however, inherent limitations to voluntary
reporting systems, the most notable of which is under-reporting. An implemented means of optimising reporting was to encourage an open reporting culture, which is a fundamental factor within clinical governance. A specific limitation to this study is that the changes in the error types of near misses are described in terms of numbers and not rates.

Although dispensing errors associated with item picking were significantly reduced, picking errors still occurred. This was most likely due to dispensing practice continuing to involve part medication packs that the automated system cannot deal with. If non-automated medication supply remains commonplace then the suggested impact of automation on patient safety will not be seen.

In addition, the overall benefit from automated dispensing in decreasing the number of item picking errors was reduced by sources of error within other stages of the dispensing process, such as labelling. This was most clearly seen with the inpatient issue type of near misses. With the rate increase of a third most likely due to changes in the labelling requirements following the introduction of one-stop dispensing, it indicates the ineffectiveness of automation in addressing these types of dispensing error. This supports the findings of a previous study where, although automation significantly reduced dispensing errors involving wrong content, there was no clear beneficial effect on labelling errors.

Further technologies to reduce the occurrence of labelling errors need to be implemented in conjunction with the development of systems that are able to deal with part medication packs if patient safety is to be truly improved by automated dispensing.

Conclusion

This study has shown that automated dispensing is not a complete solution for eradicating dispensing errors but is one step on the dispensary path to improving patient safety.

References

Results

At the time of the evaluation, 633 mini PAT assessments had been completed by the practitioners registered on the programme, with the January 2006 group having completed five rounds of mini PAT, the September 2006 group four rounds and the September 2007 group two rounds. The average response rate for the assessments completed across the three groups was 77.2% (ranging from 64.6% to 79.9%).

Pharmacists were found to be the group of assessors most frequently nominated by the GLPs, followed by pharmacy technicians, and then other healthcare professionals (nurses and doctors). As GLPs became more experienced, they were more likely to nominate doctors, particularly consultants.

Specific analysis of the three mini PAT clusters found that the GLPs were more likely to be scored higher for the personal competency cluster in the assessment than the delivery of patient care or problem solving competency clusters throughout the programme.

When the different categories of nominated assessors’ scores were grouped by the profession of the assessor, doctors and nurses were significantly more likely to score the GLPs higher across all 16 mini PAT questions than nominated pharmacists (Mann Whitney U=34, P<0.001 and U=5, P<0.001 respectively).

A total of 122 questionnaires on the usefulness of the mini PAT were returned (response rate = 82%). Table 1 (above) describes the results from some of the key questions asked.

Discussion and conclusion

The results from this evaluation illustrate that this method of assessment works in practice, with an average response rate comparable to that found in the literature for medical staff. It was interesting to find that other healthcare professionals scored the GLPs more positively in their assessments than did members of the pharmacy team. This finding most likely reflects their differing expectations of the GLPs and the differing interpretations of the mini PAT questions, and warrants further investigation.

The GLPs found the feedback the mini PAT assessment generated to be useful, particularly the qualitative comments. However, some reported that the feedback received was not specific enough to influence their practice to any great extent. This finding warrants further work as the assessment method is developed.

Overall, the findings indicate that there is a role for the mini PAT assessment among general level pharmacists working in secondary care.

References

The lead author (as head of pharmacy at Wishaw) learnt a powerful amount about the willingness and capabilities of all grades of pharmacy staff. Taking a week out from managing the department and seeing the daily dispensary issues helped to improve understanding of what improvements were necessary and how engagement with medical and nursing staff is crucial to sustaining change. The whole team wanted the changes to be successful and by empowering all grades of staff to lead, rather than management, the changes have been embedded. Morale improved and because staff could see immediate results this helped to drive the changes and ensured improvements were maintained.

The Kaizen team is now planning to perform similar exercises and suggest improvements at the other two acute hospitals in NHS Lanarkshire.

Reference

Table 1: Changes in dispensary cycle times for discharge prescriptions (Monday to Friday) before and after the Kaizen event

<table>
<thead>
<tr>
<th>Dispensary cycle time</th>
<th>Pre-Kaizen</th>
<th>Week 2</th>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–1 hour</td>
<td>42%</td>
<td>46%</td>
<td>69%</td>
</tr>
<tr>
<td>1–2 hours</td>
<td>36%</td>
<td>41%</td>
<td>27%</td>
</tr>
<tr>
<td>2–3 hours</td>
<td>13%</td>
<td>11%</td>
<td>3%</td>
</tr>
<tr>
<td>3–4 hours</td>
<td>8%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>4–5 hours</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>&gt;5 hours</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Total prescriptions</td>
<td>358</td>
<td>331</td>
<td>359</td>
</tr>
</tbody>
</table>

Sanofi-Aventis Diabetes Award 2009

Pharmacists can tackle health inequalities in South Asian diabetic patients

Gilaní A, Lowrie R
Pharmacy Development Team, Glasgow

Background
The South Asian population in the UK is up to six times more likely to get diabetes and is at a higher risk of cardiovascular disease, which accounts for higher morbidity and premature mortality. South Asians have been described as a “hard to reach” group. Cultural factors can determine lifestyle behaviours that are detrimental to their diabetes and there is a higher level of deprivation among this group.

In view of this increasing public health problem, the NHS needs to adapt to deliver more appropriate services for those in most need and provide accessible care to address this inequality.

Aim
To improve access to health and social care services and to deliver enhanced care for South Asian diabetic individuals in an area of socioeconomic deprivation.

Changing the model of care
In Glasgow a general practice-based pharmacist medication review service was established in 1997. It became apparent that it was not meeting the needs of South Asian individuals: attendance at these clinics was less than 50% compared with more than 80% for the indigenous population. As a result the service was adapted: we invited South Asian patients to attend, using an Urdu speaking administrator to ensure the first point of contact being in Urdu — a language that most South Asians understand.

1) Changing the NHS invitation process
General practices with a high South Asian population were targeted. The diabetic disease register was used to identify those with the condition. Patients were then telephoned in Urdu and invited for a medication review delivered by an Urdu-speaking pharmacist. This resulted in an increase in attendance rate for pharmacist-led clinics to greater than 80%.

2) Enabling access through community venues
An inequality in access to health services exists in the South Asian population. To tackle this, clinics were set up in community venues. Examples of venues targeted were a mosque, elderly centres and voluntary centres. Clinics were held on a weekly basis and patients’ medicines were discussed initially without access to medical case notes. Once consent was obtained...
Table 1: Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process/access outcomes</strong></td>
<td></td>
</tr>
<tr>
<td>(each patient had at least one long term condition)</td>
<td></td>
</tr>
<tr>
<td>Number of patients who received a medication review from March 2002 to November 2008</td>
<td>1,128</td>
</tr>
<tr>
<td>Average number of appointments per patient</td>
<td>2</td>
</tr>
<tr>
<td>Number of different general practices accessed</td>
<td>45</td>
</tr>
<tr>
<td><strong>Prescribing changes</strong></td>
<td></td>
</tr>
<tr>
<td>(n = 90 patients; medicines started or doses changed or tests ordered)</td>
<td></td>
</tr>
<tr>
<td>Oral hypoglycaemic agent</td>
<td>17</td>
</tr>
<tr>
<td>Statins</td>
<td>27</td>
</tr>
<tr>
<td>Antiplatelets</td>
<td>16</td>
</tr>
<tr>
<td>Antihypertensives</td>
<td>18</td>
</tr>
<tr>
<td>ACE inhibitor for hypertension or micro-albuminuria</td>
<td>14</td>
</tr>
<tr>
<td>Total medicine changes for a sample of 90 patients</td>
<td>92</td>
</tr>
<tr>
<td>Number of blood tests to inform management</td>
<td>295</td>
</tr>
<tr>
<td><strong>Health and social care referral</strong></td>
<td></td>
</tr>
<tr>
<td>Number of referrals to the health care team (eg, retinal screen, specialist secondary care clinics, community psychiatric nurse, DEXA, spirometry, exercise classes, falls prevention programme)</td>
<td>72</td>
</tr>
<tr>
<td>Number of social care referrals (eg, multicultural counselling service, bereavement services, welfare rights)</td>
<td>38</td>
</tr>
<tr>
<td><strong>Long-term conditions</strong></td>
<td></td>
</tr>
<tr>
<td>Long-term conditions diagnosed as a result of pharmacist detection</td>
<td>17</td>
</tr>
</tbody>
</table>

Discussion

This pharmacist-led service is culturally and linguistically sensitive. Patient views of the service are favourable and have indicated regular pharmacist contact is required. It is sustainable and reproducible. The service has grown from strength to strength and now has a referral process that is widely used by patients and healthcare professionals. The service tackles health inequalities in primary care and at grass-roots level to target high-risk individuals and refer them on to the health and social care team. It has shown partnership working with both health and social care teams. This is in line with all strategic policy drivers where tackling health inequalities is recognised as one of the biggest challenges to the NHS.

We have developed the service model to expand to tackle other ethnic groups who have recognised health inequalities, such as asylum seekers. We have demonstrated that care can be shifted effectively from traditional locations (eg, general practices) to the wider primary health and social care team via pharmacy, tackling health inequalities and providing accessible, appropriate care closer to the patient’s home.

Best poster award

Medicines-related communication issues during patient transfer from an acute teaching hospital to community hospitals

Chanda R*, Hough J*, Hodson KL†
†Department of Pharmacy, Oxford Radcliffe Hospitals NHS Trust, Oxford; ‡Department of Pharmacy, Welsh School of Pharmacy, Cardiff University

Introduction

Inadequate communication of medicines-related information at the primary-secondary care interface can lead to poor prescribing, resulting in medication errors and potentially adverse events. Recent national guidance, published jointly by the National Institute for Health and Clinical Excellence and the National Patient Safety Agency, has highlighted the importance of performing medicines reconciliation on admission to acute hospitals to ensure that medicines take-pre-admission are continued and to highlight and
The interviews were further explored. The interviews and focus groups were the study consisted of two focus groups at which the themes from the transfers from the acute teaching hospital. The second phase of the communication and the quality of medicines-related information care in the community hospital, three specialist registrars, five senior professionals comprised medical staff of all grades, namely, four the county agreed to participate in the study. The healthcare professionals working within three community hospitals in Method

<table>
<thead>
<tr>
<th>Category</th>
<th>Themes</th>
</tr>
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</table>
| Causes of medicines-related communication problems, based on views and opinions of community hospital healthcare professionals | - Multiple sources of medicines-related information transferred to community hospitals increase the potential for medicines-related issues, as a result of prescription discrepancies arising between these different sources  
- Community hospital healthcare professionals use different medicines-related information sources to perform medicines reconciliation  
- Pressures to complete timely discharge documentation could lead to potential loss of medicines-related information to community hospitals  
- Inappropriate and inadequate documentation of medicines-related information on discharge documents by junior medical staff, due to lack of appreciation on the importance of and key components of medicines-related information to transfer for continuity of patient care in community hospitals  
- High turnover of medical staff potentially contributing to lack of familiarity with patients, which could, in turn, lead to omission of medicines-related information on discharge documents  
- Lack of awareness of differences in facilities between the acute teaching hospital and community hospital could lead to inappropriate handover of complex medicines-related problems to the community hospitals which cannot be resolved as easily compared with in the acute teaching hospital |
| Strategies suggested to improve medicines-related communication problems, based on views and opinions of community hospital healthcare professionals | - Appropriate use of acute teaching hospital discharge documentation, especially electronic discharge documentation  
- Checking of the community hospital drug chart before patient transfer to the community hospital  
- Review of current discharge documents used to communicate medicines-related information to community hospitals  
- Development of a common drug chart for patients ready for discharge to a community hospital, which could reduce duplication of medicines-related information and ensure transfer of medicines reconciliation information, completed in the acute teaching hospital, to the community hospital  
- Education of healthcare professionals, especially junior medical staff, on importance of documentation of medicines-related information on discharge documentation to facilitate continuity of patient care in community hospitals |

resolve medicines-related discrepancies. Anecdotal reports locally suggest that medicines-related communication issues arise when patients are discharged from the acute teaching hospital to community hospitals.

Objectives

This study explored community hospital healthcare professionals’ views and opinions on different aspects of medicines-related communication at patient discharge from acute teaching hospital to community hospitals. The objectives were to:

- Establish whether medicines-related communication issues occurred
- Ascertain the types of medicines-related communication issues arising and reasons for their occurrence
- Propose strategies for improving the current processes related to medicines-related communication from acute teaching hospital to community hospital

Method

Healthcare professionals working within three community hospitals in the county agreed to participate in the study. The healthcare professionals comprised medical staff of all grades, namely, four consultants working in both the acute sector and contracted to provide care in the community hospital, three specialist registrars, five senior house officers, two GP contracted to provide medical cover to the community hospitals, nine nursing staff of various grades and two community pharmacists providing the pharmaceutical service to the community hospitals. Ethics approval was obtained prior to performing the study. The first phase of the study consisted of face-to-face semi-structured interviews with each healthcare professional (n=25) to ascertain their views and experiences of medicines-related communication and the quality of medicines-related information transferred from the acute teaching hospital. The second phase of the study consisted of two focus groups at which the themes from the interviews were further explored. The interviews and focus groups were audio-recorded and transcribed verbatim for data-analysis purposes.

Thematic and content analyses of the two stages were undertaken. The interviews led to development of common themes and categories for different aspects of medicines-related communication, whereas the focus group data resulted in recommendations for improving medicines-related communication to community hospitals.

Results

Twenty-five interviews and two focus groups (n=6, n=4) were conducted. All interviewees acknowledged that medicines-related communication issues occurred. Table 1 (above) illustrates the themes that emerged from the interviews and focus groups about the causes of medicines-related communication problems and suggested strategies for improvement.

Discussion

Medicines reconciliation has been acknowledged by NICE/NPSA as an important process for patients admitted to acute hospitals. Furthermore, previous studies have highlighted the necessity of medicines reconciliation on admission and discharge. However, there are currently no data concerning medicines reconciliation with respect to patients transferred from acute teaching hospital to community hospital. This study illustrated that community hospital healthcare professionals value accurate and appropriate medicines-related communication between these care settings. As a result, inpatient and discharge documentation will be reviewed to improve medicine-related continuity of patient care from acute teaching hospitals to community hospitals within Britain.

References

HIV and sexual health related medication errors: type, frequency, cause and outcomes in a specialist hospital-based outpatient clinic

Maret B, Naude C, Weston R, Wouda S
Imperial College Healthcare NHS Trust, London

Introduction
Medication incidents are the third most reported patient safety incident in the UK. Research estimates 6.5% of hospital admissions in England each year are due to harm from medicines, most being possibly or definitely preventable. A single retrospective Spanish study estimated outpatient antiretroviral dosing errors at 0.27 errors/100 patients dispensed per month. To our knowledge there are no published prospective data on HIV or sexual health related medication errors in a hospital outpatient setting.

Objectives
To determine the frequency and type of HIV and sexual health related medication errors, the causes, actual and potential outcomes in outpatients attending a large hospital-based sexual health clinic in the UK.

Methods
All medication orders for HIV and sexual health patients at a specialist satellite pharmacy were prospectively evaluated for defined prescribing, screening and dispensing errors in March 2008. A screening error was defined by adapting a prescribing error definition described by Dean et al. and incorporating local screening procedures. “A clinically meaningful screening error occurs when, as a result of a screening decision or process, there is an unintentional significant (1) reduction in the probability of treatment being timely and effective or (2) increase in the risk of harm when compared with generally accepted practice”. Pharmacy staff self-reported identified errors on an anonymous data collection form. The cause, medicines, outcome and probable outcome if the error was undetected were recorded. Causes of error were defined as slips or lapses and mistakes. Outcomes were classified according to harm using previous UK HIV medication study criteria in accordance with the National Patient Safety Agency; these were reviewed by a senior specialist pharmacist. All results were recorded in a Microsoft Access database and analysed using Microsoft Excel. Ethics committee approval was not required.

Results
Overall, 154 (49%) errors were recorded from 3,127 medication orders during the study period (Table 1). Prescribing errors 81/3,127 (2.6%), were due to unintentional slips 52/81 (64%) and intentional mistakes 29/81 (36%). A clinical pharmacist identified and corrected 71/81 (88%) of prescribing errors on clinical screening, the dispenser identified 9/81 (11%) at labelling, patient identified 1/11 (1%). No prescribing errors left with the patient. Errors were corrected by confirming with prescriber 47/81 (58%) or authorising without contacting prescriber 34/81 (42%). Clinical screening errors 11/3,127 (0.4%) were identified, confirmed with clinical pharmacist and corrected at the labelling stage. Errors were due to slips following prescribing error 9/11 (82%) and mistakes 2/11 (18%). Labelling errors 38/3,127 (1.2%) and dispensing errors 21/3,147 (0.7%) were recorded as due to slips or lapses 43/59 (73%) and mistakes 16/59 (27%). 58/59 were identified and corrected during dispensing or at final check, 1 error involving inadequate supply of analgesic was identified on patient collection. Checking errors 3/3127 (0.1%), due to excess supply 1, inadequate supply 1, both identified on patient collection, and 1 incorrect strength antiretroviral (ARV) was taken by the patient. No other errors were reported by patients in the following 12 months. ARV medicines were involved in 65/154 (42%) of the errors. A total of 153/154 (99%) of errors were identified and corrected before the patient left clinic. No errors resulted in harm, 59/154 (38%) of errors were classified with the potential to cause moderate to severe harm.

Discussion
The overall error rate (49%) is comparable to published data although it is difficult to interpret due to differences in taxonomy and denominators. We report a frequency of 2.6% prescribing errors similar to other specialty inpatient medication review studies in the UK. The rate of dispensing errors is comparable to published hospital data in the UK. To our knowledge there are no published data on clinical screening error rates (0.4%) and although all errors were identified and corrected in subsequent pharmacy processes it merits development of a recognised definition and further investigation. Although 1 error left with a patient, no actual harm was done. A significant proportion (38%) was classified to cause probable moderate to severe harm if undetected. ARV account for the majority of medication orders and were involved in 42% of all errors, the high severity grading may be driven by pharmacy staff awareness of the consequences of treatment failure. The limitations of this study include the potential for under reporting, the ability to ascertain the cause of prescribing errors and classification of severity or harm. Differences in classification by pharmacy staff were reviewed by a senior pharmacist, not by an ideal peer review group. We acknowledge the classification of harm is subjective; however it has been used in another UK HIV medication study in accordance with NPSA criteria as this was felt to be more realistic and meaningful to UK practice. Medication error type and frequency in HIV/sexual health outpatients are similar to other specialties and settings in the UK. No actual harm was reported but a high potential for harm emphasises the need for vigilance in identification and correction of medication errors in this setting.

Table 1 Incidence and frequency of errors

<table>
<thead>
<tr>
<th>Type of error</th>
<th>HIV related</th>
<th>Sexual health</th>
<th>Total (%)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescribing</td>
<td>74</td>
<td>7</td>
<td>81 (53%)</td>
<td>2.6</td>
</tr>
<tr>
<td>Screening</td>
<td>7</td>
<td>4</td>
<td>11 (7%)</td>
<td>0.35</td>
</tr>
<tr>
<td>Dispensing</td>
<td>43</td>
<td>16</td>
<td>59 (38%)</td>
<td>1.9</td>
</tr>
<tr>
<td>Checking</td>
<td>2</td>
<td>1</td>
<td>3 (2%)</td>
<td>0.1</td>
</tr>
<tr>
<td>Total (%)</td>
<td>126 (82%)</td>
<td>28 (18%)</td>
<td>154 (100%)</td>
<td>4.9</td>
</tr>
</tbody>
</table>

References
5 Beso A, Dean Franklin B, Barber N. The frequency and potential causes of dispensing errors in a hospital pharmacy. Pharmacy World & Science 2005;27:182–90.

Medicines-related communication issues during patient transfer from an acute teaching hospital to community hospitals

Chanda R*, Hough J†, Hodson KL†
*Department of Pharmacy, Oxford Radcliffe Hospitals NHS Trust; †Oxford, Department of Pharmacy, Welsh School of Pharmacy, Cardiff University

Winner of Best Poster Award. See p57.
An evaluation of the impact of a pharmacist at a pre-admission clinic on the accuracy and safety of patients' medication on admission to the ward

Williams S*, Jones SW, Hodson KL†
*Department of Pharmacy, Cardiff and Vale NHS Trust; †Welsh School of Pharmacy, Cardiff University

Introduction
Pre-admission clinics (PACs) are the first key-stage of an elective surgical patient's care pathway and have been identified as an area in which pharmacy can become involved.1 In May 2006, a limited (due to funding) pharmacy service was introduced into the orthopaedic PAC at University Hospital Llandough. It was decided that patients under the care of 2 of the 25 consultant orthopaedic surgeons would be reviewed. The majority of these patients are undergoing major orthopaedic surgery, are generally older, have more co-morbidities and as a result take an increased number of medications.1

Objective
To evaluate the impact of a pharmacist at an orthopaedic PAC on the accuracy and safety of the medication on admission to the ward. The number and clinical significance of pharmacists’ interventions made at PAC and at admission was used as an indicator of patient safety.

Method
The study consisted of an active arm (patients attending the pharmacist PAC) and a control arm (those patients attending a non-pharmacist PAC). The latter consisted of patients under the care of 2 other consultants who had a similar casemix as the consultants in the active arm. The difference between the two arms of the study consisted of the pharmacist reviewing the patient’s medication and transcribing the medication onto an in-patient medication chart at PAC. All patients in both arms of the study attended the PAC and once admitted to hospital had their medicines reconciled by a pharmacist on admission using various resources, eg, the patient, patient's own medication, community prescription. All pharmacists’ interventions for patients admitted between March and June 2008 were documented on a data collection form. This included the interventions made by a pharmacist in PAC for the active arm and on admission to the ward for the control and active arms. An intervention was defined as any activity the pharmacist undertook to ensure accurate, appropriate and safe prescription of medication. The interventions made at PAC and on the ward were recorded by the pharmacists that routinely cover the orthopaedic wards and PACs. The data were inputted into Statistical Package for Social Scientists (SPSS) version 15 and then analysed. The clinical significance of the interventions was assessed using a scoring system that has been shown to be practical and reliable to use. Eight senior healthcare professionals working within the field of elective surgery in the Trust were chosen to assess the clinical significance of the interventions (two consultant anaesthetists, two consultant surgeons, two pharmacists and two staff nurses). To avoid bias these healthcare professionals were not involved in the study’s data collection. The Trust’s ethics committee confirmed that approval was not required for the study.

Results
A total of 151 patients were included in the study; 83 (55%) were in the active arm and 68 (45%) in the control arm. There was no statistically significant difference between the demographics of the two groups. In total 248 interventions were made; 131 in the active arm and 117 in the control arm. On average 1.57 and 1.72 interventions were made per patient in the active and control arms respectively. The majority of interventions in the active arm (84.7%, n=111/131) were made at PAC and resolved prior to admission. The remaining 15.3% (n=20/131) made on the ward were necessary as the doctor had either not signed (n=2/131), utilised (n=12/131) or made the necessary amendments (n=6/131) to the transcribed in-patient medication chart from PAC. There was a significant reduction in the number of patients that required one or more interventions at admission in the active arm of the study compared to the control arm (18.1% vs 89.7%, P=0.000). The 248 interventions made during the study were categorised into 28 intervention types. One of the most frequent interventions related to the incorrect/incomplete allergies or intolerances documented for the patient, which occurred for 13 and 17 patients in the active and control arms respectively. This intervention was made in PAC 12 out of the 13 times in the active arm. The omission of patients’ regular medication and the provision of advice for the peri-operative management of medication were intervention types that also occurred frequently, each being recorded 25 times. The former occurred significantly more frequently in the control arm (P=0.001), whereas the latter occurred significantly more frequently in the active arm (P=0.000).

Each assessor independently classified each of the 28 intervention types for their clinical significance. A consensus opinion was not achieved. However, 6 of the 8 assessors reported that all intervention types were of clinical significance. Two assessors classified intervention type 28 (patient not on formulary choice of medication for no justifiable reason) to be of no significance. One of these assessor also classified intervention type 1 (patient not on medication which is indicated according to current national guidelines) to be of adverse significance as he does not agree with the guidelines regarding the use of thromboprophylaxis peri-operatively. These 2 assessors classified all other intervention types to be of clinical significance. Four intervention types were classified as very or extremely clinically significant by all 8 assessors, which accounted for 23.8% (n=59/248) of all interventions made during the study period. These interventions were made 10 times more frequently in the control arm (16.5%, n=41/248) than in active arm (1.6%, n=4/248).

Discussion
A similar number of interventions were made in both arms of the studies, however in the active arm the majority of the interventions were made at the PAC in advance of surgery. Almost all of the interventions were shown to be clinically significant and those interventions that were classified as being the most clinically significant were made more frequently on the ward in the control arm than the active arm. This suggests that involving the pharmacist at the PAC leads to a reduction in some of the more clinically significant interventions being made on the ward as the pharmacist has either resolved the issue in advance of surgery or prevented it from occurring. The results suggest that expanding the current pharmacy service and placing a pharmacist in PAC so that they are placed earlier in the process of care and permitted a more proactive role, may lead to a reduced number of reactive time-consuming post-admission medicines reconciliation issues. It is anticipated that the number of interventions required on the ward could be further reduced by additional education to doctors on the pharmacy transcription service. The results from this study supports previous work published where pharmacy input at PAC improved patient safety through a reduction in medication discrepancies and necessary interventions at admission.† In conclusion, this study demonstrated that pharmacy involvement at PAC led to a significant reduction in the number of interventions required at admission and therefore improved patient safety.

References
Evaluating the impact of a closed-loop electronic prescribing system on a medicine for the elderly ward

Hurtik M, McLeod MC and Franklin BD
Imperial College Healthcare NHS Trust, London

Introduction
ServeRx is a closed-loop system comprising electronic prescribing, ward-based automated dispensing, barcode patient identification and electronic medication administration records. It has been in use on ward 8 North (8N) at Charing Cross Hospital since summer 2003. At that time, 8N was a surgical ward, and a full evaluation was completed.1 Ward 8N then became a Medicine for the Elderly ward, and ServeRx was reintroduced in 2007. However, some concerns arose over the length of time required to conduct drug rounds and the incidence of missed doses. In addition, we were interested in its effects on the documentation of allergy/sensitivity status.

We therefore wanted to assess a more limited range of outcome measures to evaluate the impact of ServeRx with a Medicine for the Elderly population. We used ward 8 West (8W) as a comparator, as it serves the same patient population and consultants, but uses the traditional paper drug chart and manual dispensing system.

Objectives
To compare the following for 8N and 8W: the time taken to complete drug rounds; the incidence of missed doses and clinically significant missed doses; and the documentation of patient allergies/sensitivities.

Methods
Seven 8am drug rounds were directly observed on 8W to determine the time taken and the numbers of patients and medications involved. The same data were retrieved from ServeRx for 15 8am rounds on 8N. One drug round related to patients on one half of each ward.

We recorded the total number of regular doses that each patient should have received, and details of any omitted due to being unavailable or having no reason documented. We studied each patient’s current drug chart on 8W, and the past two weeks’ data on 8N. Data collection was performed twice, two weeks apart, to increase the sample size. Clinically significant omissions were identified by a senior clinical pharmacist using pre-existing pharmacy criteria.

We assessed documentation of allergy/sensitivity status on four occasions, one week apart. ServeRx was used to retrieve data for all patients on 8N and all available drug charts were reviewed on 8W. The percentage of patients without documented allergy/sensitivity status was calculated for each ward.

Results
A total of seven drug rounds, comprising 60 patients administered 340 medications, were observed on 8W. Data for 15 drug rounds, comprising 136 patients and 892 medications, were collected on 8N (Table 1). Overall, mean time per drug round was similar on each ward, with no statistically significant difference. Mean time spent on medication rounds per patient was also similar, although 8N nurses spent slightly less time per medication.

<table>
<thead>
<tr>
<th>Ward</th>
<th>Mean drug round time (mean, ±95% confidence interval)</th>
<th>Mean time per patient (minutes)</th>
<th>Mean time per medication (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8W</td>
<td>69.3 ± 12.8</td>
<td>8.1</td>
<td>1.4</td>
</tr>
<tr>
<td>8N</td>
<td>73.7 ± 13.8</td>
<td>8.1</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Overall, 3.1% of 2,866 doses were omitted on 8W and only 1.8% of 3,784 on 8N, a statistically significant difference (95% confidence interval for difference −0.5 to −2.1%). 8N had a significantly higher prevalence of doses omitted because medication was unavailable (1.6% versus 0.6% of all doses due), but a significantly lower proportion of doses omitted where no reason was given (0.3% versus 2.5%). This amounts to an overall net decrease in omitted doses. Clinically significant dose omissions were also less common on 8N (1.3% versus 1.8%) although the difference was not statistically significant.

A total of 59 patient drug charts were reviewed for documentation of allergy/sensitivity status on 8W, and 75 on 8N. While all drug charts reviewed on 8W had allergy/sensitivity status documented, five (7%) of those reviewed on 8N were without documentation.

Discussion
There are some limitations to our data collection. We used observation to collect data on drug round duration on 8W and retrieved ServeRx data for 8N. Pilot observational work on 8N suggested that this approach was valid; however, using observation on both wards would have been ideal. We found no obvious effect of ServeRx on drug round times, which differed to our previous study where time spent on drug rounds decreased.1

Since nurses are prompted by ServeRx when doses are due, it is logical there would be fewer medications omitted with no apparent reason on 8N. The reason for the higher proportion of doses omitted because of unavailability is unclear. A future study to verify reasons for unavailability would be useful, differentiating between drugs that are newly prescribed and those previously supplied.

It appears that in spite of staff perceptions, ServeRx has been effective in reducing the overall incidence of dose omissions compared to a ward using paper drug charts. These findings are in line with those published previously.1 We suspect that omissions are simply more obvious with electronic administration records.

While all 8W patients had allergy documentation, 7% of 8N patients did not. Given the small sample size, we cannot say if these differences are significant. Consideration should be given to making allergy status a mandatory field on ServeRx; staff have been reminded that documentation of allergy/sensitivity status is the joint responsibility of nursing, medical and pharmacy staff.

In conclusion, it appears ServeRx has little, if any, effect on the time needed for nurses to perform drug rounds and it reduces dose omissions. However, allergy/sensitivity status was less well completed than on the comparator ward.

References
Recruitment and retention of Band 6 pharmacists in Yorkshire and Humber SHA

Acomb C, Kay EA
Leeds Teaching Hospitals NHS Trust

Introduction
Within Yorkshire and The Humber SHA 50 hospital pharmacists’ posts (9%) have been vacant for more than three months. This compares with the national vacancy rate of 8% for all grades of pharmacist. One of the major areas of concern is that 16% of posts at Band 6 and 7 have been vacant for more than three months. This is a major issue for hospital pharmacy and is preventing the development of services and has the potential to compromise patient care.

Objectives
- To understand the career aspirations of hospital preregistration pharmacy students.
- To review the employment arrangements for Band 6 pharmacists in a range of hospitals.

Method
An anonymous on-line survey of preregistration hospital pharmacy students currently employed in Yorkshire and Humber was undertaken. The questionnaire was designed to provide quantitative data but also included “free text” boxes to allow some qualitative review. The survey was undertaken in January before the students had applied for the current round of job applications.

A separate on-line survey was developed to review the current employment arrangements for Band 6 pharmacists. This survey was distributed to chief pharmacists in Yorkshire and Humber, and to the chief pharmacists of the Association of Teaching Hospital Pharmacists.

Results
Eighteen students (13 full-time and five Bradford University sandwich students) completed the on-line questionnaire. Fourteen students (78%) wanted to work initially in hospital practice after registration but only eight (44%) currently felt certain this would be their long-term career pathway. Three of the four students who did not want to work initially in hospital said low hospital salaries was a factor in their decision making. Overall for this cohort the mean debt from student loan was £11,500 with a range of £0–£20,000.

Eleven (61%) students thought their highest academic qualification would be a postgraduate diploma. However, seven (39%) students thought it would be a PhD or DPharm. Fourteen (78%) students wanted to start further formal education within their first year of registration. Ten (56%) students expected to be at their final career grade within five years of registering as a pharmacist.

Working in a clinical environment and working as part of a multidisciplinary team were key themes that were important for students wanting to work in hospital.

The questionnaire to the trusts showed a range of employment conditions. Twenty-five trusts responded. Twenty (80%) trusts provide permanent contracts while five trusts provide either two- or three-year contracts. All 25 trusts provide diploma training but only nine (36%) provide training to all their Band 6 pharmacists in the first year of employment — something identified as important by students.

Twenty trusts (80%) expect their Band 6 pharmacists to undertake either on-call or rostered out of hours duties in their first year. Nine (36%) trusts expect their on-call or rostered work to be undertaken alone without experienced supervision, in the Band 6 pharmacists’ first year of employment. Various types of supervision and “second on-call” were described by a number of trusts. However, five trusts report using Band 7 pharmacists for residency duties.

Twenty-one trusts (84%) do not have any further (beyond diploma) formal education programmes. The minimum qualification to become a Band 7 pharmacist varied with one trust not answering this question (see Table 1). A number of trusts stressed that hospital experience was essential in addition to or instead of formal qualifications.

The duration of the career pathway varied widely across trusts (see Table 2). A number of trusts said this was coming under pressure and was likely to become shorter because of recruitment difficulties.

Discussion
The student questionnaire only surveyed preregistration students currently employed in hospital. It did not include students who had already started their career pathway in community practice. In the group we surveyed only 78% wanted to continue their career in hospital practice.

Evidence is presented of the mismatch between the training/qualification expectations of students compared with that offered by trusts. A significant proportion of students thought they would like to study up to PhD or DPharm level, but few trusts offer this opportunity routinely. A large proportion (78%) wanted to start their formal training in their first year but this is only offered to all Band 6 pharmacists by 36% of trusts surveyed.

The variation in the type of work undertaken out of hours or oncall was not explored but the trust survey does report wide variation in whether pharmacists work alone or unsupervised in their first year. We feel this is of potential concern and needs further research. It is noteworthy that some trusts now employ Band 7 pharmacist for residency duties.

Career progression varies greatly across trusts with many trusts under pressure to appoint pharmacists to Band 8a posts with minimal experience. The new professional body and work undertaken by Codeg and UKCPA groups have started describing career pathways for advanced practice. However, the reality at the moment is that vacancies and service pressures are forcing the appointment to some posts of pharmacists with only a few years experience.

We believe more work needs to be done to define the duties, career pathway and training of Band 6 and 7 pharmacists so that a more consistent approach is taken across the country. Recruitment and retention of pharmacists is dependent on meeting the career expectation of prospective pharmacists. With many students having a significant debt, either a “recruitment or retention payment” or rapid career progression may be a driving pressure.

Table 1: The minimum qualification to be appointed to a Band 7 post

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>No formal qualification (other than degree)</td>
<td>4 (17%)</td>
</tr>
<tr>
<td>Postgraduate certificate or equivalent</td>
<td>7 (29%)</td>
</tr>
<tr>
<td>Postgraduate diploma or equivalent</td>
<td>13 (54%)</td>
</tr>
<tr>
<td>MSc or higher qualification</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2: Average experience (Band 6 + Band 7) before becoming a Band 8a pharmacist

<table>
<thead>
<tr>
<th>Experience</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–2 years</td>
<td>0</td>
</tr>
<tr>
<td>3 years</td>
<td>5 (21%)</td>
</tr>
<tr>
<td>4 years</td>
<td>13 (54%)</td>
</tr>
<tr>
<td>5 years</td>
<td>5 (21%)</td>
</tr>
<tr>
<td>More than 5 years</td>
<td>1 (4%)</td>
</tr>
</tbody>
</table>

Reference
Does pharmacy access to electronic GP medication records improve medicines reconciliation on a hospital admissions unit?

Mohammed F
Gwent Healthcare NHS Trust, Newport, Wales.

Introduction
Medication errors pose a threat of harm to hospital inpatients, leading to increased morbidity, mortality and economic burden to health services. Errors occur most commonly on transfer between care settings and particularly at the time of admission. The aim of medicines reconciliation on hospital admission is to ensure that medicines prescribed on admission correspond to those that the patient was taking before admission.

The individual health record (IHR) is a view only extract of the patient's GP record held on a central repository. It includes details of the patient's repeat medication, medication history and allergies. It was implemented in the medical admissions unit (MAU) at Royal Gwent hospital in south Wales in May 2008. The MAU has an average daily throughput of 45 patients per day with 49% from the emergency unit, 49% from general practice and 2% from nursing homes and outpatient clinics.

Currently 83 out of 94 local GP practices provide data to the individual health record, and records are available on 503,192 patients out of a potential population of 589,708 (85%). The pharmacist collected data to investigate the effects of electronic access to GP records on medicines reconciliation for adults admitted to hospital.

Objectives
1. To identify the source of information used to complete medicines reconciliation for each patient seen by the pharmacist before and after implementation of IHR
2. To determine frequency and duration of calls to GP surgeries for medicines reconciliation purposes before and after implementation of IHR

Method
This was a prospective study using data collected on MAU over a two week period pre "go-live" (18 April to 2 May 2008) and three months post "go-live" (2 to 15 August 2008) of the IHR. Only patients with an IHR record available and accessible were included in the post implementation data collection period.

Often two or more sources are used to obtain an accurate medication history; however, for purposes of this study, only the main source of information was documented for each patient.

An average time for a phone call (five minutes) and an average time to access the IHR (two minutes) are used to evaluate duration of time spent retrieving data.

Data was analysed using simple descriptive statistics.

Results
• Of 98 admissions seen by the pharmacist in the two-week period pre IHR "go-live" the GP was phoned for medicines reconciliation information on 30 occasions (31%) and information was collected from other sources on 68 occasions (69%)
• Of 132 admissions post IHR implementation, data for 17 patients was excluded due to IHR being unavailable.
• Of the 115 patients included in the study, IHR was not required for 96 patients (83.3%) because information was collected from other sources.

Discussion
Medicines reconciliation information was gathered from other sources for 69% of patients pre-go live compared with 83% of patients post "go-live". The IHR was used as the main source of information on 17 occasions (15%) and is a useful tool to aid medicines reconciliation when the patient is unable to provide details.

The study demonstrated there was a 20% reduction in telephone calls to general practice after implementation and the time taken to phone the GP or access the IHR showed the pharmacist spent 50 minutes less each week obtaining this information. Although the scale of the benefit seen appears small from the study it is worth noting this will be magnified when the product is implemented throughout unscheduled care in Wales.

Limitations of study
The low use of the IHR during the study is a direct consequence of having other sources of information available which are used first. The use of the IHR and impact on medicines reconciliation by pharmacy on weekends when GP surgeries are shut warrants further investigation.

The role of the admissions based technician has recently evolved to include drug history taking but the technician currently does not have access to the IHR. Therefore the drug histories completed by the technician were not included in the study and reduced the sample size.

The information governance model for the pilot project will need revision before technician access can be granted.

Plans to roll out the IHR system across Wales were approved by Health Minister Edwina Hart on 7 January 2009.

ACKNOWLEDGEMENTS
I would like to thank the pharmacists and the pharmacy technicians involved for their help with the data collection and Julia Arthur, IHR Project Manager, Informing Healthcare (Wales), for input into data collection and evaluation.

Reference
The impact of a pharmacist independent prescriber on an acute medical unit

Thakkar K
Department of Pharmacy, Hammersmith Hospital, Imperial College Healthcare NHS Trust, London

Introduction
Regulations to allow independent prescribing (IP) by pharmacists came into effect in May 2006. The primary aim of this legislation was improving patient access to medications. However, there are additional potential benefits which include reducing prescribing errors.

Most of the current published literature focuses on supplementary prescribing with very little focus on clinical outcomes. There is little published research about pharmacist IP, particularly in secondary care. Our aim was to develop a model of IP for the acute medical unit and to evaluate its impact on patient care.

Objectives
● To implement IP on the acute medical unit
● To document the numbers and types of prescribing decisions made by the pharmacist
● To explore the clinical significance of these prescribing decisions

Methods
IP was introduced in November 2008. Key medical, nursing and pharmacy personnel were made aware of the new pharmacist IP role. All prescriptions written were within the scope of practice of the prescriber. This included prescribing for patients with chronic obstructive pulmonary disease and asthma, thromboprophylaxis, medications unintentionally omitted during drug history taking and smoking cessation therapies. Prescriptions were annotated on the drug chart with a clearly visible red stamp with the name of the pharmacist and "Pharmacist Independent Prescriber". This is to make the prescription obvious to other healthcare professionals. All prescribing interventions (except those made on the ward round in conjunction with medical team) were documented in the patient’s medical notes.

The evaluation was carried out on two acute medical wards (total of 28 beds) on the 40 days on which the IP pharmacist covered these wards between 4 November 2008 and 3 February 2009 (13 weeks). Patients included in this study were those admitted onto the study wards for whom one or more prescriptions were written by the IP pharmacist within 24 hours of admission.

Data collected included patient identifier, date and reason for admission, details of any prescriptions written and reasons for prescribing, and whether or not each prescription was queried by the medical team by the time of the next post-take ward round (PTWR). If no amendments were made by the medical team, this was taken to mean that the prescription was accepted and that the IP pharmacist had not made any prescribing errors. Each prescribing decision was then assessed for clinical significance based on a validated method developed for the assessment of prescribing errors. Two senior pharmacists and two medical consultants assessed each prescribing decision on a scale of 0 to 10, where 0 represented no clinical significance to the patient and 10 a case where failure to prescribe would have resulted in death. The mean score across the four judges was calculated and used as an index of severity, where those scoring less than 3 have minor significance, 3–7 have moderate significance and more than 7 have major significance to the patient.

Results
A total of 217 prescriptions were written during the 40 days (mean 5.4 per day). All were accepted by the medical team without amendment or query, and the prescribing error rate therefore assumed to be zero. Eighty per cent (n=173) of prescriptions were for drugs that were omitted during drug history taking (Table 1). Another 12% (n=26) were written for thromboprophylaxis according to trust guidance. Other prescriptions written included altering doses of antibiotics based on renal function (1%; n=3) and prescribing smoking cessation medication (1%; n=3). The 217 prescriptions were then screened for clinical significance; the mean severity score was 4.6. Of the 217 prescriptions, 216 (99.5%) were of moderate significance and one (0.5%) was of minor significance. None were of major significance.

Discussion
This study demonstrated that pharmacist IP can be successfully implemented on an acute medical unit. The high number of items prescribed each day suggests a demand for this service and a key role for a pharmacist IP. In addition, the mean severity score of 4.6 suggests that prescribing interventions were likely to be significant in relation to patient care. This service development offered by the pharmacist IP is sustainable due to the fact that they are part of the existing ward-based pharmacy team.

Recent NICE/NPSA guidance states that newly admitted patients should have medicines reconciliation within 24 hours. Previous internal audits have shown that unintentional omissions from drug history taking are not followed up for up to 72 hours. A pharmacist independent prescriber ensures medicine reconciliation is done within 24 hours of the patient’s admission. Unintentional omissions do not get carried forward to the discharge prescriptions and patients have better continuity of care.

A limitation of this study is that we do not know whether, or when, these prescriptions would have been written if it was not for the IP pharmacist. Further work in this area could look at replicating this study in a larger sample size and looking at opinions of patients, doctors, nurses and other stakeholders related to IP pharmacists.

References
3 Dean B and Barber D. A validated, reliable method of scoring the severity of medication errors. American Journal of Health-system Pharmacy 1999; 56: 57–62

Table 1: Ten most common drugs/drug classes prescribed

<table>
<thead>
<tr>
<th>Type of medication</th>
<th>Number of prescriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enoxaparin</td>
<td>26</td>
</tr>
<tr>
<td>Antihypertensives and antianginals</td>
<td>21</td>
</tr>
<tr>
<td>Eye, ear and nose drops</td>
<td>19</td>
</tr>
<tr>
<td>Inhalers</td>
<td>18</td>
</tr>
<tr>
<td>Proton pump Inhibitors</td>
<td>18</td>
</tr>
<tr>
<td>Bisphosphonates</td>
<td>10</td>
</tr>
<tr>
<td>Statins</td>
<td>10</td>
</tr>
<tr>
<td>Calcium supplements</td>
<td>9</td>
</tr>
<tr>
<td>Aspirin or clopidogrel</td>
<td>7</td>
</tr>
<tr>
<td>Iron preparations</td>
<td>7</td>
</tr>
</tbody>
</table>
Implementing a system to ensure purchasing for safety principles are followed when procuring medicines at Wirral University Teaching Hospital

Fallon R, Herbert K
Pharmacy Department, Wirral University Teaching Hospital
NHS Foundation Trust, Wirral

Introduction
In 2000 “The organisation with a memory” was published, setting the direction for building systems in the NHS to protect patients from harm and to learn from our mistakes. The implementation plan for this, “Building a safer NHS for patients”, identified that purchasing was an unsystematic process and that action should be taken to build safety into purchasing policy within the NHS. As the drugs bill is a significant part of NHS procurement and medicines are related to a high number of incidents this is an obvious area pharmacy staff should be reviewing.

In addition in 2007 the National Patient Safety Alert (NPSA) 20, “Promoting safer use of injectable medicines”, recommended that all NHS organisations implement a “purchasing for safety” policy to promote procurement of injectable medicines with inherent safety features.

It is clear there is a need for purchasing for safety systems for medicines, which would include injectable medicines which hold a higher incidence of risk.

Objectives
- To devise and implement a system to ensure the procurement of medicines followed purchasing for safety good practice principles.
- To ensure areas of non-compliance are fed back appropriately so that lessons could be learnt and the knowledge shared.

Method
A review of the requirements of the NPSA 20 and of the recommendations of Quality Control North West’s “Purchasing for safety” resource document (produced in November 2007)” was conducted. A pharmacy standard operating procedure (SOP) was written and approved by the Pharmacy SOP Advisory Group in May 2008. It included a risk assessment, listing essential and desirable criteria, that aims to ensure, where possible, that:

- Injectable medicines include technical information on preparation and administration.
- Medicines are designed in such a way as to promote safer practice (including packaging, labelling and the patient information leaflet).
- Medicines are ready to administer or ready to use.
- Corporate livery issues (eg, drug, form and strength differentiation) and livery differentiation issues between different suppliers/ manufacturers are considered.
- Medicines are robot compatible.

Designated staff were trained in the new process and how it integrated with current practice. A database was developed to record the outcomes of each review.

The new system requires that any medicine procured outside of regional or national contracting arrangements must be assessed by a senior pharmacist who has full understanding of the purpose and use of the product, and knowledge of reported medication errors within the Trust. If the medicine is an injectable medicine then an additional risk assessment is also required, in line with NPSA guidance. Also for any injectable medicine that is new to the trust, even if procured within the regional or national contracting arrangement, a risk assessment is performed to ensure the injection is suitable for use within the trust.

Table 1: Medicines not approved

<table>
<thead>
<tr>
<th>Product description</th>
<th>Manufacturer</th>
<th>Reason for not approving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aciclovir 250mg dry powder injection</td>
<td>Wockhardt</td>
<td>Poor technical data. No displacement value specified which is necessary for use in paediatric wards. Does not state if latex free</td>
</tr>
<tr>
<td>Ceftriaxone 250mg and 1g injection</td>
<td>DEMO SA</td>
<td>No technical data of reconstitution volume, final concentrations and displacement value which are particularly necessary in paediatrics. Poor product packaging</td>
</tr>
<tr>
<td>Citalopram 10mg tablets</td>
<td>Activas</td>
<td>No tablet markings and licensed indications not comprehensive</td>
</tr>
<tr>
<td>Co-amoxiclav 600mg injection</td>
<td>Bowmed</td>
<td>No technical data of reconstitution volume, final concentrations and displacement value which are particularly necessary in paediatrics</td>
</tr>
<tr>
<td>Magnesium sulphate 5g in 10ml injection</td>
<td>Martindale</td>
<td>No summary of product characteristics with the pack. Volume of infusion fluid not listed, no stability or compatibility data, no millimetres/ml on the box or ampoule</td>
</tr>
<tr>
<td>Glycopyronium bromide 0.5mg and neostigmine 2.5mg in 1ml injection (Robinul)</td>
<td>Anpharm</td>
<td>Confusing information regarding strength on packaging</td>
</tr>
</tbody>
</table>

Results
Since implementation in June 2008, 104 medicines have been assessed. The most common reason, 66%, for the purchase not being a medicine on a regional or national contract was due to the NHS Purchasing and Supply Agency (PASA) contract line not being available. Out of the 104 medicines assessed the majority were approved for use. Seven (6.7%) were not approved for use and were returned to the supplier. The reason for not approving them was mainly due to poor technical data for injectable medicines.

A separate risk assessment was conducted for the injectable medicines. Five products were deemed moderate risk products and two were scored as high risk. The injectable medicines involved had already been identified and were on the trust’s list for risk reduction strategies with their use.

Discussion
Often problems with medicines are highlighted once the product is about to be used and the end user encounters a problem. Preventing the product from getting to the end user is far preferable from a safety viewpoint but also negates the inconvenience encountered from retrospectively reviewing the product and withdrawing it and also the potential financial loss. In the nine months since implementing the new system of risk assessing the medicine prior to release downstream of the supply chain, seven medicines have been prevented from entering it and potentially causing problems.

References
4. Quality Control North West. Purchasing for safety. A resource document for trusts to facilitate compliance with NPSA
9 An observational study into intravenous medicine preparation and administration at a district general hospital

Malton S*, Hedges C*, Aldred A*, Roberts V†, Dale C†
*Harrogate and District NHS Foundation Trust; †Baxter Healthcare

Introduction
Around 24% of medication incidents reported to the NPSA concerned injectable medicines, with 25 fatalities and 28 incidents of serious harm between January 2005 and June 2006. At Harrogate and District NHS Foundation Trust (HDFT) in 2007–08, 46 errors involving intravenous medicines were reported, 15% causing moderate harm. Following the 2007 NPSA Patient Safety Alert 20, “Promoting safer use of injectable medicines” we have implemented various actions, one of which was to audit the use of injectable medicines using an observational study.

Objectives
- To audit the use of injectable medicines at HDFT; identify current practice and any deficiencies in compliance with the NPSA alert and local standards.
- To identify training requirements for injectable medicine preparation and administration.
- To provide recommendations for improving practice to the Injectable Medicines Safety Group (IMSG).

Method
We engaged key stakeholders, namely the IMSG, in agreeing the study’s objectives. Project leads were identified and data was collected and analysed. The results and recommendations were reported to IMSG for implementation throughout the trust. Over 15 days, a registered nurse visited predefined clinical areas to observe the preparation and administration of IV medicines. With the permission of the nurse in charge, practice was observed and recorded. Staff were also questioned regarding injectable medicines training.

Results
Eighty–six observations were undertaken of 52 members of nursing staff (ranging from Bands 5 to 7) in 10 clinical areas. The areas included acute and rehabilitation wards, critical care areas, the oncology day unit, paediatrics and obstetrics. A total of 35 parameters were assessed in four main clusters–environmental observations, preparation, administration and training.

Of the medicines administered, 55% (n=26) were prepared at ward level, 36% (n=17) in pharmacy and 9% (n=4) prepared commercially. Table 1 demonstrates the location of injectable medicine preparation in clinical areas.

Other major findings were:
- On 98% (n=82) of occasions, the nurse was witnessed undertaking hand decontamination.
- In 95% (n=81) of cases products were checked by two nurses.
- 57% (n=35) of nurses wore gloves.
- In 96% (n=80) of cases the patient was positively identified.
- An aseptic “no touch” technique was employed in 100% (n=84) of cases.
- Preparation time ranged from one to 15 minutes with the majority of products taking two to five minutes.
- 62% (n=34) of nurses had undergone IV training more than two years ago; one nurse was practising IV administration without training.
- Only 19% (n=18) of nurses were aware of NPSA alert 20.

Discussion
The majority of IV drugs were found to have been prepared in clinical areas. The study served the purpose of auditing this practice and highlighted a number of areas requiring improvement. The majority of drugs prepared in clinical areas were done so using the minibag plus safety device. This is a low risk procedure in line with our risk assessment. However, some higher risk medicines were being prepared in near patient areas, in a variety of locations, many of which were unsuitable for injectable medicines preparation.

The results were reported to IMSG, and an action plan was formulated. The plan was disseminated to all clinical directorates and training undertaken for senior nurses to cascade in their area. Two nurses (2%) did not undertake hand decontamination before preparing or administering an injectable medicine, which contravened the HDFT injectable medicines policy1 and the infection control policy2. This was reported to the infection control team. There was confusion as to when gloves should be worn. After discussion, it was agreed that nurses should wear gloves when preparing injectable medicines and when accessing any intravenous device, as a personal protective measure. The infection control policy states that sterile gloves should be worn when manipulating central venous catheters.

In 4% (n=3) of cases the patient was not positively identified. This is of concern. HDFT has a positive identification policy and has investigated a number of errors concerning patient identification. The trust is looking at ways to address this.

Our policy states that all intravenous medicines should be checked by two qualified practitioners3. This did not occur in 3% (n=3) of cases. This has been reiterated to senior nurses. In injectable medicines training, nurses currently attend a study day, are tested on calculations and complete a work-based competency manual. Many nurses received this training several years ago. Due to staffing and time issues an update for all nurses was difficult to deliver and methods to address this are being pursued.

This study has highlighted areas of good practice and some deficiencies. Errors with injectable medicines are common and following the NPSA alert we are taking action to minimise these. In response to the results of the study additional recommendations were made:
- All new staff joining the trust should receive IV training – now in place for nursing staff and will be extended to junior medical staff shortly.
- Establish designated IV preparation sites in clinical areas, where staff will not be disturbed.
- Standardise throughout the hospital a needle-free system – as part of HDFT’s purchasing for safety policy, several new devices for safer IV preparation have been introduced in clinical areas.

References

Table 1: Where drugs were prepared in clinical areas (n = 86 observations)

<table>
<thead>
<tr>
<th>Site of preparation</th>
<th>Number of products</th>
<th>Percentage of products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>Bedside</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Drug preparation area</td>
<td>33</td>
<td>41</td>
</tr>
<tr>
<td>On the desk</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Bedside on sterile trolley</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Bedside on nursing kardex</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>On patient bedside table</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Evaluating the impact of a closed-loop electronic prescribing system on a medicine for the elderly ward

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Introduction
ServeRx is a closed-loop system comprising electronic prescribing, ward-based automated dispensing, barcode patient identification and electronic medication administration records. It has been in use on ward 8 North (8N) at Charing Cross Hospital since summer 2003. At that time, 8N was a surgical ward, and a full evaluation was completed.1-3 Ward 8N then became a Medicine for the Elderly ward, and ServeRx was reintroduced in 2007. However, some concerns arose over the length of time required to conduct drug rounds and the incidence of missed doses. In addition, we were interested in its effects on the documentation of allergy/sensitivity status.

We therefore wanted to assess a more limited range of outcome measures to evaluate the impact of ServeRx with a Medicine for the Elderly population. We used ward 8 West (8W) as a comparator, as it serves the same patient population and consultants, but uses the traditional paper drug chart and manual dispensing system.

Objectives
To compare the following for 8N and 8W: the time taken to complete drug rounds; the incidence of missed doses and clinically significant missed doses; and the documentation of patient allergies/sensitivities.

Methods
Seven 8am drug rounds were directly observed on 8W to determine the time taken and the numbers of patients and medications involved. The same data were retrieved from ServeRx for 15 8am rounds on 8N. One drug round related to patients on one half of each ward.

We recorded the total number of regular doses that each patient should have received, and details of any omitted due to being unavailable or having no reason documented. We studied each patient’s current drug chart on 8W, and the past two weeks’ data on 8N. Data collection was performed twice, two weeks apart, to increase the sample size. Clinically significant omissions were identified by a senior clinical pharmacist using pre-existing pharmacy criteria.

We assessed documentation of allergy/sensitivity status on four occasions, one week apart. ServeRx was used to retrieve data for all patients on 8N and all available drug charts were reviewed on 8W. The percentage of patients without documented allergy/sensitivity status was calculated for each ward.

Results
A total of seven drug rounds, comprising 60 patients administered 340 medications, were observed on 8W. Data for 15 drug rounds, comprising 136 patients and 892 medications, were collected on 8N (Table 1). Overall, mean time per drug round was similar on each ward, with no statistically significant difference. Mean time spent on medication rounds per patient was also similar, although 8N nurses spent slightly less time per medication.

Table 1: Summary of data collected on duration of medication rounds

<table>
<thead>
<tr>
<th>Ward</th>
<th>Mean drug round time (minutes, 95% confidence interval)</th>
<th>Mean time per patient (minutes)</th>
<th>Mean time per medication (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8W</td>
<td>69.3 ± 12.8</td>
<td>8.1</td>
<td>1.4</td>
</tr>
<tr>
<td>8N</td>
<td>73.7 ± 13.8</td>
<td>8.1</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Overall, 3.1% of 2,866 doses were omitted on 8W and only 1.8% of 3,784 on 8N, a statistically significant difference (95% confidence interval for difference −0.5 to −2.1%). 8N had a significantly higher prevalence of doses omitted because medication was unavailable (1.6% versus 0.6% of all doses due), but a significantly lower proportion of doses omitted where no reason was given (0.3% versus 2.5%). This amounts to an overall net decrease in omitted doses. Clinically significant dose omissions were also less common on 8N (1.3% versus 1.8%) although the difference was not statistically significant.

A total of 59 patient drug charts were reviewed for documentation of allergy/sensitivity status on 8W, and 75 on 8N. While all drug charts reviewed on 8W had allergy/sensitivity status documented, five (7%) of those reviewed on 8N were without documentation.

Discussion
There are some limitations to our data collection. We used observation to collect data on drug round duration on 8W and retrieved ServeRx data for 8N. Pilot observational work on 8N suggested that this approach was valid; however, using observation on both wards would have been ideal. We found no obvious effect of ServeRx on drug round times, which differed to our previous study where time spent on drug rounds decreased.

Since nurses are prompted by ServeRx when doses are due, it is logical there would be fewer medications omitted with no apparent reason on 8N. The reason for the higher proportion of doses omitted because of unavailability is unclear. A future study to verify reasons for unavailability would be useful, differentiating between drugs that are newly prescribed and those previously supplied.

It appears that in spite of staff perceptions, ServeRx has been effective in reducing the overall incidence of dose omissions compared to a ward using paper drug charts. These findings are in line with those published previously. We suspect that omissions are simply more obvious with electronic administration records.

While all 8W patients had allergy documentation, 7% of 8N patients did not. Given the small sample size, we cannot say if these differences are significant. Consideration should be given to making allergy status a mandatory field on ServeRx; staff have been reminded that documentation of allergy/sensitivity status is the joint responsibility of nursing, medical and pharmacy staff.

In conclusion, it appears ServeRx has little, if any, effect on the time needed for nurses to perform drug rounds and it reduces dose omissions. However, allergy/sensitivity status was less well completed than on the comparator ward.

References
Recruitment and retention of Band 6 pharmacists in Yorkshire and Humber SHA

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Leeds Teaching Hospitals NHS Trust

Introduction
Within Yorkshire and The Humber SHA 50 hospital pharmacists’ posts (9%) have been vacant for more than three months. This compares with the national vacancy rate of 8% for all grades of pharmacist. One of the major areas of concern is that 16% of posts at Band 6 and 7 have been vacant for more than three months. This is a major issue for hospital pharmacy and is preventing the development of services and has the potential to compromise patient care.

Objectives
- To understand the career aspirations of hospital preregistration pharmacy students.
- To review the employment arrangements for Band 6 pharmacists in a range of hospitals.

Method
An anonymous on-line survey of preregistration hospital pharmacy students currently employed in Yorkshire and Humber was undertaken. The questionnaire was designed to provide quantitative data but also included “free text” boxes to allow some qualitative review. This was undertaken in January before the students had applied for the current round of job applications.

A separate on-line survey was developed to review the current employment arrangements for Band 6 pharmacists. This survey was distributed to chief pharmacists in Yorkshire and Humber, and to the chief pharmacists of the Association of Teaching Hospital Pharmacists.

Results
Eighteen students (13 full-time and five Bradford University sandwich students) completed the on-line questionnaire. Fourteen students (78%) wanted to work initially in hospital practice after registration but only eight (44%) currently felt certain this would be their long-term career pathway. Three of the four students who did not want to work initially in hospital said low hospital salaries was a factor in their decision making. Overall for this cohort the mean debt from student loan was £11,500 with a range of £0–£20,000.

Eleven (61%) students thought their highest academic qualification would be a postgraduate diploma. However, seven (39%) students thought it would be a PhD or DPharm. Fourteen (78%) students wanted to start further formal education within their first year of registration. Ten (56%) students expected to be at their final career grade within five years of registering as a pharmacist.

Working in a clinical environment and working as part of a multidisciplinary team were key themes that were important for students wanting to work in hospital.

The questionnaire to the trusts showed a range of employment conditions. Twenty-five trusts responded. Twenty (80%) trusts provide permanent contracts while five trusts provide either two- or three-year contracts. All 25 trusts provide diploma training but only nine (36%) provide training to all their Band 6 pharmacists in the first year of employment — something identified as important by students.

Twenty trusts (80%) expect their Band 6 pharmacists to undertake either on-call or rostered out of hours duties in their first year. Nine (36%) trusts expect their on-call or rostered work to be undertaken alone without experienced supervision, in the Band 6 pharmacists’ first year of employment. Various types of supervision and “second on-call” were described by a number of trusts. However, five trusts report using Band 7 pharmacists for residency duties.

Table 1: The minimum qualification to be appointed to a Band 7 post

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>No formal qualification (other than degree)</td>
<td>4 (17%)</td>
</tr>
<tr>
<td>Postgraduate certificate or equivalent</td>
<td>7 (29%)</td>
</tr>
<tr>
<td>Postgraduate diploma or equivalent</td>
<td>13 (54%)</td>
</tr>
<tr>
<td>MSc or higher qualification</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2: Average experience (Band 6 + Band 7) before becoming a Band 8a pharmacist

<table>
<thead>
<tr>
<th>Experience</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–2 years</td>
<td>0</td>
</tr>
<tr>
<td>3 years</td>
<td>5 (21%)</td>
</tr>
<tr>
<td>4 years</td>
<td>13 (54%)</td>
</tr>
<tr>
<td>5 years</td>
<td>5 (21%)</td>
</tr>
<tr>
<td>More than 5 years</td>
<td>1 (4%)</td>
</tr>
</tbody>
</table>

Twenty-one trusts (84%) do not have any further (beyond diploma) formal education programmes. The minimum qualification to become a Band 7 pharmacist varied with one trust not answering this question (see Table 1). A number of trusts stressed that hospital experience was essential in addition to or instead of formal qualifications.

The duration of the career pathway varied widely across trusts (see Table 2). A number of trusts said this was coming under pressure and was likely to become shorter because of recruitment difficulties.

Discussion
The student questionnaire only surveyed preregistration students currently employed in hospital. It did not include students who had already started their career pathway in community practice. In the group we surveyed only 78% wanted to continue their career in hospital practice.

Evidence is presented of the mismatch between the training/qualification expectations of students compared with that offered by trusts. A significant proportion of students thought they would like to study up to PhD or DPharm level, but few trusts offer this opportunity routinely. A large proportion (78%) wanted to start their formal training in their first year but this is only offered to all Band 6 pharmacists by 36% of trusts surveyed.

The variation in the type of work undertaken out of hours or on call was not explored but the trust survey does report wide variation in whether pharmacists work alone or unsupervised in their first year. We feel this is of potential concern and needs further research. It is noteworthy that some trusts now employ Band 7 pharmacist for residency duties.

Career progression varies greatly across trusts with many trusts under pressure to appoint pharmacists to Band 8a posts with minimal experience. The new professional body and work undertaken by Codeg and UKCPA groups have started describing career pathways for advanced practice. However, the reality at the moment is that vacancies and service pressures are forcing the appointment to some posts of pharmacists with only a few years experience.

We believe more work needs to be done to define the duties, career pathway and training of Band 6 and 7 pharmacists so that a more consistent approach is taken across the country. Recruitment and retention of pharmacists is dependent on meeting the career expectation of prospective pharmacists. With many students having a significant debt, either a “recruitment or retention payment” or rapid career progression may be a driving pressure.

Reference
1 NHS Pharmacy Staffing Establishment & Vacancy Survey 2008.
6 Does pharmacy access to electronic GP medication records improve medicines reconciliation on a hospital admissions unit?

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Gwent Healthcare NHS Trust, Newport, Wales.

Introduction
Medication errors pose a threat of harm to hospital inpatients, leading to increased morbidity, mortality and economic burden to health services. Errors occur most commonly on transfer between care settings and particularly at the time of admission.1 The aim of medicines reconciliation on hospital admission is to ensure that medicines prescribed on admission correspond to those that the patient was taking before admission.1

The individual health record (IHR) is a view only extract of the patient's GP record held on a central repository. It includes details of the patient's repeat medication, medication history and allergies. It was implemented in the medical admissions unit (MAU) at Royal Gwent hospital in south Wales in May 2008. The MAU has an average daily throughput of 45 patients per day with 49% from the emergency unit, 49% from general practice and 2% from nursing homes and outpatient clinics.

Currently 83 out of 94 local GP practices provide data to the individual health record, and records are available on 503,192 patients out of a potential population of 589,708 (85%). The pharmacist collected data to investigate the effects of electronic access to GP records on medicines reconciliation for adults admitted to hospital.

Objectives
1 To identify the source of information used to complete medicines reconciliation for each patient seen by the pharmacist before and after implementation of IHR
2 To determine frequency and duration of calls to GP surgeries for medicines reconciliation purposes before and after implementation of IHR

Method
This was a prospective study using data collected on MAU over a two week period pre "go-live" (18 April to 2 May 2008) and three months post "go-live" (2 to 15 August 2008) of the IHR. Only patients with an IHR record available and accessible were included in the post implementation data collection period.

Often two or more sources are used to obtain an accurate medication history, however for purposes of this study, only the main source of information was documented for each patient.

An average time for a phone call (five minutes) and an average time to access the IHR (two minutes) are used to evaluate duration of time spent retrieving data.

Data was analysed using simple descriptive statistics.

Results
- Of 98 admissions seen by the pharmacist in the two-week period pre IHR “go-live” the GP was phoned for medicines reconciliation information on 30 occasions (31%) and information was collected from other sources on 68 occasions (69%)
- Of 132 admissions post IHR implementation, data for 17 patients was excluded due to IHR being unavailable.
- Of the 115 patients included in the study, IHR was not required for 96 patients (83.3%) because information was collected from other sources.

Discussion
Medicines reconciliation information was gathered from other sources for 69% of patients pre go live compared with 83% of patients post “go-live”. The IHR was used as the main source of information on 17 occasions (15%) and is a useful tool to aid medicines reconciliation when the patient is unable to provide details.

The study demonstrated there was a 20% reduction in telephone calls to general practice after implementation and the time taken to phone the GP or access the IHR showed the pharmacist spent 50 minutes less each week obtaining this information. Although the scale of the benefit seen appears small from the study it is worth noting this will be magnified when the product is implemented throughout unscheduled care in Wales.

Limitations of study
The low use of the IHR during the study is a direct consequence of having other sources of information available which are used first. The use of the IHR and impact on medicines reconciliation by pharmacy on weekends when GP surgeries are shut warrants further investigation.

The role of the admissions based technician has recently evolved to include drug history taking but the technician currently does not have access to the IHR. Therefore the drug histories completed by the technician were not included in the study and reduced the sample size.

The information governance model for the pilot project will need revision before technician access can be granted.

Plans to roll out the IHR system across Wales were approved by Health Minister Edwina Hart on 7 January 2009.

ACKNOWLEDGEMENTS
I would like to thank the pharmacists and the pharmacy technicians involved for their help with the data collection and Julia Arthur, IHR Project Manager, Informing Healthcare (Wales), for input into data collection and evaluation.

Reference
The impact of a pharmacist independent prescriber on an acute medical unit

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Introduction
Regulations to allow independent prescribing (IP) by pharmacists came into effect in May 2006. The primary aim of this legislation was improving patient access to medications. However, there are additional potential benefits which include reducing prescribing errors.

Most of the current published literature focuses on supplementary prescribing with very little focus on clinical outcomes. There is little published research about pharmacist IP, particularly in secondary care. Our aims were to develop a model of IP for the acute medical unit and to evaluate its impact on patient care.

Objectives
- To implement IP on the acute medical unit
- To document the numbers and types of prescribing decisions made by the pharmacist
- To explore the clinical significance of these prescribing decisions

Methods
IP was introduced in November 2008. Key medical, nursing and pharmacy personnel were made aware of the new pharmacist IP role. All prescriptions written were within the scope of practice of the prescriber. This included prescribing for patients with chronic obstructive pulmonary disease and asthma, thromboprophylaxis, medications unintentionally omitted during drug history taking and smoking cessation therapies. Prescriptions were annotated on the drug chart with a clearly visible red stamp with the name of the pharmacist and "Pharmacist Independent Prescriber". This is to make the prescription obvious to other healthcare professionals. All prescribing interventions (except those made on the ward round in conjunction with medical team) were documented in the patient's medical notes.

The evaluation was carried out on two acute medical wards (total of 28 beds) on the 40 days on which the IP pharmacist covered these wards between 4 November 2008 and 3 February 2009 (13 weeks). Patients included in this study were those admitted onto the study wards for whom one or more prescriptions were written by the IP pharmacist within 24 hours of admission. Data collected included patient identifier, date and reason for admission, details of any prescriptions written and reasons for prescribing, and whether or not each prescription was queried by the medical team by the time of the next post-take ward round (PTWR). If no amendments were made by the medical team, this was taken to mean that the prescription was accepted and that the IP pharmacist had not made any prescribing errors. Each prescribing decision was then assessed for clinical significance based on a validated method developed for the assessment of prescribing errors. Two senior pharmacists and two medical consultants assessed each prescribing decision on a scale of 0 to 10, where 0 represented no clinical significance to the patient and 10 a case where failure to prescribe would have resulted in death. The mean score across the four judges was calculated and used as an index of severity, where those scoring less than 3 have minor significance, 3–7 have moderate significance and more than 7 have major significance to the patient.

Table 1: Ten most common drugs/drug classes prescribed

<table>
<thead>
<tr>
<th>Type of medication</th>
<th>Number of prescriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enoxaparin</td>
<td>26</td>
</tr>
<tr>
<td>Antihypertensives and antianginals</td>
<td>21</td>
</tr>
<tr>
<td>Eye, ear and nose drops</td>
<td>19</td>
</tr>
<tr>
<td>Inhalers</td>
<td>18</td>
</tr>
<tr>
<td>Proton pump Inhibitors</td>
<td>18</td>
</tr>
<tr>
<td>Bisphosphonates</td>
<td>10</td>
</tr>
<tr>
<td>Statins</td>
<td>10</td>
</tr>
<tr>
<td>Calcium supplements</td>
<td>9</td>
</tr>
<tr>
<td>Aspirin or clopidogrel</td>
<td>7</td>
</tr>
<tr>
<td>Iron preparations</td>
<td>7</td>
</tr>
</tbody>
</table>

Results
A total of 217 prescriptions were written during the 40 days (mean 5.4 per day). All were accepted by the medical team without amendment or query, and the prescribing error rate therefore assumed to be zero.

Eighty per cent (n=173) of prescriptions were for drugs that were omitted during drug history taking (Table 1). Another 12% (n=26) were written for thromboprophylaxis according to trust guidance. Other prescriptions written included altering doses of antibiotics based on renal function (1%; n=3) and prescribing smoking cessation medication (1%; n=3).

The 217 prescriptions were then screened for clinical significance; the mean severity score was 4.6. Of the 217 prescriptions, 216 (99.5%) were of moderate significance and one (0.5%) was of minor significance. None were of major significance.

Discussion
This study demonstrated that pharmacist IP can be successfully implemented on an acute medical unit. The high number of items prescribed each day suggests a demand for this service and a key role for a pharmacist IP. In addition, the mean severity score of 4.6 suggests that prescribing interventions were likely to be significant in relation to patient care. This service development offered by the pharmacist IP is sustainable due to the fact that they are part of the existing ward-based pharmacy team.

Recent NICE/NPSA guidance states that newly admitted patients should have medicines reconciliation within 24 hours. Previous internal audits have shown that unintentional omissions from drug history taking are not followed up for up to 72 hours. A pharmacist independent prescriber ensures medicine reconciliation is done within 24 hours of the patient's admission. Unintentional omissions do not get carried forward to the discharge prescriptions and patients have better continuity of care.

A limitation of this study is that we do not know whether, or when, these prescriptions would have been written if it was not for the IP pharmacist. Further work in this area could look at replicating this study in a larger sample size and looking at opinions of patients, doctors, nurses and other stakeholders related to IP pharmacists.

References
Implementing a system to ensure purchasing for safety principles are followed when procuring medicines at Wirral University Teaching Hospital

Fallon R, Herbert K
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NHS Foundation Trust, Wirral

Introduction
In 2000 “The organisation with a memory” was published, setting the direction for building systems in the NHS to protect patients from harm and to learn from our mistakes. The implementation plan for this, “Building a safer NHS for patients”, identified that purchasing was an unsystematic process and that action should be taken to build safety into purchasing policy within the NHS. As the drugs bill is a significant part of NHS procurement and medicines are related to a high number of incidents this is an obvious area pharmacy staff should be reviewing.

In addition in 2007 the National Patient Safety Alert (NPSA) 20, “Promoting safer use of injectable medicines”, recommended that all NHS organisations implement a “purchasing for safety” policy to promote procurement of injectable medicines with inherent safety features. It is clear there is a need for purchasing for safety systems for medicines, which would include injectable medicines which hold a higher incidence of risk.

Objectives
- To devise and implement a system to ensure the procurement of medicines followed purchasing for safety good practice principles.
- To ensure areas of non-compliance are fed back appropriately so that lessons could be learnt and the knowledge shared.

Method
A review of the requirements of the NPSA 20 and of the recommendations of Quality Control North West’s “Purchasing for safety” resource document (produced in November 2007)” was conducted. A pharmacy standard operating procedure (SOP) was written and approved by the Pharmacy SOP Advisory Group in May 2008. It included a risk assessment, listing essential and desirable criteria, that aims to ensure, where possible, that:

- Injectables include technical information on preparation and administration.
- Medicines are designed in such a way as to promote safer practice (including packaging, labelling and the patient information leaflet).
- Medicines are ready to administer or ready to use.
- Corporate and/or issues (e.g. drug, form and strength differentiation) and livery differentiation issues between different suppliers/manufacturers are considered.
- Medicines are robot compatible.

Designated staff were trained in the new process and how it integrated with current practice. A database was developed to record the outcomes of each review.

The new system requires that any medicine procured outside of regional or national contracting arrangements must be assessed by a senior pharmacist who has full understanding of the purpose and use of the product, and knowledge of reported medication errors within the Trust. If the medicine is an injectable medicine then an additional risk assessment is also required, in line with NPSA guidance. Also for any injectable medicine that is new to the trust, even if procured within the regional or national contracting arrangement, a risk assessment is performed to ensure the injection is suitable for use within the trust.

Table 1: Medicines not approved

<table>
<thead>
<tr>
<th>Product description</th>
<th>Manufacturer</th>
<th>Reason for not approving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aciclovir 250mg dry powder injection</td>
<td>Wockhardt</td>
<td>Poor technical data. No displacement value specified which is necessary for use in paediatric wards. Does not state if latex free</td>
</tr>
<tr>
<td>Ceftriaxone 250mg and 1g injection</td>
<td>DEMO SA</td>
<td>No technical data of reconstitution volume, final concentrations and displacement value which are particularly necessary in paediatrics. Poor product packaging</td>
</tr>
<tr>
<td>Citalopram 10mg tablets</td>
<td>Activas</td>
<td>No tablet markings and licensed indications not comprehensive</td>
</tr>
<tr>
<td>Co-amoxiclav 600mg injection</td>
<td>Bowmed</td>
<td>No technical data of reconstitution volume, final concentrations and displacement value which are particularly necessary in paediatrics</td>
</tr>
<tr>
<td>Magnesium sulphate 5g in 10ml injection</td>
<td>Martindale</td>
<td>No summary of product characteristics with the pack. Volume of infusion fluid not listed, no stability or compatibility data, no millimoles/mL on the box or ampoule</td>
</tr>
<tr>
<td>Glycopyronium bromide 0.5mg and neostigmine 2.5mg in 1ml injection (Robinul)</td>
<td>Anpharm</td>
<td>Confusing information regarding strength on packaging</td>
</tr>
</tbody>
</table>

Results
Since implementation in June 2008, 104 medicines have been assessed. The most common reason, 66%, for the purchase not being a medicine on a regional or national contract was due to the NHS Purchasing and Supply Agency (PASA) contract line not being available. Out of the 104 medicines assessed the majority were approved for use. Seven (6.7%) were not approved for use and were returned to the supplier. The reason for not approving them was mainly due to poor technical data for injectable medicines. Table 1 lists the medicines concerned. All except one are injectable medicines. In all cases an alternative manufacturer of the product was successfully sought. Quality Control North West were informed of our decision and the reasons why so that the regulatory body, NPSA, suppliers and other trusts as appropriate can be notified.

A separate risk assessment was conducted for the injectable medicines. Five products were deemed moderate risk products and two were scored as high risk. The injectable medicines involved had already been identified and were on the trust’s list for risk reduction strategies with their use.

Discussion
Often problems with medicines are highlighted once the product is about to be used and the end user encounters a problem. Preventing the product from getting to the end user is far preferable from a safety viewpoint but also negates the inconvenience encountered from retrospectively reviewing the product and withdrawing it and also the potential financial loss. In the nine months since implementing the new system of risk assessing the medicine prior to release downstream of the supply chain, seven medicines have been prevented from entering it and potentially causing problems.

References
4 Quality Control North West. Purchasing for safety. A resource document for trusts to facilitate compliance with NPSA
An observational study into intravenous medicine preparation and administration at a district general hospital

Malton S*, Hedges C*, Aldred A*, Roberts Vt, Dale C†
*Harrogate and District NHS Foundation Trust; †Baxter Healthcare

Introduction
Around 24% of medication incidents reported to the NPSA concerned injectable medicines, with 25 fatalities and 28 incidents of serious harm between January 2005 and June 2006. At Harrogate and District NHS Foundation Trust (HDFT) in 2007–08, 46 errors involving intravenous medicines were reported, 15% causing moderate harm. Following the 2007 NPSA Patient Safety Alert 20, “Promoting safer use of injectable medicines” we have implemented various actions, one of which was to audit the use of injectable medicines using an observational study.

Objectives
● To audit the use of injectable medicines at HDFT; identify current practice and any deficiencies in compliance with the NPSA alert and local standards.
● To identify training requirements for injectable medicine preparation and administration.
● To provide recommendations for improving practice to the Injectable Medicines Safety Group (IMSG).

Method
We engaged key stakeholders, namely the IMSG, in agreeing the study’s objectives. Project leads were identified and data was collected and analysed. The results and recommendations were reported to IMSG for implementation throughout the trust. Over 15 days, a registered nurse visited predefined clinical areas to observe the preparation and administration of IV medicines. With the permission of the nurse in charge, practice was observed and recorded. Staff were also questioned regarding injectable medicines training.

Results
Eighty-six observations were undertaken of 52 members of nursing staff (ranging from Bands 5 to 7) in 10 clinical areas. The areas included acute and rehabilitation wards, critical care areas, the oncology day unit, paediatrics and obstetrics. A total of 35 parameters were assessed in four main clusters – environmental observations, preparation, administration and training.

Of the medicines administered, 55% (n=26) were prepared at ward level, 36% (n=17) in pharmacy and 9% (n=4) prepared commercially. Table 1 demonstrates the location of injectable medicine preparation in clinical areas.

Other major findings were:
● On 98% (n=82) of occasions, the nurse was witnessed undertaking hand decontamination.
● In 95% (n=81) of cases products were checked by two nurses.
● 57% (n=35) of nurses wore gloves.
● In 96% (n=80) of cases the patient was positively identified.
● An aseptic “no touch” technique was employed in 100% (n=84) of cases.
● Preparation time ranged from one to 15 minutes with the majority of products taking two to five minutes.
● 62% (n=34) of nurses had undergone IV training more than two years ago; one nurse was practising IV administration without training.
● Only 19% (n=18) of nurses were aware of NPSA alert 20.

Discussion
The majority of IV drugs were found to have been prepared in clinical areas. The study served the purpose of auditing this practice and highlighted a number of areas requiring improvement. The majority of drugs prepared in clinical areas were done so using the minibag plus safety device. This is a low risk procedure in line with our risk assessment. However, some higher risk medicines were being prepared in near patient areas, in a variety of locations, many of which were unsuitable for injectable medicines preparation.

The results were reported to IMSG, and an action plan was formulated. The plan was disseminated to all clinical directorates and training undertaken for senior nurses to cascade in their area. Two nurses (2%) did not undertake hand decontamination before preparing or administering an injectable medicine, which contravened the HDFT injectable medicines policy and the infection control policy. This was reported to the infection control team. There was confusion as to when gloves should be worn. After discussion, it was agreed that nurses should wear gloves when preparing injectable medicines and when accessing any intravenous device, as a personal protective measure. The infection control policy states that sterile gloves should be worn when manipulating central venous catheters.

In 4% (n=3) of cases the patient was not positively identified. This is of concern. HDFT has a positive identification policy and has investigated a number of errors concerning patient identification. The trust is looking at ways to address this.

Our policy states that all intravenous medicines should be checked by two qualified practitioners. This did not occur in 3% (n=3) of cases. This has been reiterated to senior nurses. In injectable medicines training, nurses currently attend a study day, are tested on calculations and complete a work-based competency manual. Many nurses received this training several years ago. Due to staffing and time issues an update for all nurses was difficult to deliver and methods to address this are being pursued.

This study has highlighted areas of good practice and some deficiencies. Errors with injectable medicines are common and following the NPSA alert we are taking action to minimise these. In response to the results of the study additional recommendations were made:
● All new staff joining the trust should receive IV training – now in place for nursing staff and will be extended to junior medical staff shortly.
● Establish designated IV preparation sites in clinical areas, where staff will not be disturbed.
● Standardise throughout the hospital a needle-free system – as part of HDFT’s purchasing for safety policy, several new devices for safer IV preparation have been introduced in clinical areas.

Table 1. Where drugs were prepared in clinical areas (n = 86 observations)

<table>
<thead>
<tr>
<th>Site of preparation</th>
<th>Number of products</th>
<th>Percentage of products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical room</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>Bedside</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Drug preparation area</td>
<td>33</td>
<td>41</td>
</tr>
<tr>
<td>On the desk</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Bedside on sterile trolley</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Bedside on nursing kardex</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>On patient bedside table</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

References
10 Appropriateness of Tazocin and meropenem prescribing on a vascular ward

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Introduction
Restricted antibiotics refers to those antibiotics that could contribute to development of multiresistant organisms. These are generally antibiotics with broad spectrums of action, where resistance emerges rapidly and where toxicity is readily identified. Patients being treated with broad spectrum antibiotics are also at greatest risk of diarrhoea associated with Clostridium difficile. Avoiding unnecessary antibiotic use and optimising the administration of antimicrobial agents can help to improve patient outcomes while minimising further pressures for resistance. Antibiotic administration guidelines developed locally or nationally can avoid unnecessary administration of antibiotics and increase therapeutic effectiveness. In this audit, the use of two restricted antibiotics, Tazocin, and meropenem, have been investigated to ensure that they are used appropriately in accordance with the trust’s treatment of infection guidelines (TOI) or after microbiology approval.

Objectives
- To determine whether indication and duration of treatment has been documented either on the drug chart or in the notes at the point of prescribing for each antibiotic.
- To determine whether these antibiotics have been prescribed appropriately (ie, according to trust TOI guidelines or after consultation and recommendation of the microbiology team).
- To relate any inappropriate prescribing of these antibiotics to cost of treatment.

Standard 1: 100% of patients should be prescribed Tazocin or meropenem according to current TOI guidelines or in accordance with advice by the microbiology team.

Method
A data collection form was designed and piloted on a 24-bedded vascular surgery ward over two days. The form was amended and used to collect data over a six-week period from 10 November to 19 December 2008. It was initially decided that a four-week data collection period would be sufficient to obtain enough data. However, this was extended to six weeks as there was sufficient time to collect further data.

Patients were included if either Tazocin or meropenem was prescribed during this study period. Data collected included: patient details, antibiotic prescribed, dose, frequency of administration, indication, duration (if documented), sources of documentation (handover sheet, chart or notes) and whether there was any evidence of micro approval was recorded. The start and stop date of the antibiotics was noted with the number of doses administered on those days, which was then used to record the number of days of treatment, number of doses the patient received and the cost of treatment per patient.

Results
Nineteen patients (14 prescribed Tazocin, five prescribed meropenem) were identified as having been initiated on either drug during the audit period from 10 November to 19 December 2008.

Indication: In a total of 13 (68%) patients the indication was stated in one or more of the three sources. Nine (47%) patients had the indication of antibiotics stated in the notes, one (5%) on drug chart and seven (37%) on the handover sheet.

Duration: In only two patients (11%) the duration was stated in either one of the three sources: one (5%) in the notes and one (5%) on the drug chart.

Appropriateness of prescribing according to trust TOI guidelines: Of the 19 patients, the indication for the antibiotics was known for 13. One had been prescribed them as per trust guidelines, three patients had not been prescribed as per guidelines, for nine patients there were no guidelines for the indication that they were prescribed antibiotics for. Six patients had no indication stated in either of the three sources.

Micro approval: 37% of patients had evidence of micro approval; however, 63% of patients had no evidence of micro approval, and of these one patient (5%) had been prescribed antibiotics in accordance with treatment of infection guidelines.

Length of treatment: The average length of treatment of Tazocin was 17 days with the range being from four days to 71 days. Median length of treatment of Tazocin was 10 days and the average length of treatment of meropenem was 14 days, with a range from six days to 31 days. Median length of treatment of meropenem was 10 days.

Cost of treatment: The average cost of treatment with Tazocin per patient was £369.30 (range £78.10–£1,616.67). The average cost of treatment with meropenem per patient was £598.76 (range £99.90–£1,291.67). Total cost of the inappropriate prescribing was £2,889.05.

Discussion
This audit demonstrated that indications and durations of Tazocin and meropenem are poorly documented.

Standard 1: Only 42% of patients were prescribed either Tazocin or meropenem according to current TOI guidelines or in accordance with advice by the microbiology team.

Standard 2: Only 5% of the time the duration of antibiotic was documented in the notes.

Possible reasons for poor documentation may be that currently on microbiology rounds when the consultant makes recommendations, the junior doctors prescribe the antibiotics that have been suggested but fail to document the indication and duration in the notes. In future it may be better to take the notes to the patient’s bedside and document suggestions immediately on both the drug chart and the notes. The results also show that inappropriate prescribing of antibiotics and prolonged durations can result in high cost per course of antibiotics. It is necessary to reaudit after six months to determine the improvement in adherence to trust TOI guidelines and in documentation of indication and duration of antibiotics after ensuring greater accessibility to guidelines and educating prescribers and nursing staff on the importance of clear documentation. Greater access to guidance may improve the prescribing of restricted antibiotics. This may be achieved by having more treatment of infection guideline posters available and pocket guidelines making them more readily available.

Pharmacists are well placed to help improve documentation and to ensure duration of treatment is stated, as well as to prompt review of antibiotics.

References
1 Kollef MH, Review Optimizing antibiotic therapy in the intensive care unit setting. Critical Care 2001, 5:189-199
3 Adult Treatment of Infection Guidelines 2007, Approved by Antibiotic Review Group
An audit of near misses in the pharmacy dispensary at Central Middlesex Hospital

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Introduction
Evidence suggests that dispensing errors occur less frequently than prescribing errors but nonetheless they can cause serious harm to patients.1 Data on near misses in a pharmacy dispensary setting is limited, but identification of these is a significant aspect of a dispensing environment because they have the potential to cause harm to patients, if not discovered before the medicine is supplied.

The aim of the audit is to determine the types of near misses made within the dispensary and the appropriateness of the data collection form used to document them.

Objectives
- To identify the types of near misses occurring most frequently on a daily basis, over a four-month period using the near miss codes allocated on the form. It is expected that the type of near misses documented should be recorded at all times with no exceptions (ie, 100%).
- To determine the appropriateness of the form over a four-month period by checking that all sections of the form are completed at all times with no exceptions.
- To ascertain whether all near misses documented on the form are reviewed on a weekly basis by the dispensary team with no exceptions.

Method
Data was obtained and collected retrospectively, six days a week (Monday to Saturday), over a four-month period (August to November) using data collection forms located in the dispensary. For the purpose of this audit, a “near miss” as defined by the clinical team at Central Middlesex, will be “any incident detected up to and including the point at which the medication was handed over to the patient or patient’s representative”. All members of the Pharmacy team were briefed about near miss documentation before the audit and were shown how to use the form appropriately.

Data collection consisted of: date, time, type of prescription, type of near miss (using near miss codes), comments on nature of near miss and the names of the individuals who found and made the near miss. The near misses were sub categorised into four groups, and these included: 1, incorrect label; 2, incorrect contents; 3, other; and 4, screening. Near misses were identified at the final checking stage by an accredited checking technician (ACT) or a pharmacist and were documented at the time of the near miss during normal working hours.

Results
Over a four-month period, 289 near misses were recorded. Of these, on 100% of occasions, the type of near miss was documented, and therefore met the first standard set for the audit. The number of near misses made within each subcategory is illustrated in Figure 1 (below).

Within the “incorrect label” subcategory, incorrect/missing expiry date or batch number was most commonly documented, accounting for 10.7% of near misses made. In the “incorrect contents” subcategory, the most frequent near miss documented included insufficient quantities of drug being supplied (9.7%). In the “other” subcategory, it was found that local procedures were not followed correctly. For example, lack of documentation for certain drugs (eg, blood products, cytotoxic, immunoglobulins), and fridge items not stored in the fridge as required, resulting in 10.7% of the near misses. Fourteen (4.3%) screening near misses were documented; examples included unknown duration of antibiotics, unconfirmed strength of drugs and miscalculated doses.

It was expected that documented data would be reviewed on a weekly basis. However, it was found that the dispensary team (two pharmacists and two senior technicians) assessed the data on two occasions over the month of the audit period. This therefore did not meet the 100% standard set in the audit. Lastly, in order to assess the appropriateness of the near miss form, all sections of the form were checked to see if fully completed 100% of the time. Of the 289 near misses recorded, 6% (19) entries had a subsection missing (for example name of person making error missing, near miss code not documented) and therefore did not meet this standard. Colleagues were also asked to record the time and date to assess whether near misses were more common at a particular time of the day. This, however, was not the case, as near misses occurred throughout the day with no specific time where most frequent.

Discussion
As Figure 1 illustrates, incorrect labelling by dispensary staff was most frequently documented as a near miss. Dispensing near misses were more common than screening, and this may be because the dispenser is not checking their dispensed items before handing the prescription over to the pharmacist/ACT for a final check.

The “near miss made by” column was not always completed, suggesting documenting names may not always be viewed in a positive manner. It may be regarded as a “prevailing blame culture”, thereby deterring individuals from reporting names. As a consequence, not only will data be inconclusive, but also the training needs of individuals will not become apparent.

Furthermore, data collected during the month of the audit was not reviewed on a weekly basis and therefore feedback was given to the dispensary team only on two occasions. A more proactive approach is therefore needed to make sure feedback is provided weekly to staff as a standard.

The form should ideally be used to develop a reporting culture that is open and fair, so all staff can learn from the near misses made, in order to reduce risk and recurrence. A review of the form and educating staff about recording near misses will ensure there is routine and formal feedback to staff at dispensary meetings, to therefore improve the quality of service provided and reduce risk. It is important to recognise that it is not about acknowledging that risks exist, but rather taking the action to prevent them from occurring. The ideas discussed here represent a practical approach to achieve this.

References
3 Royal Pharmaceutical Society. The contribution of pharmacy to make Britain a safer place to take medicines, 2009.
An audit of unfractionated heparin infusion use at the John Radcliffe Hospital

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Pharmacy Department, Oxford Radcliffe Hospitals NHS Trust, Oxford

Introduction
Intravenous (IV) heparin is a frequent identified cause of harm and prolonged hospital stay. Guidelines issued by the British Society for Haematology and the National Patient Safety Agency (NPSA) have highlighted that IV heparin treatment could be made safer. Through managing these risks, the chances of patients coming to harm will also be greatly reduced. Human errors related to performance are the most frequent cause of adverse events associated with anticoagulation medicines. Within the trust, anticoagulants have persistently been identified on the corporate Medicines Management Risk Register. In response, the Oxford Radcliffe Hospitals (ORH) has produced and implemented guidelines on IV heparin use in adults. The aim of the audit was to measure compliance with these.

Objectives
To determine the proportion of patients with:
(a) The treatment indication clearly documented in the medical notes
(b) Appropriate baseline tests taken before starting treatment
(c) The recommended loading dose given
(d) An activated partial thromboplastin time (APTT) taken four hours after starting treatment
(e) An APTT within therapeutic range within 24 hours of starting treatment
(f) Prescriptions adhering to safe medication practice recommendations
(g) Documented evidence of adverse effects

The audit standard was 100% compliance with the guidelines for each of the objectives in those patients meeting the inclusion criteria.

Methods
Adult patients receiving IV heparin infusions were eligible for inclusion. Paediatric patients and those on renal replacement therapies were excluded as these groups were beyond the scope of the guidelines. Suitable patients were identified via communication with clinical pharmacists using ward codes and hospital inpatient numbers as patient identifiers. A prepopulated data collection form was used to record data collected retrospectively at the John Radcliffe site of the ORH Trust over a four-week period, from 20 October to 16 November 2008. Data were obtained from the inpatient drug chart, infusion monitoring chart, nursing notes, medical notes and electronic laboratory results. Baseline tests required before treatment were serum potassium, platelets, APTT and prothrombin time (PT).

The data were analysed using Microsoft Excel. Safe practice recommendations were units written in full, IV route specified, infusion pump used and a standard concentration of 1000 units/mL used.

Results
Data were collected from 19 patients.

(a) Sixteen patients had an indication clearly documented in the medical notes.

(b) Seventeen patients had baseline serum potassium measured, 16 patients had baseline platelets measured, 15 patients had baseline APTT measured and 14 patients had baseline PT measured. One patient received treatment without any baseline tests taken.

(c) Fourteen patients received the recommended loading dose of 5000 units heparin

(d) The length of treatment ranged from one to seven days, with a mean of 2.6 days. The monitoring of APTT during treatment is shown in Table 1 (target APTT = 60–100 seconds).

(e) Adherence to safe practice recommendations is displayed in Table 2

(f) Intramuscular injections (IM) were prescribed on four drug charts, but none were given. There was no documented evidence of bleeding in all cases. There was no documented incidence of heparin induced thrombocytopenia as platelets did not decrease by 50% and were all within the ORH reference range.

Discussion
Strict adherence to guidance is essential for safe and effective heparin use as serious adverse events are more likely to occur if guidance is not followed. The objectives for the audit have been met and 100% compliance has been achieved in some areas of the guidance involving safe medication practice. However, the majority of the objectives show that compliance is not at the required 100% standard.

As 100% compliance with guidelines has not been achieved, work must be done in order to improve adherence and to ensure the quality of prescribing and monitoring for safety. Further work should involve a period of education and raising awareness around ORH heparin guidelines with focus on non-compliant issues, which will be measured using a follow up study to observe the effect of any improvements to heparin prescribing and using updated methods. Reasons for non-compliance have not been investigated in this study but may be investigated in the future to assess whether human error is a major reason. A possibility to look at designing and implementing a heparin only prescription chart may help eliminate the problems and issues found in this audit.

Table 1: APTT monitoring during treatment with intravenous heparin

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Target APTT stated on prescription</td>
<td>13</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>APTT measured within four hours of starting treatment</td>
<td>11</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>APTT in target range 24 hours after starting treatment</td>
<td>15</td>
<td>4</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 2: Safe medication practice adherence

<table>
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<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units written in full</td>
<td>19</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>IV route specified</td>
<td>19</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Infusion pump used</td>
<td>19</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Infusion changed every 24 hours</td>
<td>19</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>1000 Units/mL concentration</td>
<td>17</td>
<td>2</td>
<td>19</td>
</tr>
</tbody>
</table>

References
Audit of a new electronic prescribing insulin pathway and its effects on prescribing errors in insulin prescriptions

Goatley H, Power B, McFarlane F.
Wirral University Teaching Hospital NHS Foundation Trust, Wirral

Introduction
Insulin has been classified as one of the five high risk medicines used in hospital. Incorrect prescribing and administration of insulin can compromise patient care and safety. It can lead to poor glycaemic control and has even resulted in fatalities. The challenges with insulin prescribing revolve around the large number of insulins with differing duration of actions, confusing array of devices and wide dose ranges.

Previous attempts to improve the electronic insulin prescribing processes at this university teaching hospital led to the development of a pathway that was found to be non-intuitive to prescribers. In addition, the drug catalogue was not updated promptly when new insulins were introduced. A previous local audit confirmed that prescription errors with insulin were high with problems ranging from the insulin not being prescribed at all on the electronic system to either an incorrect or no device being prescribed.

With this evidence and the perception among clinical staff that the electronic insulin prescribing pathway was inadequate, it was decided to revisit this area to see if it could be improved. The overall aim of the project was to reduce the number of errors associated with insulin by the introduction of a new electronic prescribing pathway.

Objective
1. Determine the incidence and type of prescribing errors associated with the original electronic insulin pathway.
2. Design and build a new insulin pathway.
3. Determine the incidence and type of prescribing errors associated with the revised electronic insulin pathway.
4. Analyse results and determine areas for further work.

Method
Audit of original insulin prescribing pathway Data collection took place over a three-week period. Patients prescribed insulin were identified via a daily report generated from the trust's electronic data repository. The prescriptions were checked to ensure the correct insulin was prescribed and then assessed for compliance with the trust standard for insulin prescribing namely that they should include the insulin name, device, route, reference to ‘see paper chart for dose’ and frequency. Those prescriptions that did not meet all the criteria were deemed as incorrect and the error type was recorded for each one. It was also noted if the prescription had been generated from the drug catalogue or whether it was free-typed into the electronic prescribing system.

Design and build of revised electronic insulin prescribing pathway
The results of the initial audit were analysed and screens for the new insulin pathway were designed in conjunction with the diabetes team and the lead diabetes and information technology (IT) pharmacists. The pathway was built and checked by the IT pharmacy team. It was then put into the electronic prescribing system replacing the old pathways.

Audit of revised insulin prescribing pathway After a settling in period of one month, data collection was undertaken in the same way as the initial audit over a three week period, allowing for comparative analysis.

Results
In the original pathway 96 patients generated 128 prescriptions of which 107 (84%) were incorrect (Figure 1). In the revised pathway, 120 patients generated 179 prescriptions of which eight (4%) were incorrect (Figure 2).

Free-typed prescriptions accounted for 107 orders in the initial audit. These were incorrect in 97 instances. With the revised pathway six prescriptions were free-typed with five of these being incorrect.

Discussion
The results showed a significant improvement in insulin prescribing through the modification of the electronic prescribing pathways. The initial audit proved that the old pathway was inadequate and led to a high rate of prescribing errors. This was due to the pathway not being intuitive to use and not keeping up to date with the ever growing range of insulins and devices.

Working with the diabetes team ensured that the revised pathway better reflected the way clinical staff approached insulin prescribing. This was shown in the reduced number of prescribing errors. There continues to be problems in ensuring the selection of the correct insulin device as this was the commonest error seen with the prescribing pathway.

The project highlights the need to work closely with clinical staff in order to optimise the design of electronic prescribing pathways. It also highlights the need to continually quantify and analyse prescribing errors and to evaluate any significant changes to ensure that they have the desired effect.

Challenges for the future include trying to promote correct insulin product selection first time through education of prescriber, as well as trying to ensure the system is kept updated. In addition we should try to incorporate the lessons learnt from this project into the design of the new electronic prescribing systems being implemented in the NHS.

References
1 Begin C. Insulin prescribing: compliance with standards. Clinical Pharmacy Europe. 2007 (Spring); 32–34.
14 Monitoring serum calcium in patients taking lithium

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Introduction
The true prevalence of hypercalcemia in patients taking lithium is uncertain, but retrospective series suggest that it may occur in 5–40% of patients.1 In a recent review by NICE serum calcium determinations were not reported.2

It has been our practice to monitor serum calcium every six months. This frequency has been recommended by other workers.3 In 2006 we undertook an audit to help us review our practice.

As a result of this audit, in 2007 we developed new guidelines and in 2008 we reviewed the effect of these guidelines.

Objectives
Audit (2006)
1. To determine the percentage of patients who meet the current local standards for serum calcium monitoring.
2. To determine the number of long-term lithium patients who have had serum calcium levels during one year of lithium therapy.

Following the audit (2007)
3. To develop referral guidelines for patients with raised serum calcium.

4. To determine the effect of the new guidelines in practice.

Method
The serum calcium results for all patients who attended the pharmacy-led lithium clinic in 2006 were reviewed. Patients who had been registered with the clinic for less than one year were excluded.

The number of corrected serum calcium levels was determined for each patient over the 12-month period. The serum calcium levels above the reference range were reviewed. (The local laboratory reference range for corrected serum calcium was 2.20–2.60 mmol/l at the time of the audit but has now changed to 2.12–2.50 mmol/l). Where patients had a corrected serum calcium result above 2.75 mmol/l, the pharmacy patient records were reviewed to see if this had been reported to the patient’s general practitioner (and consultant psychiatrist where appropriate). A search was undertaken to see whether an intact parathyroid hormone test (PTH) had been recommended to the GP and whether PTH had gone on to be subsequently determined in these patients.

Following the 2006 audit, an algorithm and referral guidelines were developed (in conjunction with a consultant endocrinologist and consultant in chemical pathology) to manage patients with high serum calcium levels. The algorithm and guidelines were approved by the drug and therapeutic committee. The algorithm identified criteria for patients who are recommended to be referred to a consultant led metabolic bone clinic. When a patient meets the criteria on the algorithm, the pharmacy led lithium clinic arranges a PTH determination and writes a letter to the GP recommending referral to the metabolic bone clinic. In 2008 all patients who met the criteria for referral to the metabolic bone clinic were reviewed.

Results
Audit (2006) 160 patients met the criteria for being included in the audit with 140 patients (87.5%) meeting the standard of at least two serum calcium estimations performed during the 12 months (ie, a serum calcium every six months). One patient did not have any serum calcium determinations.

Fifteen patients had at least one raised serum calcium, in all cases the GP (and consultant psychiatrist where appropriate) was informed.

Eleven of the 15 patients with a raised serum calcium went on to have an increased frequency of serum calcium determinations.

Of the 348 calcium results, 323 (93%) were within the reference range and 25 (7%) were above range. Three patients (see Table 1) were identified with markedly raised serum calcium (greater than 2.75 mmol/l). In each case the raised serum calcium was highlighted to the GP (and consultant psychiatrist where appropriate). During the audit period PTH was not determined by GPs in these three patients.

Evaluation of new guidelines (2008) In the 12 months following approval of the algorithm within the trust and PCT 13 patients met the criteria for referral to the metabolic bone clinic. Seven of the 13 were referred to the clinic (see Table 2). Two of 13 had previously been investigated and four patients were not referred by their GP. No patients had PTH below the reference range. All 13 patients are currently continuing on lithium therapy.

Discussion
In the 2006 audit the majority of patients attending lithium clinic met with the current local standards of having a serum calcium determined approximately every six months. Where patients had a raised serum calcium there was a tendency to increase the frequency of monitoring.

Prior to the algorithm, pharmacy was not authorised to arrange PTH and follow-up was at the discretion of the GP. There was inconsistent determination of PTH and referral. The development of the algorithm and referral guideline has led to a more consistent approach to managing hypercalcemia in this vulnerable group of patients. The regular monitoring of serum calcium in this group of patients (during 2008) identified nine (5.6%) with a raised PTH. This compares with an incidence of primary hyperparathyroidism of 20 per 100 000 population.”

ACKNOWLEDGEMENT Thank you to Dr C R Parker (consultant endocrinologist) and Dr N Bradford (consultant chemical pathologist) for their valuable contributions.

Table 1: Numbers of patients with raised serum calcium (Audit 2006)

| All serum calcium results within reference range | Number of patients |
| 2.2–2.6 mmol/l | 144 (90.0%) |
| At least one serum calcium result above reference range | 15 (9.4%) |
| 1 serum calcium result > 2.75 mmol/l | 3 (1.9%) |
| More than one serum calcium > 2.75 mmol/l | 0 |

Table 2: PTH (laboratory reference range: 11 – 87 pg/ml) in patients meeting the criteria for referral to metabolic bone clinic

<table>
<thead>
<tr>
<th>Number</th>
<th>Number with high PTH</th>
<th>Mean PTH</th>
<th>Range of results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Referred by GP to clinic</td>
<td>7</td>
<td>5</td>
<td>100.1</td>
</tr>
<tr>
<td>Previously investigated</td>
<td>2</td>
<td>2</td>
<td>103.2</td>
</tr>
<tr>
<td>Not referred to clinic</td>
<td>4</td>
<td>2</td>
<td>59.0</td>
</tr>
<tr>
<td>Cohort total</td>
<td>13</td>
<td>9</td>
<td>87.9</td>
</tr>
</tbody>
</table>

References
1 Rifai MA, Mole K and Harrington DP. Lithium induced hypercalcaemia and parathyroid dysfunction. Psychosomatics 2001;42:359–361
Adherence to the National Patient Safety Agency guidelines: Actions that can make anticoagulant therapy safer (2007)

Moody J and Coleman J
Pharmacy Department, Oxford Radcliffe Hospitals

Introduction
Anticoagulants are the second most common therapeutic group causing incidents resulting in severe harm or death. Indeed, by 2003 the National Patient Safety Agency (NPSA) had received 92 reports of warfarin associated deaths in the UK. As a result of the large number of patients on warfarin therapy and wide inter-patient variability, action needs to be taken to ensure the safe use of this medicine in all patients.1

The NPSA Patient Safety Alert 18: Actions that make anticoagulation therapy safer (2007), highlighted a number of risks associated with the use of warfarin. These included wrongly prescribed doses, especially loading doses; inadequate documentation relating to therapy; poor communication between primary and secondary care on discharge from hospital; and inadequate clinical audits of anticoagulation services.

Objectives
The audit aimed to assess adherence to NPSA guidance for pharmacy related safety indicators, namely, the proportion of patients:

1. Following the Oxford Radcliffe Hospital (ORH) initiation guidelines appropriate to indication (for patients newly initiated on warfarin)
2. Developing international normalised ratio (INR) greater than 5 during hospital stay
3. With INR in therapeutic range or at target INR at discharge

Secondary objectives based on local safety indicators were the proportion of patients with:

4. Baseline INR or prothrombin time (PT) results conducted before initiation
5. All sections of warfarin prescriptions complete on inpatient charts
6. Correct pharmacy endorsements on medication chart in line with hospital guidelines
7. Unintentional missed warfarin doses
8. Completed anticoagulation referral cards received at the anticoagulation clinic at discharge for Oxfordshire patients

A 100% standard was set for all objectives with the exception of objectives 2 and 7 which were 0% standard.

Method
A retrospective audit was undertaken of all adult inpatients newly initiated or restarted on warfarin at the John Radcliffe Hospital, Oxford from 26 August to 23 September 2008. Patients were identified by ward pharmacists, using discharge prescriptions for warfarin and also using the pharmacy computer labelling system (audit function). Patients were excluded if they had not been discharged before the end of the audit period and/or if the medical notes were unavailable.

The auditor used a preplotted data collection form to collate the relevant information from medication charts, medical notes, electronic laboratory results database and the Oxford anticoagulation referral cards. Microsoft Excel® was used to analyse the results.

Results
Details of patients included in the study and warfarin indication are displayed in Figure 1.

The results for each objective and the corresponding standards are detailed in Table 1.

Discussion
This audit has shown that the trust is not adhering to the guidance set out by the NPSA and has identified weaknesses in the current processes involving warfarin. Education of all staff is essential and includes update of, and increased accessibility to, guidelines for anticoagulant therapy. The inpatient warfarin chart could be modified to improve prescribing and include a section for record of the preadmission dose where applicable. In relation to pharmacy there is a need to ensure consistent practice including endorsements on drug charts and counselling of all patients. A monthly audit of adult inpatients with an INR greater than 5 should be commenced to monitor adverse events and ensure optimum management of warfarin patients. Communication and arrangements at the time of discharge need to be reassessed to ensure continuation of monitoring in the community. Continued non-compliance with NPSA and trust guidance on warfarin therapy could increase the risk of adverse events including serious harm and death.

References
An audit of early antimicrobial management of bloodstream infections in a university teaching hospital

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Introduction
Bloodstream infection is a common illness associated with significant morbidity and mortality. Patients treated with ineffective antimicrobials are two to three times more likely to die from bloodstream infection.1 An audit of the management of bloodstream infections at a large UK teaching hospital revealed major errors in management of 30% of episodes due to delay before administration of antimicrobials in critically ill patients or failure to administer effective antibiotics despite blood culture result.2

Objectives
The aim of this audit was to evaluate antibiotic management of bloodstream infection in a university teaching hospital and to explore the relationship with patient outcomes. The objectives were:

- To monitor adherence to microbiology recommendations
- To evaluate patient outcomes according to timeliness and accuracy of adherence to recommendations

Audit standards
- 100% of microbiology recommendations for antibiotic therapy are followed
- 80% of recommendations for antibiotic therapy are acted upon within six hours (based upon published experience of Minton et al)3

Methods
Biomedical scientists in the microbiology department maintained a log of positive blood cultures for a nine-day period during October 2008, recording the time and result of preliminary Gram staining. Consultant medical microbiologists and registrars recorded the time of communication of the preliminary result to the ward doctor and the nature of advice given. A record was also made of final identification of microorganisms and antibiotic sensitivity profile. The time this information was communicated to the doctor and the nature of resulting advice on patient management was documented. Relevant biochemistry and haematology data were obtained from the hospital electronic pathology records system. These included C-reactive protein (CRP) and white blood cell count. Antibiotic prescriptions and physical observation data, including respiration rate, blood pressure, heart rate and temperature, were obtained by one of the authors (JP) from records at the bedside or from medical notes. These data were used to calculate a systemic inflammatory response syndrome (SIRS) score. Outcome measures included resolution of SIRS parameters, 50% reduction in CRP, and length of stay following microbiology advice. These data were analysed using descriptive statistics in SPSS software.

Results
During the period of data collection 58 blood cultures were positive for microorganism growth. Thirty-seven isolates were considered contaminated and were not included. Isolates from 21 patients were considered clinically significant. Three of these patients were excluded from the analysis. In one case, the patient died before the medical microbiologist had any input. In another case the patient died after preliminary microbiology advice was given but before full sensitivities were reported and medical notes were unavailable. In a third case the

Table 1: Audit standards (n = 23 microbiology recommendations to change therapy)

<table>
<thead>
<tr>
<th>Time to administration of recommended antimicrobials</th>
<th>Standard</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 6 hours</td>
<td>&gt;80%</td>
<td>11</td>
<td>48%</td>
</tr>
<tr>
<td>&gt; 6 hours</td>
<td>&lt;20%</td>
<td>8</td>
<td>35%</td>
</tr>
<tr>
<td>Recommended regimen not administered</td>
<td>0%</td>
<td>4</td>
<td>17%</td>
</tr>
</tbody>
</table>

Table 2: Outcome measures

<table>
<thead>
<tr>
<th>Time to administration of recommended antimicrobials (n=16)</th>
<th>CRP 50% resolution (days)</th>
<th>SIRS ≤ 2 (days)</th>
<th>Length of stay (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n Mean</td>
<td>Median</td>
<td>n Mean</td>
</tr>
<tr>
<td>≤ 6 hours</td>
<td>5 6</td>
<td>5 6</td>
<td>6 3.3</td>
</tr>
<tr>
<td>&gt; 6 hours</td>
<td>4 5.5</td>
<td>5.5</td>
<td>5 6</td>
</tr>
<tr>
<td>Recommendation not followed</td>
<td>3 3.3</td>
<td>3 3</td>
<td>3 3</td>
</tr>
</tbody>
</table>

References
An audit of the quality of prescribing and adherence to prescribing standards for the NEW Yorkshire chart at Harrogate and District NHS Foundation Trust

*Harrogate and District NHS Foundation Trust; †Leeds Teaching Hospitals NHS Trust

Introduction
Following the successful introduction of an all-Wales prescribing chart,1 Yorkshire chief pharmacist agreed that a similar approach would be welcomed in Yorkshire. The Wales experience, which uses a common inpatient prescription chart, common standards and guidance for prescribers, demonstrated a 10% drop in prescribing errors after implementation. The NEW (north, east, west) Yorkshire-wide prescription chart was agreed by senior pharmacists across the region and the final update co-ordinated by Chris Acomb, Clinical Services Manager at Leeds Teaching Hospitals NHS Trust. In addition to the chart, Yorkshire prescribing standards were produced and used to support good practice. The chart was introduced to the Harrogate and District NHS Foundation Trust in early 2008.

Objectives
To carry out a retrospective audit, of prescription charts, to assess the quality of prescribing at Harrogate and District NHS Foundation Trust by prescribers. To feed back the results from the audit to prescribers to show any gaps that are present in prescribing at the trust. To assess the level of adherence to the prescribing standards relating to the NEW Yorkshire prescribing chart and standards.

Method
During two weeks in November 2008 prescription charts from eight wards of the trust were audited. A two-week period was chosen to allow the required number of charts to be audited. These were ITU, Maternity, Mental Health, Orthopaedics, Rehabilitation, General Medicine, Paediatrics and General Surgery. The aim was to audit 20 charts from each area. All the charts reviewed were from recently admitted patients selected at random within 72 hours of admission. The audit looked at the prescription as originally written, not as amended by a pharmacist. Data collection was carried out by nurses, doctors and pharmacists. The Yorkshire prescribing standards were used to create a standard data collection proforma. Auditors were trained by a senior pharmacist on what the standards meant in practice. The prescription charts were looked at while the patients were on the wards; past entries on the charts were audited. The results were collated and analysed by the clinical effectiveness department using the standard pro forma in conjunction with a senior pharmacist to analyse the data. The report was validated prior to release.

Results
Over the two weeks 143 prescription charts were audited. Seven patients had been transferred to another ward before the chart was seen by auditors. None of these charts had the date of transfer or new consultant documented and only three (43%) had the new ward documented. Of the 116 drugs stopped on charts at the time of auditing 102 (88%) were crossed off incorrectly. Nine drugs had a change of administration route or dose, of these six (67%) had been changed incorrectly. In the auditors’ opinion, 142 prescription charts were judged on clarity, 68 (48%) were judged as being adequate, 45 (32%) good and 16 (11%) excellent.

Of the 43 charts on which a drug allergy was documented, 12 (27%) had documentation of both the drug and the reaction; 26 (57%) had the drug recorded but no reaction details. Seven (16%) charts had nothing recorded in the allergy section. Full documentation of author identification of allergy status occurred on 38 (27%) prescription charts, 74 (52%) had partial compliance to this standard. In 20 (14%) patients drug doses had been administered prior to the allergy status being recorded. Table 1 shows the percentage of prescription charts where the documentation meets the standards set for the prescribing of regular drugs.

Discussion
The audit has highlighted areas of concern especially around the documentation of allergies. Of particular concern were the seven charts which had nothing regarding allergies documented. The nursing and midwifery Council guidelines for administration of medicines states that “nurses should check that the patient is not allergic to the medicine before administering it”. In addition, the trust drug allergy policy states “health care professionals must not administer any medicine unless the allergy box is completed on the drug chart”. This audit showed that in 20 (14%) of cases drugs were actually administered before the allergy box was filled, while in 10 (7%) it was difficult to tell whether the medications were administered before or after the allergy box was filled because the drug charts were not properly dated. This is a major patient safety issue.

Although prescribing of drugs on the whole met the standards set lack of documentation of patient’s wards on prescription charts and lack of prescriber identification are patient safety issues and could lead to missed drug doses. Drugs were documented as being stopped on the prescription chart incorrectly in 88% of charts which can lead to confusion and possible inadvertent continuation of medication. The audit has demonstrated a need for prescriber education especially around the area of drug allergies. In addition further education is required with all members of the clinical team who use the prescription chart to improve compliance with the Yorkshire standards. The audit will be repeated after the implementation of education with the aim to show a similar reduction in prescribing errors as demonstrated by the all the Wales group.

Table 1: Results of the audit of prescription charts

<table>
<thead>
<tr>
<th>Standard measured: the following are correctly documented</th>
<th>Expected compliance to standard (%)</th>
<th>Number of prescription charts achieving compliance to standard</th>
<th>Percentage of prescription charts achieving standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients name</td>
<td>100</td>
<td>143</td>
<td>100</td>
</tr>
<tr>
<td>Patients date of birth</td>
<td>100</td>
<td>139</td>
<td>97</td>
</tr>
<tr>
<td>Patients hospital number</td>
<td>100</td>
<td>137</td>
<td>96</td>
</tr>
<tr>
<td>Date of admission</td>
<td>100</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Consultant</td>
<td>100</td>
<td>44</td>
<td>31</td>
</tr>
<tr>
<td>Ward</td>
<td>100</td>
<td>72</td>
<td>50</td>
</tr>
<tr>
<td>Number of prescription charts in use per patient</td>
<td>100</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Supplementary charts</td>
<td>100</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Once-only section of prescription chart (n=204 drugs prescribed)</td>
<td>100</td>
<td>182</td>
<td>89</td>
</tr>
<tr>
<td>Documentation of dose</td>
<td>100</td>
<td>196</td>
<td>96</td>
</tr>
<tr>
<td>Documentation of route</td>
<td>100</td>
<td>37</td>
<td>18</td>
</tr>
<tr>
<td>Prescriber details</td>
<td>100</td>
<td>104</td>
<td>51</td>
</tr>
<tr>
<td>Prescription dated and timed</td>
<td>100</td>
<td>897</td>
<td>75</td>
</tr>
<tr>
<td>Regular prescription section (n=920 drugs prescribed)</td>
<td>100</td>
<td>690</td>
<td>75</td>
</tr>
<tr>
<td>Drug names</td>
<td>100</td>
<td>837</td>
<td>91</td>
</tr>
<tr>
<td>Doses</td>
<td>100</td>
<td>856</td>
<td>93</td>
</tr>
<tr>
<td>Routes</td>
<td>100</td>
<td>211</td>
<td>23</td>
</tr>
<tr>
<td>Prescriber details</td>
<td>100</td>
<td>837</td>
<td>91</td>
</tr>
</tbody>
</table>

References
Audit of safety indicators for anticoagulant therapy

Purcell S, Power B, Caldwell NA, Hodgkinson R, Smith S, Orton J
Pharmacy Department, Wirral University Teaching Hospital
NHS Foundation Trust, Wirral

Introduction
Warfarin kills and harms patients because of inadequate monitoring and dosing. An NPSA Patient Safety Alert in March 2007 identified a series of action points to promote safety. This audit was performed to fulfill part of the audit requirements of the safety alert, and to assess compliance with local pharmaceutical care standards which recommends that newly commenced on warfarin should be counselled and documentation be made in their patient record that counselling has taken place.

Objectives
1. To identify the number of patients receiving rapid anticoagulation using approved protocol
2. To identify the number of patients with an INR in therapeutic range at discharge
3. To identify the number of patients who developed an INR greater than 5
4. To identify the proportion of patients with evidence of oral anticoagulant counselling

Method
A prospective, observational audit of anticoagulant charts, medical and electronic pharmacy notes for all patients initiated on warfarin was undertaken. Audit standards included

1. 100% of patients commenced warfarin will follow approved rapid anticoagulation protocol, if rapid anticoagulation indicated
2. 100% of patients commenced warfarin will be discharged with an INR within therapeutic range
3. No patients will develop an INR greater than 5
4. 100% of patients commenced warfarin will receive oral anticoagulant counselling.

The study was approved by the trust’s clinical practice research unit. Patients who were restarted on warfarin (eg, after surgery) were excluded.

Results
During six weeks in April/May 2008 56 patients were initiated on warfarin. Case notes and prescription charts were available for 46 patients. Five patients were commenced on low dose warfarin initiation and were excluded. Data for 41 patients were analysed. Data was collected for 151 warfarin doses during rapid anticoagulation (see Table 1). Sixteen patients (39%) correctly followed the initiation schedule and received correct doses based on a measured INR. 482 INRs were measured in patients commenced warfarin during their hospital stay. Of these, two patients’ INR was greater than 5 on three occasions. Twenty-four patients (52%) were discharged on warfarin with an INR outside the therapeutic range. Only nine of these patients had documented evidence of organised follow up to ensure a therapeutic INR was achieved. Thirty-three patients (72%) had documented evidence that warfarin counselling was undertaken either by ward pharmacist (16 patients), warfarin education class (15 patients) or cardiology nurse (two patients). Thirteen patients had no documented evidence of receiving counselling.

Discussion
Sixteen out of 41 patients (39%) correctly followed the rapid anticoagulation protocol. A similar audit in 1998 within the trust showed 8% of patients had correctly followed protocol and consequently the prescription chart was redesigned. This audit shows improved adherence to recommended warfarin initiation. Not measuring INR was the most common reason for deviating from protocol with 20% of doses prescribed without an appropriate INR measurement. Warfarin is primarily prescribed by junior doctors, whose lack of experience and knowledge may lead to poor anticoagulant control. However, initiation using the protocol should achieve safe and effective therapy. Current guidelines are not followed by all doctors. This may be due to lack of education/training or lack of awareness. The audit results were presented to all pharmacists, the Medicines Safety Group and Medical Division’s “Audit Day” to promote best practice.

Two patients (less than 4%) had an INR above 5. In comparison, a study in 2006 showed 11% of patients on long-term warfarin therapy who visited the emergency department had an INR greater than five, though study population diversity may explain the differing results. The study illustrates the serious consequences of an elevated INR with 40% of patients exhibiting “gross bleeding”. Improved guidelines for loading doses of anticoagulants are recommended in the NPSA’s “Safer practice solutions to be further reviewed and developed.” National guidance for rapid initiation of warfarin will hopefully be published and should improve both initiation and maintenance prescribing of warfarin.

Over half of patients sent home on warfarin had an INR outside the therapeutic range. This is higher than a study at a hospital similar to ours which reported 18% of patients were discharged with INRs outside the therapeutic range. The audit within a 580 bed acute general hospital, over four months reported 62 patients discharged on warfarin. Subjective data from colleagues suggests that checking that INR is within target range at discharge does not always occur. We suggest that this should become a routine part of clinically checking a discharge prescription for all those prescribed warfarin. This must also be clearly documented on all discharge prescriptions. Of 24 patients discharged with an INR outwith target range, only nine had organised follow up documented to ensure a therapeutic INR was achieved. This was an incidental finding, as the data collection form did not specifically request this information. It is therefore not possible to draw conclusions from this finding.

The trust’s pharmaceutical care standards state that all patients newly commenced warfarin should be counselled and entry made in the patient’s record. Thirteen patients (28%) initiated and subsequently discharged on warfarin had no evidence of receiving counselling. They may have been counselled with no record made. However, adequate documentation must be performed to prove the action was performed. Further investigation of patients with no record of warfarin counselling revealed three patients were booked into the twice weekly “warfarin class” but were discharged before attending. This should form part of the clinical check of discharge prescriptions for patients discharged on warfarin. If patients commenced on anticoagulant therapy are due to attend warfarin class this must be communicated appropriately. Nursing staff should request counselling from pharmacy if a patient is to be discharged prior to attendance. Additionally, any patient booked into, but not attending, warfarin class should be alerted to the pharmacy team to ensure individualised counselling takes place prior to discharge.

Table 1. Warfarin dosing according to rapid anticoagulation protocol

<table>
<thead>
<tr>
<th>Warfarin dose</th>
<th>Number of doses</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct</td>
<td>105</td>
<td>70</td>
</tr>
<tr>
<td>Low</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>No INR</td>
<td>29</td>
<td>19</td>
</tr>
</tbody>
</table>

References
A prospective audit of the trust anticoagulation chart in patients newly started on warfarin

Omar R and Chouhan U
Glan Clwyd Hospital, Rhyl, Denbighshire LL18 5UJ

Introduction
Anticoagulants are the most frequently identified cause of preventable harm and admission to hospitals.1 There are number of factors putting patients at higher risk of developing an adverse effect. These factors include age over 75 and elevated international normalised ratio (INR).2
This trust does not have an anticoagulation service and the majority of warfarin initiation occurs while patients are in hospital. In order to make the prescribing of warfarin safer in the elderly population, a new initiation scheme was designed. This takes into account the patient’s age and baseline INR. At this hospital trust there are two initiation schemes. All patients aged ≥70 OR have INR ≥1.4 follow a low dose regimen described by Siguret V, et al.1 Patients aged <70 AND have INR <1.4 follow the standard Fennerty’s regimen.2

Aim
Identify whether inpatients that are newly started on warfarin have been initiated according to the trust’s anticoagulation loading scheme.

Objectives
● Identify whether indication is stated on trust’s anticoagulation loading scheme.
● Identify whether target INR is stated on trust’s anticoagulation loading scheme.
● Identify patients who did not have their baseline INR measured.
● Identify patients who followed trust’s anticoagulation scheme from Day 1 to 4.

Standards
● All patients should have their target INR range and indication selected on the chart.
● All aged <70 AND INR <1.4 should have baseline INR.
● All aged >70 AND INR <1.4 should have daily INR and correct dosage from Day 1 to 4.
● All aged ≥70 OR INR ≥1.4 should have INR on Day 4.
● All aged ≥70 OR INR ≥1.4 should have daily dosage according to protocol from Day 1 to 4.

Method
● The audit was carried out from February to June 2008.
● Ward pharmacists and technicians identified all medical and surgical patients newly started on warfarin.
● The author followed up the patients prospectively for the initial four days and on discharge.
● Patients who have previously been on warfarin and patients discharged prior to Day 4 were excluded. All data were collected on a data capture form and were analysed using Microsoft access.

Results
● A total of 122 patients were captured.
● The age range was 36 to 101, with a mean age of 74 years.
● 75% of the group were over 70 years of age.
● 27% of patients had baseline INR ≥1.4
● Most frequent indication for warfarin use was atrial fibrillation, followed by deep vein thrombosis and pulmonary embolism.

Conclusion
The compliance of this hospital against the trust’s anticoagulation chart needs to be improved (Table 1). In the over 70 years of age group, most deviation from the recommendations happened on Day 4. Possible explanation was subtherapeutic INR on Day 4. The patient characteristic of the area is biased towards the elderly population. Patients over 70 years of age accounted for 75% of the total data captured. In the over 70 years of age group there were higher incidences of over-coagulation in patients who did not follow the chart, 13% compared to 6% when the chart is followed (Table 2). Age over 80 years and INR >4 are risk factors for developing intracranial haemorrhage in patients on warfarin. This highlights the importance of following the recommendations in order to prevent unnecessary harm to patients.

Recommendations
Twice yearly education session should be carried out by pharmacists to junior doctors to improve the prescribing of warfarin and raise awareness to the trust anticoagulation chart. Another recommendation is to bring forward the administration of warfarin to 2pm from 6pm. This will eliminate the out-of-hours prescribing of warfarin and reduce errors.
Also it is important to make doctors aware that in the older population therapeutic INR on Day 4 is not crucial. However, following the recommendation is important because it has been shown that the dose of warfarin on Day 4 to be within 0.5mg of the maintenance dose.3 Training pharmacists to manage newly started warfarin patients is another option. Finally, designing a computer system that takes into account the baseline INR, prompts doctors to do INR tests and recommends dosage regime for the patient based on their INR could be devised.

References

| Table 1: Compliance of the trust against the standards set |
| Criteria | Standard | Compliance |
| All patients should have their target INR range and indication selected on the chart | 100% | 96% |
| Age <70 AND INR <1.4. All should have baseline INR | 100% | 74% |
| Age <70 AND INR <1.4. All should have daily INR and correct dosage from day 1-4 | 100% | 37% |
| Age ≥70 OR INR ≥1.4 All should have INR on day 4 | 100% | 77% |
| Age ≥70 OR INR ≥1.4 All should have dosage according to protocol from day 1-4 | 100% | 35% |

| Table 2: A summary of the main outcomes gathered from the audit |
| Findings | Starting regimen |
| Total patients | Age <70 AND INR <1.4 | Age ≥70 OR INR ≥1.4 |
| Mean age | 58 | 80 |
| Chart followed from Day 1 to 4 | 10 (37%) | 33 (35%) |
| Therapeutic INR Day 4 | 6 (60%) | 8 (24%) |
| Over target INR Day 4 | 2 (20%) | 3 (9%) |
| Therapeutic INR on discharge | 9 (90%) | 21/31* (68%) |
| Hospital stay | 6.6 days | 6.9 days |
| Over coagulation | Chart followed | Chart not followed |
| INR=4 | 2 (20%) | 3 (17%) |
| INR=6 | 0 | 0 |
| Over target | Chart followed | Chart not followed |
| INR=1 | 2 (6%) | 2 (3%) |

* Two patients did not have INR carried out on discharge
The omission and documentation of prescribed inpatient medication doses on surgical wards in a large teaching hospital environment

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Introduction
Medication administration errors, including omitted doses of prescribed medication have previously been identified as an area of concern. The consequences of such omissions depend on the medication omitted and rationale for treatment. This may range from an unnecessary analgesic being refused, to a diuretic omitted in a patient with heart failure or an epileptic patient missing their regular anticonvulsant. The National Patient Safety Agency has recommended regular audit of dose omissions, including lack of appropriate documentation. Professional nursing standards require that all doses administered or omitted are recorded, including the reasons for any omission.

The findings of previous trust audit within the adult medical wards showed that omission errors were common and preventable. Therefore, it was timely to investigate the situation within surgery. A particular area of local interest, identified from previous audit and incident reports, was omissions due to required medicine being unavailable in clinical areas. Specifically, to what extent the medicine was absent or simply not found.

Objectives
To investigate the prevalence of omitted and undocumented inpatient doses on adult surgical wards. Audit standards set, based on trust medicines policy and the Nursing and Midwifery Council standards, were:

**Standard I** 100% of doses administered and omitted were documented on the drug chart.

**Standard II** 100% of omitted doses had the reason for omission recorded on drug charts using the trust's numerical code and the reasoning behind medical/nursing decisions documented in patients' clinical notes.

**Standard III** No consecutive omissions due to "unavailable" medicines. No established standard or guidance could be found. However it would be reasonable to expect unavailable medicines to be ordered promptly, so a standard of less than 90% doses was proposed.

Method
Data were collected using a prepiloted structured data collection form on single days during November 2008. Patients with an inpatient drug chart physically present on the ward were eligible for inclusion. A convenience sample of eight adult surgical wards at the John Radcliffe was chosen.

Data collection was restricted to medication prescribed for regular administration. Doses that had been prescribed but omitted or were not documented in the 24 hours preceding 0am on the day of data collection were recorded as follows: medicine, route, dose, frequency, date, time, numerical code and reason for omission (not available, clinical decision, patient refused etc.) according to the numeric codes used within the trust. In cases where the medicine was documented “unavailable,” a physical check to confirm this was made within the clinical area, eg, patient’s medication locker and record of pharmacist ordering. Consecutive omissions were excluded if there was less than four hours between doses, to allow time for ordering. A “snapshot audit” has previously been used successfully for data collection regarding dose omissions. Data were analysed using Excel.

Results
Of a total 1,825 doses prescribed for regular administration to 137 patients, 281 (15%) were omitted or undocumented in some manner.

Table 1 shows the overall prevalence and reasons for omission. Of the 39 instances where a clinical decisions was made to omit a dose (32 nursing and seven medical), 31 had no reason documented. In the 22 doses omitted due to “medicine unavailable”, three were found in the patient’s medication locker and four had been ordered by the pharmacist but were not present on the ward. There were 10 occasions when adjacent doses were omitted as unavailable.

Therefore, none of the audit standards were met.

Discussion
The most common reason for omission was patient refusal. In some cases the refusal omissions may have been justified, eg, analgesia or laxatives, but this was beyond the scope of this audit. Further work should explore whether prescription review was needed. The second most common reason was a lack of documentation, meaning it was not possible to establish if the dose was administered or omitted.

While a 24-hour “snapshot” does not provide generalisable findings, as it is limited in its coverage of activity within the clinical areas, it provides sufficiently robust data to determine whether further investigation and risk reduction initiatives are warranted.

The prevalence of dose omissions is of concern and significantly higher than those reported by other centres. Examples of potentially serious omissions included spironolactone omitted over several days, azathioprine, quetiapine, dalteparin and insulin detemir. Improvement and reaudit are required in this area, which could usefully examine any correlation between weekends and dose omissions. Improvements in dose documentation and reducing omissions might be brought about through staff re-education and the joint interdisciplinary responsibility for this. Omissions due to medicine unavailability could have been prevented through appropriate pharmacy ordering.

References

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