Safety in Doses
Improving the use of medicines in the NHS
Learning from national reporting 2007
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Acknowledgements

This report was produced by the National Patient Safety Agency (NPSA) Safe Medication Practice Team.

The data analysis for this themed review was undertaken by contributions from the following external frontline practitioners:

A thematic analysis of acute sector medication incident data was provided by Dr Clare Crowley, Lead Medicines Safety Pharmacist, Oxford Radcliffe Hospitals NHS Trust.

A thematic analysis of data from the mental health and learning disabilities sector was provided by Ian Maidment, Senior Pharmacist, Kent and Medway NHS and Social Care Partnership Trust and Honorary Research Fellow, Centre for Health Service Studies, University of Kent and Matthew Elswood, Lead Pharmacist – Mental Health, Milton Keynes Primary Care Trust.

Sharon Conroy, Lecturer in Paediatric Clinical Pharmacy, Derbyshire Children’s Hospital (Nottingham University); Dr Zareena Davar, Speciality Paediatric Trainee Registrar, Imperial College Healthcare NHS Trust (London Deanery); and Andy Fox, Principal Pharmacist – Risk, Southampton University Hospitals NHS Trust provided a thematic analysis of paediatric medication incident data.

A review of medication incidents in elderly patients was undertaken by Gillian Cavell, Deputy Director of Pharmacy, Medication Safety, King’s College Hospital NHS Foundation Trust.
Executive summary

Incidents reported to the National Patient Safety Agency’s (NPSA) Reporting and Learning System (RLS) provide valuable learning to make the NHS safer for patients. This report provides a detailed review of the medication incidents reported to the RLS in 2007.

More incidents being reported

- There has been a significant year-on-year increase in the reporting of medication incidents from England and Wales to the National Reporting and Learning Service (NRLS), from 64,678 incidents reported in 2006 to 86,085 reported in 2007.
- A base dataset of 72,482 medication incident reports from the RLS was used in the analysis of incidents occurring between 1 January 2007 and 31 December 2007.
- Incidents involving medicines were the third largest group (nine per cent) of all incidents reported to the RLS, after patient accidents (35 per cent) and treatment/procedure (nine per cent), from a total of 811,746 incidents of all types reported during 2007.
- The majority of medication incidents (96 per cent) had actual clinical outcomes of no harm or low harm.
- Acute care (all specialties) remains the highest reporter of all incidents (73 per cent) and medication incidents (76 per cent). Primary care (defined as a combination of community nursing, community and general dental services, community optometry/optician services, community pharmacy and general practice) is the next highest reporter of medication incidents (14 per cent). Mental health is the third highest reporter of medication incidents (nine per cent).

The most serious incidents

- The NPSA received 100 medication incident reports of death and severe harm via the RLS.
- Most serious incidents were caused by errors in medicine administration (41 per cent) and, to a lesser extent, prescribing (32 per cent).
- Incidents involving injectable medicines represent 62 per cent of all reported incidents leading to death or severe harm.
- Three incident types – unclear/wrong dose or frequency, wrong medicine and omitted/delayed medicines – account for 71 per cent of fatal and serious harms from medication incidents.
- Types of medicines most frequently associated with severe harm include cardiovascular, anti-infective, opioid, anticoagulant and anti-platelet medicines.
- Following earlier guidance on the safe use of potassium chloride injection and oral methotrexate, there were no incident reports of death or severe harm in 2007 involving these medicines.
How to use this report

Healthcare organisations should use this report to:

1. review the number and completeness of medication incident reports received locally and identify whether current arrangements are enabling local learning and action to minimise risk of harm to patients;
2. use the information and examples in this report to risk assess and, where necessary, improve the safety of local medication management systems;
3. continue to review previously implemented NPSA safer practice recommendations to ensure that robust implementation is maintained;
4. implement local risk reduction strategies that focus on minimising the high medication risks for children; these include:
   - neonatal medication errors;
   - dose calculation errors for all children; and
   - risks associated with poor documentation of medication use and the safe use of paracetamol, gentamicin, morphine, vaccines, insulin products and intravenous fluids;
5. promote initiatives to help reduce medication incidents involving elderly patients, such as a review of local arrangements for managing medication-related therapy for patients with swallowing difficulties and processes associated with medication concordance and compliance in elderly patients, particularly the use of patients’ own medicines and compliance aids.

Further information and tools for learning are available at: www.npsa.nhs.uk/nrls/medication-zone
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The NPSA manages the national Reporting and Learning System (RLS) which collects safety incident reports from all NHS organisations in England and Wales. The RLS aims to help providers of NHS care improve patient safety. This report provides an overview of in-depth analysis of medication incidents reported to the RLS in 2007.

Introduction – what are medication incidents?
1.1 The NPSA’s Reporting and Learning System

The RLS aims to help providers of NHS care improve patient safety. Reports made to the RLS are analysed with expert clinical input to identify hazards, risks and opportunities to improve patient safety.

The NPSA defines a patient safety incident as ‘any unintended or unexpected incident which could have or did lead to harm for one or more patients’.

All NHS organisations in England and Wales had the capability to report patient safety incidents to the RLS from 1 January 2005. The RLS enables NHS staff, patients and members of the public to report patient safety incidents.

Further information on the RLS, incident analysis and patient safety guidance is available at: www.npsa.nhs.uk/nrls

1.2 Patient safety incidents involving medicines

There are various terms that have been used in the literature to describe harm from medicines; these include medication error, adverse drug reaction and adverse drug event. Bates et al (1995) described the relationship between these three terms (see Figure 1 which illustrates this relationship).

1.2.1 Medication errors

Medication errors are any incident where there has been an error in the process of prescribing, dispensing, preparing, administering, monitoring or providing medicines advice, regardless of whether any harm occurred or was possible. This is a broad definition and most errors result in no or low harm.

1.2.2 Clinical outcomes of medication incidents

A small proportion of medication incidents will involve actual harm to patients; these are sometimes called adverse drug events. These types of incidents can be divided into two groups depending on whether an error occurred or not. Where harm occurred and no error took place in the medication process, then these incidents are judged non-preventable and are usually called adverse drug reactions. An example of this would be a patient experiencing a side effect from a medicine for the first time, which could not have been predicted. These kinds of incidents are not collected by the NPSA but should be reported to the Medicines and Healthcare products Regulatory Agency (MHRA) Pharmacovigilance ‘Yellow Card’ Scheme at: www.mhra.gov.uk/Safetyinformation/Reportingsafetyproblems/Medicines/Reportingsuspectedadversedrugreactions/index.htm

Where harm occurred due to an error, these types of incidents are either preventable or the harm from the incident can be minimised. Examples of preventable incidents include:

- A medicine was prescribed for a patient who had a known allergy to that medicine.
- A 10-fold dose (i.e. overdose) was prescribed, dispensed or administered.
- A correctly prescribed medicine was administered by the wrong route of administration.

Examples of medication incidents where the harm could have been minimised usually involve an error in the medicine monitoring process. These are sometimes not included in the medication safety literature, for example failure to:

- monitor and adjust the dosage of warfarin, lithium, anticonvulsants, glycopeptide or aminoglycoside antibiotics;
• monitor full blood count and assess renal clearance in patients on non-steroidal anti-inflammatory medicines and, where necessary, adjust treatment and co-prescribe other medicines such as gastro-protective agents; or
• monitor blood sodium and potassium levels, adjust the dose of diuretics and, where necessary, co-prescribe other medicines.

These types of incidents are sometimes called ameliorable incidents, indicating that the harm can be minimised.

1.2.3 Potential harm from medicines (near misses)
Another group of medication incidents will not have caused harm but will be judged to have the potential to cause harm, and these types of incidents are often called ‘near misses’. These reports provide valuable insight into where systems need to be improved to prevent death or serious harm. They are important as patients with different susceptibilities may have suffered harm from the same incident.

1.3 Previous publications on RLS medication incidents and safer practice guidance
The NPSA provides regular feedback on patient safety incidents.

An analysis of the first 60,000 medication-related incident reports between January 2005 and June 2006 was published in the fourth report of the Patient Safety Observatory, *Safety in doses: medication safety incidents in the NHS*.2 This report and a range of patient safety guidance on safe medication practice are available on the NPSA website at:
www.npsa.nhs.uk/nrls

Two-page summaries of patient safety reports for each individual NHS organisation in England and Wales are published on the NPSA website at:
www.npsa.nhs.uk/nrls/patient-safety-incident-data/organisation-reports/

The summaries are published on a six-monthly basis.

The NPSA also provides regular feedback to organisations on all patient safety incidents in the form of feedback reports. Feedback reports provide an analysis of patient safety incidents that have been reported from an organisation through the RLS (see www.npsa.nhs.uk/nrlsxtras/ (available to NHS trusts ONLY)). The reports compare similar sized organisations from the same care setting to allow organisations to benchmark activities.

The NPSA also publishes regular Quarterly Data Summaries – www.npsa.nhs.uk/nrls/patient-safety-incident-data/quarterly-data-reports/. These publications set out the number of patient safety incident reports received from across England and Wales, and describe patterns and trends in these incidents.

1.4 References

There has been a significant year-on-year increase in the reporting of medication incidents to the RLS.

72,482 medication incidents were reported to the RLS as occurring between 1 January 2007 and 31 December 2007.

Incidents involving medicines was the third largest group (nine per cent) of all incidents reported to the NPSA, after patient accidents (34 per cent) and treatment/procedure (nine per cent).

The majority of medication incidents (96 per cent) reported clinical outcomes of no harm or low harm. However, there is important learning to gain from reviewing all the medication incident reports.

Acute care (adults and children) remains the highest reporter of all incidents and medication incidents (73 per cent and 76 per cent respectively).

Primary care (defined as a combination of community nursing, community and general dental services, community optometry/optician services, community pharmacy and general practice) is the next highest reporter of medication incidents (14 per cent).

Mental health is the third highest reporter of medication incidents (nine per cent).

During 2007, out of 423 NHS organisations, 29 reported no medication incidents and a further 90 organisations reported 10 incidents or fewer.

Without reporting, opportunities for national learning are diminished. Organisations that have a poor reporting culture and system where few medication incidents are reported may be at greater risk of harming patients with a medicine as there is less opportunity to learn and improve their medication systems.
2.1 Introduction

Patient safety incident reports are an invaluable source of learning for organisations. Research\(^1\) has shown that higher reporting rates correlate with a better safety culture and risk management ratings; regular reporting of incidents from organisations is therefore something to be encouraged.

This chapter will first examine levels of reporting to the RLS, and will then review some of the patterns that have emerged from reporting. Without reporting, opportunities for national learning are diminished. Medication incidents occur very frequently in all healthcare systems across the world. Only a small percentage result in actual harm, but no harm and low harm incidents provide an opportunity to learn and develop strategies to minimise the risk of preventable harms from medicines. Organisations that have a poor reporting culture and system where few medication incidents are reported may be at greater risk of harming a patient with a medicine as there is less opportunity to learn and improve their medication systems.

It is important to note that the two quantitative sections of this chapter are based on different datasets, as incidents may be reported some time after they have occurred. The data provided in section 2.2 should therefore not be compared with subsequent sections.

2.2 Number of medication incidents reported

There has been an increase in reporting of medication incidents, with 86,085 medication incidents reported to the RLS between 1 January 2007 and 31 December 2007; 64,678 were received during 2006, representing an increase in reporting of over 20,000 incidents (Table 1). It is worth noting that this increase in reporting is largely in line with overall levels of reporting to the RLS.

Table 1

<table>
<thead>
<tr>
<th>Time period</th>
<th>Number of medication incidents reported to the RLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 2005 to Dec 2005</td>
<td>36,335</td>
</tr>
<tr>
<td>Jan 2006 to Dec 2006</td>
<td>64,678</td>
</tr>
<tr>
<td>Jan 2007 to Dec 2007</td>
<td>86,085</td>
</tr>
</tbody>
</table>

Note: The figures in the table above are based on the date that incidents were reported to the RLS and are intended to demonstrate levels of incident reporting. This is not comparable with other figures provided in this document, which are intended to illustrate incident trends, and are based on the date the incident occurred.

A breakdown of reporting organisations by cluster type (based on Care Quality Commission cluster types used for rating organisations) shows that, of the 423 NHS organisations in England and Wales, the vast majority (394) submitted at least one incident during 2007 (Table 2).

Acute organisations are the highest reporters by volume, with a median of 299 reports submitted in 2007. A further breakdown within the acute sector (Table 3) shows that the volumes of incidents

Table 2 Medication incidents by cluster type, 2007

<table>
<thead>
<tr>
<th>Cluster type*</th>
<th>Number of reporting organisations</th>
<th>Organisations reporting no medication incidents</th>
<th>Percentage of organisations that have reported</th>
<th>Lower quartile</th>
<th>Median number of reports submitted</th>
<th>Upper quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute</td>
<td>170</td>
<td>3</td>
<td>98</td>
<td>145</td>
<td>299</td>
<td>492</td>
</tr>
<tr>
<td>Ambulance</td>
<td>10</td>
<td>2</td>
<td>–</td>
<td>3</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>Combined</td>
<td>4</td>
<td>0</td>
<td>–</td>
<td>310</td>
<td>479</td>
<td>600</td>
</tr>
<tr>
<td>Learning disability</td>
<td>2</td>
<td>0</td>
<td>–</td>
<td>2</td>
<td>32.5</td>
<td>63</td>
</tr>
<tr>
<td>Mental health</td>
<td>49</td>
<td>9</td>
<td>84</td>
<td>46</td>
<td>113</td>
<td>214</td>
</tr>
<tr>
<td>Primary care organisation</td>
<td>159</td>
<td>15</td>
<td>91</td>
<td>10</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Total</td>
<td>394</td>
<td>29</td>
<td>93</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A list of organisations and cluster types allocation can be found at: www.npsa.nhs.uk/nrls/reporting/how-can-i-get-feedback-about-information-reported-from-my-organisation/sample-reports-benchmarking/*
reported by small, medium and large acute trusts are in proportion to their size, with small acute trusts generally reporting fewer incidents than medium trusts, for example.

Mental health organisations are the next highest reporting sector, with a median of 113 reports submitted in 2007, followed by primary care organisations (PCOs), with a median of 30 reports submitted.

2.3 Patterns in medication incidents

This quantitative review of medication safety data is based on incidents that occurred between 1 January 2007 and 31 December 2007 and that were reported to the RLS by organisations or individuals in England and Wales. This set of data is based on data derived for the Quarterly Data Summary, Issue 8, 2008, Section 2.

It is important to note that some of the data may have been updated by reporters in the intervening period, so there may be some minor differences in the totals if the tables are compared.

Approximately nine per cent of all incident reports received by the NPSA involve medicines, and medication is the third most frequently reported incident type after patient accident and treatment/procedure (see Table 4).

Table 3 Medication incidents reported by the acute care cluster type, 2007

<table>
<thead>
<tr>
<th>Acute organisation cluster*</th>
<th>Number of reporting organisations</th>
<th>Acute organisations that have not reported any incidents</th>
<th>Lower quartile</th>
<th>Median</th>
<th>Upper quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute specialist trust (including acute specialist (children))</td>
<td>20</td>
<td>1</td>
<td>31</td>
<td>131</td>
<td>291</td>
</tr>
<tr>
<td>Acute teaching trust</td>
<td>25</td>
<td>0</td>
<td>478</td>
<td>813</td>
<td>986</td>
</tr>
<tr>
<td>Large acute trust</td>
<td>44</td>
<td>0</td>
<td>164</td>
<td>376</td>
<td>493</td>
</tr>
<tr>
<td>Medium acute trust</td>
<td>51</td>
<td>1</td>
<td>150</td>
<td>265</td>
<td>440</td>
</tr>
<tr>
<td>Small acute trust</td>
<td>30</td>
<td>1</td>
<td>112</td>
<td>203.5</td>
<td>264</td>
</tr>
<tr>
<td>Total</td>
<td>170</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A list of organisations and cluster types allocation can be found at: www.npsa.nhs.uk/nrls/reporting/how-can-i-get-feedback-about-information-reported-from-my-organisation/sample-reports-benchmarking/

Table 4 Types of reported patient safety incidents for England and Wales, 2007

<table>
<thead>
<tr>
<th>Types of patient safety incidents</th>
<th>Number of incidents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient accident</td>
<td>279,858</td>
<td>34</td>
</tr>
<tr>
<td>Treatment/procedure</td>
<td>75,875</td>
<td>9</td>
</tr>
<tr>
<td>Medication</td>
<td>72,482</td>
<td>9</td>
</tr>
<tr>
<td>Access, admission, transfer, discharge (including missing patient)</td>
<td>60,694</td>
<td>7</td>
</tr>
<tr>
<td>Infrastructure (including staffing, facilities, environment)</td>
<td>52,096</td>
<td>6</td>
</tr>
<tr>
<td>All other types of incident</td>
<td>270,741</td>
<td>33</td>
</tr>
<tr>
<td>Total</td>
<td>811,746</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 5 illustrates the number of medication incidents by care setting. It is clear that the bulk of reports are from acute sector hospitals and very few medication incident reports are received from other care settings.

Table 5 Medication incidents by care setting, 2007

<table>
<thead>
<tr>
<th>Care setting</th>
<th>Incidents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute hospitals</td>
<td>54,827</td>
<td>76</td>
</tr>
<tr>
<td>Mental health service</td>
<td>6,551</td>
<td>9</td>
</tr>
<tr>
<td>Community nursing, medical and therapy service (including community hospitals)</td>
<td>5,563</td>
<td>8</td>
</tr>
<tr>
<td>Community pharmacy</td>
<td>3,521</td>
<td>5</td>
</tr>
<tr>
<td>Learning disabilities service</td>
<td>1,183</td>
<td>2</td>
</tr>
<tr>
<td>General practice</td>
<td>738</td>
<td>1</td>
</tr>
<tr>
<td>Ambulance service</td>
<td>86</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Community and general dental service</td>
<td>12</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Community optometry/ optician service</td>
<td>1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Total</td>
<td>72,482</td>
<td>100</td>
</tr>
</tbody>
</table>
The 8,603 incidents (Table 6) reported by the primary care sector represent 12 per cent of the total for the review period. Given that over 748 million prescriptions were prescribed and dispensed in primary care during the review period, it would be reasonable to expect that more incidents would be reported. The NPSA is committed to promoting improved reporting and learning, and in 2009/10 will launch a number of initiatives to support this aim.

2.4 Are patients harmed from medication incidents?
The reported clinical outcomes of medication incidents are shown in Table 7. Reports with outcomes of death or severe harm were reviewed by expert reviewers. Where it was unclear whether the incident report had a clinical outcome of death or severe harm, the reports were assigned to other outcome categories. The number of reviewed reports is included in Table 9.

More than 95 per cent of medication incident reports had reported clinical outcomes of no harm or low harm. Although these incidents did not lead to significant harm, there is often learning that can be obtained at both local and national level from these incident reports. For example, the large number of no or low harm incident reports concerning delayed or omitted medicine doses when added to the smaller numbers with clinical outcomes of death or severe harm indicates that this is an important problem that needs to be addressed (see chapter 3).

<table>
<thead>
<tr>
<th>Primary care location</th>
<th>Number of reports</th>
<th>Percentage of primary care reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community pharmacy</td>
<td>5,223</td>
<td>61</td>
</tr>
<tr>
<td>General medical practice</td>
<td>908</td>
<td>11</td>
</tr>
<tr>
<td>General dental practice</td>
<td>15</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Patient’s own home</td>
<td>2,457</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td>8,603</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 7 Medication incidents by clinical outcome, 2007

<table>
<thead>
<tr>
<th>Clinical outcome</th>
<th>Incidents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No harm</td>
<td>58,326</td>
<td>80</td>
</tr>
<tr>
<td>Low harm</td>
<td>11,338</td>
<td>16</td>
</tr>
<tr>
<td>Moderate harm</td>
<td>2,710</td>
<td>4</td>
</tr>
<tr>
<td>Severe harm (following review)</td>
<td>63</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Death (following review)</td>
<td>37</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Other*</td>
<td>8</td>
<td>&lt;1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>72,482</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Clinical outcome is not provided or the incident(s) involved a number of patients where impact on an individual is difficult to determine.

2.5 Which part of the medication process carries most risk?
Results of an analysis of medication incident reports by the stage of the medication process are shown in Chart 1 (all care settings) and Table 8 (primary care locations). Nearly half of the reports describe incidents involved with the administration or supply of a medicine in a clinical area. Smaller percentages are seen for the other stages of the medication process.

There are more opportunities for error during medicine administration than during the prescribing and dispensing stages of medicine use. The reporting culture in the NHS is also more likely to mean that staff will report an incident where an error has actually occurred rather than a near miss where the error has been prevented.

Incidents associated with monitoring the effects of an administered medicine are also less likely to be reported. It is often unclear what type of monitoring should be performed, when it should be carried out and who is responsible for undertaking monitoring and acting on the results. If a preventable harm from the medicine is detected, it is sometimes interpreted as being due to a change in the patient’s condition or as a non-preventable side effect of the medicine.
2.6 Types of medication incident

Medication incidents that arise from the wrong or unclear dose or strength of medicine continue to be the largest single type of report received by the RLS (Chart 2). This category is of particular concern in paediatrics where, in the sample analysed, it accounted for almost half of the errors (see chapter 7).

The top three incident types account for nearly half of all medication reports received by the RLS. Chart 2 shows the top five medication incident types.

Incident types reported by primary care settings reflect the same patterns, with the exception of omitted medicines, which are rarely reported by primary care locations.

2.7 Incident by age group

Age is not a mandatory field in the RLS, and a significant proportion of the data (39 per cent) do not contain information on the patient’s age, therefore figures have not been provided in this report as the data cannot be considered robust.

An initial investigation into the data suggests that the use of medication for very young and elderly patients is error prone, although this must be considered in light of the greater likelihood of such patient groups requiring any form of medical intervention.

Unfortunately, age-related data in the RLS are not yet mature enough to fully investigate this issue. This remains a topic for further review.

2.8 Does the quality of data limit learning?

Learning from patient safety incident reports needs to be effective. It is important that the information contained in each report is reviewed within the NHS organisation in which the incident occurred so that risk-minimising action can be taken.
One of the key elements of an incident review by an NHS organisation is to check that the report contains sufficient information to describe the incident and that there has been appropriate use of the RLS data fields.

One of the most important data fields concerns the clinical outcome resulting from the patient safety incident. The RLS requires that the code used in this field reflects the actual clinical outcome rather than the potential clinical outcome. For a code of ‘death’ or ‘severe harm’ to be allocated, the incident narrative should clearly indicate that the patient has died or has experienced serious harm directly resulting from the incident. An analysis of medication incident reports with incorrectly coded clinical outcomes is shown in Table 9.

Fifty-two incidents were reported with a clinical outcome code of ‘death’; following review of the incident detail, reviewers agreed to rate 29 incidents (56 per cent) with this outcome and 23 (44 per cent) were assigned other outcomes. A review of 371 incident reports of serious harm resulted in reviewers agreeing that only 63 incidents should have this code and 308 (83 per cent) were assigned other codes.

Data supporting Chart 2 can be found in the appendix.

The data field enabling the reporting of the name of the medication involved in the incident is not a ‘required field’ for medication incidents within the RLS dataset structure. In the previous NPSA report Safety in doses (2007), only 27 per cent of reports involving medication errors had the data field ‘medicine name’ completed. This percentage has not increased very much for incidents reported in 2007. Only 34 per cent of reports had the medicine name data field completed (Table 10). Although the name of the medicine is usually included in the text description of the incident, failure to use the voluntary medication name data field makes identifying the medicines most frequently
associated with patient safety incidents difficult, both locally and nationally.

<table>
<thead>
<tr>
<th>Medicine name field completed?</th>
<th>Number of incidents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>47,682</td>
<td>66</td>
</tr>
<tr>
<td>Yes</td>
<td>24,800</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>72,482</td>
<td>100</td>
</tr>
</tbody>
</table>

Information about medication incidents can vary from very long, detailed descriptions concerning what happened, to the brief description ‘a medication incident occurred’ or ‘see attached report of incident’. If details of the incident are not included in the incident report submitted via the RLS, then the potential for learning is diminished or impossible.

2.9 What are the key messages?
It was encouraging to find that there was a significant increase in the reporting of medication incidents to the NRLS. From the previous report reviewing medication in 2005/06 to this report of incidents in 2007, the overall volume of reports has increased from 64,678 to 86,085.

There are still very low numbers of medication incidents being reported by any primary care, mental health and some acute care organisations. More reporting enables more learning and opportunities for improving patient safety, and should not be interpreted as an increase in the number of medication incidents that are actually occurring in the NHS.

As previously mentioned, erroneous coding of clinical outcome (harm coding) for medication incident reports received from NHS organisations indicates that the system for reviewing, validating and learning from these incidents can be improved locally to improve patient safety. It should be stressed that actual rather than potential harm should be recorded.

Only a third of reports had the medicine name data field completed. Failure to use the voluntary medication name data field makes identifying the medicines most frequently associated with patient safety incidents difficult locally and nationally. It is expected that this field will become a mandatory reporting field in the dataset in the near future.

NHS boards increasingly require incident information to enable an assessment of the risks faced by the organisation and to enable decisions to be made about the action required to reduce risk where possible. This requires an appropriate volume and quality of incident reports to enable robust local analysis, and review of those reports at a senior level.

As management arrangements for World Class Commissioning mature in the NHS in England, provider organisations may be called upon to share with commissioners their incident data, and the resulting actions to ameliorate risk, in order to fulfil contractual obligations.

**Action points**

NHS organisations should review the number and completeness of medication incident reports received locally to identify whether current arrangements are enabling local learning and action to minimise the risk of harm to patients.

Actions might include:
- comparing the organisation’s reporting performance in relation to similar organisations (gap analysis questioning, ‘how are we doing?’);
- assessing the local reporting culture and identifying and managing local barriers to incident reporting;
- investigating all incident reports with outcomes of death and severe harm, to ensure that action is taken to minimise any recurrence of these incidents and also to ensure that these incident reports relate to actual harm rather than potential harm;
- increasing the percentage of medication incident reports where the name of the medicine(s) is included in the appropriate data field;
- increasing the percentage of incident reports where the age field is completed for children and elderly patients; and
• providing regular reports (concerning medication incident reports and actions to minimise harm) to clinical governance and medicines management groups in the organisation.

Further information about assessing and developing a reporting culture and improving incident reporting rates, including:
• Seven steps to patient safety;
• Questions are the answer! Seven key questions every board member should ask about patient safety;
• the Manchester Patient Safety Framework (MaPSaF);
and other NPSA resources, are available from: www.npsa.nhs.uk/nrls/

2.10 References


What can we learn from serious medication safety incidents?

- The NRLS received reports of 100 medication incidents which caused death and severe harm via the RLS for the year January 2007 to December 2007.
- Most of the serious incidents were caused by errors in drug administration (41 per cent) and, to a lesser extent, prescribing (32 per cent).
- Incidents involving injectable medicine represented 62 per cent of all reported incidents leading to death or severe harm.
- Three incident types – unclear/wrong dose or frequency, wrong medicine, and omitted/delayed medicines – accounted for 71 per cent of fatal and serious harms from medication incidents.
- The types of medicines most frequently associated with the most severe harms include cardiovascular, anti-infective, opioid, anticoagulants and anti-platelet medicines.
- Following earlier guidance on the safe use of potassium chloride injection and oral methotrexate, there were no incident reports in 2007 of death or severe harm involving these medicines.
- Examples of medication incidents that relate to death and severe harm to patients included in this report should be reviewed by local NHS organisations. This information will enable NHS organisations to question whether the identified risks are adequately managed locally.
- Effective implementation of NPSA guidance on safer medicines practice needs to be a continued area of focus and action.
3.1 Introduction
This chapter provides information following a review of medication incidents with fatal or severe harm outcomes that were reported as occurring during 2007. Further understanding of these types of incidents can be obtained from analysis of these reports, and initiatives can be taken at both local and national level to address and minimise preventable harm. More information on how serious incidents are reviewed by the NPSA, and key actions are identified, is available from Acting on serious risks to patient safety at: www.npsa.nhs.uk/rrr

3.2 What is the key learning?
3.2.1 Analysis by stage of medication process
The most serious incidents were caused by errors in medicine administration and, to a lesser extent, prescribing. Fewer serious medication incidents occurred during preparing/dispensing and monitoring medicines (Chart 3).

Chart 3 Medication incidents that report death and severe harm by stage of medication process, 2007

Data supporting Chart 3 can be found in the appendix.

3.2.2 Analysis by medication incident type
Three incident types – unclear/wrong dose or frequency, wrong medicine and omitted/delayed medicines – account for 71 per cent of fatal and serious harms from medication incidents (Chart 4).

Chart 4 Types of medication incident that report death and severe harm, 2007

Data supporting Chart 4 can be found in the appendix.
Examples of unclear/wrong dose or frequency of administration
Incident reports involving unclear/wrong dose or frequency or rate of administration make up the largest group of incident types and cause the greatest numbers of deaths and severe harm. Miscalculation, failure to titrate the dose to the patient’s needs, miscommunication and failure on the part of all team members to check the dose before dispensing, preparing or administering a dose are the most common factors contributing to dosing errors.

The information in the green tinted boxes is taken directly from the RLS database.

Prescribing
- Patient prescribed loading dose of phenytoin 1g then maintenance dose of 1g twice daily (usual maintenance dose is around 300mg daily) on Friday. Five 1g doses were administered over the weekend. Screened by a pharmacist on the Sunday and incorrect dose not picked up and queried with the medical team. Patient not seen by any medical team on Monday. I noticed wrong dose on Tuesday morning and crossed off prescription and discussed with medical team. Patient died the next day. (Death)

Dispensing/medicine supply
- Patient was prescribed digoxin 62.5 micrograms. On 27th January by mistake digoxin 250 micrograms was dispensed instead. Patient felt unwell for few days. The error was noticed by the family member on 12th February; the patient’s family contacted the pharmacy. Records were checked and the overdose identified. A doctor was called in and patient was examined. The family was told to withhold the next dose. The patient collapsed and later died in hospital. (Death)

Administration
- Staff Nurse administered 20ml Potassium Chloride Injection to patient as a slow bolus. Two doctors rushed to bedside and confirmed the slow bolus. Doctor informed Staff Nurse that Potassium Chloride injection should always be administered in 50ml of Dextrose/ Saline as a slow infusion. Patient arrested. Patient successfully resuscitated by doctor. (Severe harm)

Monitoring
- Patient admitted from another hospital with metastatic adenoma of unknown primary with high output stoma requiring >4.5 litres of Total Parenteral Nutrition (TPN) per day. Patient’s TPN acknowledged in notes ‘continue TPN’ but not prescribed. Husband continued to provide TPN (via previous hospital) and we put up the TPN at his request. During admission patient continued to get more breathless. Furosemide prescribed orally and later intravenously, also spironolactone orally. Shortness of breath got worse with pedal oedema and dull bases. Cardiology inputs recommended refer to nutrition team for TPN management. Legs swollen to knees lead to an increase in furosemide. Nutrition team came and advised volume of TPN to be reduced to 1.5l daily with strict fluid balance. Doctors suspected fluid overload and heart failure but wanted nutrition to continue, therefore smallest volume bag advised. Up until then no fluid balance had been done. Patient’s condition worsened and with increased shortness of breath. (Death)

Examples of wrong medicine incidents
The wrong medicine may be selected in error at every stage of the medication process. Here are examples of death and severe harm when the wrong medicine was dispensed, prepared and administered.
Prescribing

• Child with pulmonary atresia (undiagnosed) in A&E. PICU staff attended and brought to PICU. Prescribed prostacyclin by Registrar and infusion commenced. No improvement in condition so review of child made. At this time it was realised the child should have been prescribed prostaglandin. (Severe harm)

Dispensing/medicine supply

• Patient had a percutaneous coronary intervention. Wife stated they were not given any aspirin or clopidogrel on discharge but wife also said they had a long delay in discharge waiting for discharge medicines, delaying lift home so the discharge was rushed. The TTOs were not explained. Re-admitted with blocked stents. (Severe harm)

Administration

• Patient admitted following traffic accident. Sustained bilateral lower limb fractures. Recovering well. Cardiac arrest following symptoms consistent with large pulmonary embolus. Resuscitated for long enough to transfer to Critical Care Unit but died shortly afterwards despite increasing treatment. On his drug chart, the prophylactic heparin injections were not signed as being administered on some occasions. (Death)

Example of known allergy

A patient with a known allergy to a medicine or a therapeutic class of medicine is a specific type of contraindication for the use of some medicines, although there are many cases where patients claim allergy to a medicine and this is found not to be the case. There are frequent occasions when a patient is known to be profoundly allergic to a medicine but they are still prescribed, dispensed or administered and lead to anaphylaxis.

Prescribing

• Given antibiotic trimethoprim. Collapsed and arrested shortly afterwards. Prescription sheet states that patient allergic to Septrin/penicillin. Now on medical ward. No absolute Oxygen given as yet but anaphylactic shock was given as a possible/probable diagnosis. Arrest included entering into a ventricular fibrillation rhythm which required defibrillation. (Severe harm)

Dispensing/medicine supply

• Patient called General Practitioner who diagnosed lower respiratory tract infection. Was prescribed prednisolone and amoxicillin. Patient took medicines and then collapsed. Patient came to A&E via ambulance and was bradycardic and hypotensive. A box of propranolol 40mg tablets labelled as prednisolone (take 8 tablets once daily for 5 days). Patient had taken propranolol 320mg as a single dose. (Death)

Administration

• Patient infused insulin instead of midazolam in error. Infusion stopped when error noted. Blood sugar 4.2 down to 1.9. 50% glucose given until blood sugar rose to 5.6. (Severe harm)

Examples of omitted medicine incidents

It is not well recognised that serious consequences can arise when medicines are omitted. There are reports of deaths and serious harm when medicines have been omitted when prescribing, dispensing and administering medicines to patients.

Prescribing

• Failure to re-prescribe cardiovascular medication prior to discharge. The drugs were correctly stopped on admission due to cardiovascular instability following a significant upper gastro-intestinal bleed. The patient after discharge became symptomatic with probable heart failure and saw her GP who reinstated medication. Unfortunately the patient died at home 5 days after discharge. (Death)
Example of wrong route incidents
Wrong route errors are made possible by the use of universal compatible luer connectors for all routes used to administer medicines.

- Accidental intravenous infusion of bupivacaine leading to cardiac arrest and death of the patient. (Death)

The NPSA issued Patient safety alert 21 on the safer use of epidural medicines in March 2007. Guidance was provided to help to minimise the risk of wrong route errors with epidural injections and infusions. (Available at: www.npsa.nhs.uk/nrls/alerts-and-directives/alerts/epidural-injections-and-infusions/)

Patient safety alert 19 on promoting safer measurement and administration of liquid medicines via oral and other enteral routes, issued in March 2007, provided guidance to reduce the risks of wrong route errors with oral and enteral medicines and liquids. (Available at: www.npsa.nhs.uk/nrls/alerts-and-directives/alerts/liquid-medicines)

Mismatching patients with their treatment
Incidents that are reported as a mismatch between two patients (‘wrong patient’) occur at all stages of the medication process.

Dispensing/medicine supply errors
- Another patient’s methadone should have been dispensed and consumption observed. Pharmacist dispensed as take home dose. Patient took this medication along with his own and overdosed. (Severe harm)

Administration
- Enoxaparin given to patient with gastro-intestinal bleed instead of patient with similar name. Enoxaparin 120mg given to wrong patient. Two patients on ward with similar surnames. Patient died next day following a gastro-intestinal bleed. (Death)

3.2.3 Analysis by route of administration
Medicines which are injected pose the greatest risk of harm (62 per cent of incidents leading to death and severe harm outcomes). This same finding was found in the analysis of incidents reported in 2005/06. Injectable medicines are often the most complex and potent medicines, requiring complex calculations, methods of preparation and administration, and systems for monitoring treatment (Table 11).

<table>
<thead>
<tr>
<th>Route</th>
<th>Deaths</th>
<th>Severe harms</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injectable</td>
<td>27</td>
<td>35</td>
<td>62</td>
</tr>
<tr>
<td>Oral</td>
<td>10</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Inhaled</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rectal</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>37</td>
<td>63</td>
<td>100</td>
</tr>
</tbody>
</table>

Example of incidents with injectable medicines
- Patient having colonoscopy to assess severity of colitis. Midazolam 2.5mg administered to patient as per protocol. Adrenaline (1:1000) was mistaken for Pethidine and administered to patient. Error realised after medication had been administered. Patient developed a supraventricular tachycardia, hypotension and pulmonary oedema. Patient was admitted to the hospital for 5 days. The patient has sustained moderate left ventricular dysfunction and requires medication therapy. (Severe harm)

In March 2007 the NPSA issued Patient safety alert 20 providing guidance on the safer use of injectable medicines. (Available at: www.npsa.nhs.uk/nrls/alerts-and-directives/alerts/injectable-medicines/)

3.2.4 Analysis by therapeutic groups
The review of incidents reported as leading to death or severe harm enabled patterns to be identified in relation to the therapeutic classes of the medicines that are involved in medicines safety incidents (Table 12).
Table 12 Medication incidents by therapeutic group, 2007

<table>
<thead>
<tr>
<th>Therapeutic group</th>
<th>Deaths</th>
<th>Severe harm</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>7</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>Anti-infectives</td>
<td>3</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Opioids</td>
<td>8</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Anticoagulants and anti-platelets</td>
<td>4</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Anaesthetics</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Insulin</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>63</td>
<td>100</td>
</tr>
</tbody>
</table>

Examples of incidents with cardiovascular medicines
Cardiovascular medicines comprise oral and injectable medicines to assist the heart and maintain blood pressure. There are a large number of incidents involving errors with these medicines that lead to serious outcomes. Causes of incidents include dosing, wrong medicine, contraindicated medicine and monitoring errors.

Prescribing
- Patient discharged from hospital in sinus rhythm following a brief episode of atrial fibrillation post surgery with digoxin 250 micrograms once daily and amiodarone reducing dose. Re-admitted with a digoxin level of 6.0 via A&E with digoxin poisoning which required treatment with digibind. (Severe harm)

Dispensing/supply of medicines
- Patient was admitted on 11th February with NSTEMI and had percutaneous coronary intervention on 13th February. Patient was discharged home with the wrong drug: verapamil 240mg twice daily. Patient was not prescribed for verapamil, but he took 4 x tablets at 240mg each. Patient became unwell and was readmitted to CCU. (Severe harm)

Administration
- Patient was transferred to Catheter Suite by Registrar, Critical Care Technician, and Band 6 staff nurse. During anaesthesia patient experienced a sudden and unexpected rise in blood pressure together with a rapid fall in heart rate (140bpm to 50bpm). Upon investigation, it quickly transpired that Registrar had confused the propofol and noradrenaline syringes. Staff nurse stopped the noradrenaline and informed Registrar of his error. (Severe harm)

Examples of incidents involving anti-infectives
Anti-infective medicines include antibiotics, antiviral and anti-fungal medicines. Incidents involving this group of medicines include dosing, omission or delay and medicine allergy errors.

Prescribing
- Admitted earlier this evening by day on-call team. The patient had epigastric pain radiating retrosternally. Pyrexia, tachycardia, WCC 20, crp103, epigastric tenderness. Commence 1st dose co-amoxiclav (Augmentin). The patient is allergic to amoxycillin, although when asked, patient mentioned morphine and tramadol only. Had 10ml of 1.2g co-amoxiclav (Augmentin) diluted in 20ml sodium chloride 0.9%. Patient collapsed. (Severe harm)

Dispensing/supply of medicines
- Patient was sent to hospital possibly due to the fact that they did not receive their medication in time. Patient required urgent clindamycin medication from Doctor for a home visit. Podiatrist contacted the surgery and was informed that the pharmacy involved did not deliver on Friday afternoons and that Monday would be the next delivery date. Patient had right big toe and second lesser toe amputated. (Severe harm)
Administration
- Patient admitted with infected ulcer and cellulitis. At 15.00hrs the senior house officer noticed that the patient had not had her 12.00hrs intravenous antibiotics and observations recorded at lunch time were BP 77 but drawn on the chart as 120 systolic and IV fluids had been stopped. The SHO informed that nurse of the error and instructed her to give IV antibiotics immediately and re-do observations. The SHO returned at 16.30hrs – observations still not done. Antibiotics not given and the patient was drowsy. Nurse-in-Charge said she was too busy to listen. Staff Nurse took manual BP 70/40 – patient tachycardic. Patient had to go to ICU, died from severe sepsis. (Death)

Monitoring
- Wrong blood results written in notes. Patient subsequently given Gentamicin and as a result developed renal failure requiring dialysis. (Severe harm)

Examples of incidents involving opioids
Incidents involving opioid medicines are usually concerned with the wrong dose, frequency or rate of administration of these medicines. The NPSA issued guidance on the safe dosing of opioid medicines during 2008: Rapid Response NPSA/2008/RRR05: Reducing Dosing Errors with Opioid Medicines. (Available at: www.npsa.nhs.uk/nrls/alerts-and-directives/rapidrr/reducing-dosing-errors-with-opioid-medicines/)

Prescribing
- I was informed by the Critical Care Outreach team that a dose of Morphine 10mg administered intravenously during resuscitation might have contributed significantly to adverse outcome of resuscitation efforts. The patient died despite attempts at resuscitation. (Death)

Dispensing/medicine supply
- Patient dispensed morphine (Oramorph) 100mg/5ml UDVs instead of prescribed morphine (Oramorph) 10mg/5ml UDVs. Patient took two of these UDVs. Patient has since died. (Death)

Administration
- Patient given Diamorphine 5mg subcutaneously at 08.45hrs by Staff Nurse. Dose prescribed was Morphine Sulphate 5mg. Drug checked by two registered nurses. Different names (Diamorphine and Morphine) apparently discussed by two RNs who concluded it was the same drug. Staff Nurse then independently administered Diamorphine to patient. Staff Nurse became aware of her error at approx 09.15hrs when talking to ward pharmacist. Patient died at 10.07hrs. (Death)

Examples of incidents involving anticoagulants and anti-platelet medicines
The NPSA issued guidance on the safe use of anticoagulant medicines, Patient safety alert 18, in March 2007. (Available at: www.npsa.nhs.uk/nrls/alerts-and-directives/alerts/anticoagulant/)

Prescribing
- Transferred as emergency from another hospital straight to cardiac catheter lab for coronary angiography. During the procedure a large thrombus in the left main stem was noted, at the same time it was noted that intravenous or intra arterial heparin had not been given. CPR team was called. Resuscitation not successful and patient died. (Death)

Administration
- Patient on warfarin for DVT/embolic events. Stopped as had haematuria. Asked and wrote in notes for Warfarin to re-start and it was not given. He had chest pain and during the morning none of his angina medication had been administered and he developed left arm symptoms. Had a troponin check which was 0.06, indication of a small myocardial infarction as a result of not receiving medication. (Severe harm)
Examples of incidents involving chemotherapy
The complexity of chemotherapy regimens and the need to enable patients to recover from one chemotherapy course before receiving the next course have contributed to the serious incidents received by the NRLS concerning chemotherapy. The NPSA plans to issue a more detailed review of chemotherapy incidents during 2009.

Implementing chemotherapy protocols
• In the process of completing documentation for sudden death, it was noted that for all 4 cycles of chemotherapy capecitabine was prescribed at a dose of 1250mg/m² twice daily. As patient was aged over 70 years the Quasar TT protocol indicates that his dose should have been 1000mg/m² twice daily. (Death)

Setting up chemotherapy protocol on electronic prescribing system
• Patient was admitted as he was acutely breathless (scans from showed pulmonary fibrosis, pulmonary embolisms and a small pneumothorax). The patient was then transferred to ITU. The patient died of pulmonary fibrosis related to bleomycin. It was discovered by the trials nurse that the patient had received too high a dose of bleomycin. (Death)

Monitoring and managing chemotherapy toxicity
• Chemotherapy with FEC – docetaxol. Patient received 3 cycles of FEC without major toxicity noted, 1st docetaxol given on 14th March. Patient attended hospital one week after administration with diarrhoea and vomiting, this was interpreted as gastro-enteritis. The patient received 2nd dose of docetaxol on 11th April. Patient admitted again to hospital on 18th April. Patient collapsed at home and resuscitation failed. (Death)


Incidents involving anaesthetic medicines


Wrong dose
• Preparing for theatre. Reassessing ETT – Pancuronium given (10x dose given by Doctor on prescription written by another doctor). Baby 907g. Mother informed and transfer team informed. (Severe harm)

Adverse drug reaction
• Patient required crash section. On induction noted that patient’s blood pressure dropped and also red rash over whole body. Given adrenaline and called for assistance. Patient stabilised and baby delivered. Patient transferred to main theatre recovery for care. Extubated later and admitted to HDU. (Severe harm)

Incidents involving insulin
The NPSA receives a large number of incident reports concerning unsafe use of insulin products. These usually involve the wrong product selection, wrong dose, frequency or rate of administration, or errors in monitoring the patient.
Adminstration

- A patient on the GP unit was prescribed 10 units of Glargine insulin. At midday two qualified nurses checked the medication chart and both read it as 100 units; this dose was then administered. The patient became ill and was transferred to the acute trust where her blood sugar level was recorded as 0.5. Hypostop administered and blood sugar recorded at 8.4 and then 12. Patient died in A&E department at 04.00hrs. (Death)
- Sliding scale insulin running 2ml/hr – not the protocol for patients with high potassium. Switched off and noticed syringe only had about 3ml in it. Doctor informed as patient hypoglycaemic and complaining of chest pain. Patient had cardiac arrest and died. (Death)
- Patient fitted and had hypoglycaemic event – became aggressive and confused. Blood Glucose 3.1. Patient had been given Insulatard insulin in the morning instead of 4u as prescribed. (Severe harm)

Standardisation of national adult critical care practice for strong potassium administration would enable the cost-effective production of a ready-to-administer injectable. The Intensive Care Society is undertaking work in this area.

3.3.2 Oral methotrexate
The NPSA issued guidance in Patient safety alert 3: Reducing the harm caused by oral methotrexate in July 2004. Prior to the guidance, the NPSA received regular fatal or severe harm reports following the incorrect use of oral methotrexate intended for once-weekly administration. The NPSA did not receive any reports in 2007 involving oral methotrexate that had caused death or severe harm.

3.4 Discussion
Medication incidents do not often result in severe harm or death. However, as examples of medication incidents in this chapter have shown, a wide range of medicine-related incidents have consequences which can lead to severe harm or death of patients.

The NPSA has developed guidance on a range of risks in medication practice applicable to all healthcare sectors. It is possible that many of the incidents described in this chapter might have been avoided if NPSA guidance had been fully implemented in practice.

Action points
The information and incident examples in this chapter relating to deaths and severe harm should be used to risk assess and, where necessary, improve the safety of local medication management systems.

3.5 Reference
Wrong/unclear dose, strength or frequency remains the most frequently reported incident type occurring during the treatment of adult patients in the acute setting.

The prevalence of omitted medicines continues to be high across the acute sector.

Incidents involving injectable medicines cause significant harm.

Incidents frequently occur due to a breakdown in communication between healthcare professionals in the acute care setting and as a result of poor documentation – particularly at transfers and hand-offs.

Incidents can sometimes arise from high workload pressures and insufficient resources.

New and emerging complex pathways of care suggest that systems for medicines use require frequent review and adaptation to improve safety.
4.1 Introduction
Reports from secondary care acute hospitals make up a significant percentage of incidents in the RLS database, representing over 75 per cent of medication incidents reported (see chapter 2). The sample analysed consisted of 400 randomly selected incidents from the acute care setting.

This chapter highlights themes which are largely peculiar to the analysis of incidents from this healthcare sector. Where not mentioned, other themes and trends for this specialty can be considered as reflecting those represented in chapter 2 (What are the patterns of reporting?).

Many of the themes emerging from reported incidents in the acute care setting were identified in the Safety in doses (2007) report.1 These include selection of the unclear/wrong dose, strength or frequency; delays or omissions of medicine administration; and the wrong medicine being selected.

In addition, there are themes leading to harm which cut across the different types of medication errors. These include incidents relating to the use of injectable medicines; poor communication and documentation; issues in patients’ transfer of care; and having insufficient resources.

4.2 What types of medication error occur during the treatment of patients admitted to hospital?
4.2.1 Wrong/unclear dose, strength or frequency
Wrong/unclear dose, strength or frequency remains the most frequently reported incident type in patients in the acute setting (see chapter 2). There are unique issues associated with children (see section 7.3.1).

4.3 Incidents occurring across the acute sector
This section describes incidents that occur across the acute sector, including children and elderly patients.

4.3.1 Omitted medicine
Delays or omissions linked to medication therapy occur at all stages of the medication process and all have the potential for patient harm, but some groups naturally carry greater risks for patients. These include antimicrobials, anticoagulants and insulin.

Medication incident reports show that the causes of delays or omissions are often due to failure in the supply process, both during routine working hours and after hours. Other factors include delays in reporting laboratory results; patients not being on the ward during routine times of medication rounds (and with no system for managing medication following absence); the route of administration not being available; and lack of familiarity of staff with the medication or device.

Organisations should consider setting standards for what constitutes acceptable and unacceptable periods of delay for the range of clinical circumstances, and audit against these standards with a view to taking action. This is a key recommendation for the acute sector as a whole.

Examples of omitted/delayed treatment with medicines

- Patient was diagnosed with cryptococcal meningitis late on [date]. The patient did not receive Ambisome (as suggested from microbiology dept) until the following day when pharmacy was open. (Moderate harm)
- Nurse withheld vancomycin because level could not be taken. A level had been taken in the morning but the result was not on EPR. Nursing staff had been repeatedly asked to give vancomycin irrespective of whether or not the level had been taken as omitting a dose will have a greater effect on the patient. (Low harm)
• Baby born 18.48hrs. SHO bleeped 19.55hrs, unable to attend (handover). I went to see baby after handover at 21.15hrs. Prescribed zidovudine, bloods/Hep B done. Told 2 midwives specifically that zidovudine had to be given by 22.30hrs. On ward at 22.40hrs enquired about baby. Drug chart not yet sent to Pharmacy. No zidovudine on birth centre or ward. Zidovudine not given until after 23.00hrs (more than 4 hours after birth). (Moderate harm)

• Patient had poor urine output, very dry. No Intravenous fluids given for 6 hours despite several bags being prescribed. 2 doses of antibiotics not given. Consequences – possibly major injury/disability. (Reported as no harm)

4.3.2 Wrong medicine
Incidents resulting from confusion between two medicines and leading to the wrong medicine being prescribed, dispensed and administered can occur because of medicines that ‘look alike’ or ‘sound alike’, where labelling and packaging is similar and also due to poor management of storage. Purchasing and storage strategies should take the potential for this into account – particularly for high-risk medicines.

Examples of incidents associated with ‘look-alike’ or ‘sound-alike’ medicines

• Phosphate Sandoz prescribed. Nurse administered Sando K (from stock cupboard). Error noticed next day by ward pharmacist. Spoken with 3 nurses who had administered the drug. Highlighted that in future that particular drug must be double checked as 2 different drugs are in very similar containers, and the wrong drug was obtained from emergency drug cupboard. (Low harm)

• Prescription sent to pharmacy for Methylprednisolone 40mg IV. Pharmacy sent Depomedrone injection. This is the second time this has happened. (No harm)

• Clindamycin was prescribed on drug chart. Three vials of Gentamicin administered in error, therefore a random gentamicin level has been obtained. Next dose of Clindamycin has been omitted until discussed on the ward round. (Low harm)

Principles of design have been identified that take account of the potential for human error and can help to minimise the risk of these types of incidents occurring.

The NPSA has developed safer design concept guides to assist procurement staff to purchase medicines – and manufacturers to develop products – with in-built safety features:

• Design for patient safety: A guide to labelling and packaging of injectable medicines (2008); and


These are available at: www.npsa.nhs.uk/nrls/medication-zone/design-for-patient-safety-medication-topics/

4.3.3 Injectable medicines
Injectable medicines were commonly involved in incidents reported from the acute sector, and represent 62 per cent of all reported incidents leading to death or severe harm. This confirms the importance of making injectable medicines a priority for safe medicines practice. Patient safety alert 20: Promoting safer use of injectable medicines required NHS organisations to risk assess injectable medicines and practice, identify high risks and to take action to minimise these risks.

This was the most common type of incident reported in the acute sector, with incidents occurring at all stages of the medication process. Injectable medicines may also require manipulation in the clinical area, in order to prepare a dose suitable for administration. This process is unique to injectable therapy and provides additional opportunities for error. Recent quantitative research has highlighted the scale of this problem. 2
Examples of injectable medicines incidents

- **Patient who was admitted with an Acute Coronary Syndrome (ACS) was prescribed dalteparin 18,000 units twice daily.** The patient weighed 121kg, and the dose for ACS is 120 units per kg twelve hourly, however the maximum daily dose is 10,000 units twice daily. In addition, the patient was very obese, and was only 5'3” tall, so her ideal body weight of around 50kg meant that the dose of dalteparin should have been 6000 units twice daily. She received three doses of 18,000 units over the next 36 hours. When the 4th dose was due the nurses noted that her APTT was somewhat prolonged at 51 seconds, so the next two doses were omitted. No bleeding was observed, and the patient’s clotting returned to normal. *(Low harm)*

- **150mg bolus Phenytoin given via central line in error – mixed up with saline flush.** Acute care team, on call reg and pharmacist informed. Central line lumen clamped immediately error realised. For transfer to HDU for cardiac monitoring. *(No harm)*

- **At change of shift, drug infusions checked. Xigris had incorrect infusion rate set.** For 7 hours of day shift, Xigris had been administered at 4ml/hr, correct rate being 14.4ml/hr. Dr [Staff Name] informed and correct rate set. *(No harm)*

- **Patient having medication for pain relief via syringe driver. Upon checking syringe had not been correctly placed in the pump.** No medication administered. Syringe measured 48mm set up on [date] at 23.15hrs with 48mm medication documented in chart as having been checked throughout the night with measurements reducing as if medication absorbed. *(No harm)*

- **Patient’s BM level low throughout the night and all day even though glucose 10% bolus given. Operation cancelled and diet given.** BM discussed with Paediatric Registrar who said to give regular insulin Novo Rapid at 17.00hrs. When checking patient’s Insulin Pens I noticed that 2 out of his 3 insulin pens had Novo Mix 30 inside and the 3rd had Lantus insulin. The patient’s father admitted that he had been giving the incorrect insulin for the past couple of days by mistake. *(No harm)*

- **Patient prescribed Novomix 30 insulin 124 units OM and 64 units teatime.** Patient’s usual dose is 12 units OM and 6 units teatime. The insulin chart has been signed that the evening dose has been given but as the patient didn’t have any problems with hypoglycaemia it is unlikely that the patient received the dose prescribed. *(No harm)*

### 4.3.4 Insulin

The NPSA has received a number of reports of confusion and mis-selection of insulin products across all age groups.

- **Patient’s BM level low throughout the night and all day even though glucose 10% bolus given. Operation cancelled and diet given.** BM discussed with Paediatric Registrar who said to give regular insulin Novo Rapid at 17.00hrs. When checking patient’s Insulin Pens I noticed that 2 out of his 3 insulin pens had Novo Mix 30 inside and the 3rd had Lantus insulin. The patient’s father admitted that he had been giving the incorrect insulin for the past couple of days by mistake. *(No harm)*

### 4.3.5 Communication and documentation

Incidents have been reported which occurred due to a breakdown in communication between healthcare professionals and across healthcare sectors, very often at discharge. Poor documentation, including illegible or incomplete prescriptions and administration or monitoring charts have also led to harm.

Examples of incidents involving poor communication or documentation

- **Vitamin K given IM on labour ward by midwife 1mg then given again on arrival to NNU 1mg IV.** *(No harm)*

- **Patient had missed Felodipine M/R 10mg daily dose over the weekend and two days of the following week despite bleeping the [specialty] team and leaving notes on the chart and communication book on ward.** Medication was fixed on the third day. Patient’s blood pressure raised. *(Low harm)*
Patient was given an evening dose of insulin as charted on the drug chart. It was handed over to the night staff that the drug had been given. However the drug chart was not signed. Over the night shift the patient was given another dose as the night staff thought it had been missed. The error was discovered the next morning when examining the drug chart as it been handed over that the patient was hypoglycaemic over the night. (Moderate harm)

Admitted to ED with Dosette box then transferred to ward. Medications not prescribed on arrival to ED or during stay and assessment on [admissions unit]. No note of Dosette box. (No harm)

4.3.6 Transfers and hand-offs
A new theme identified from the analysis concerned patient transfers and hand-offs of care. A patient’s journey through hospital is increasingly complex. Transitions where errors of this kind can occur include site-to-site transfers (i.e. patient transfer from A&E to inpatient ward) or from person to person (i.e. daytime staff nurse handover to night-time staff nurse). Communication and documentation issues may often be contributory factors. Some examples of these incidents are shown below.

Patient prescribed IV vancomycin to be given when level <10.0. At handover told verbally that level was 6.0 therefore infusion started. On double checking level found to be 11.0 therefore infusion stopped when vancomycin 3/4 through. (No harm)

Patient returned to the emergency department after being discharged the same day. He was concerned that he had been sent home with intravenous drugs which were not on the discharge summary. No arrangements had been made for a district nurse to give. (Low harm)

Patient given medication from ward to take home. On inspection before patient left the hospital in the discharge lounge, the reporting senior pharmacy technician found that some of the items were not labelled or were labelled incorrectly. She did not have enough of her meds and some were missing altogether. Whilst sorting out the patient medication, patient missed her transport as they could not wait any longer. (No harm)

In a rapidly evolving hospital care environment, these incidents suggest that some adaption is needed to build in processes that alert when essential care has not been delivered. Solutions may involve implementing a robust set of protocols for hand-off communication with a low risk of ambiguity. This highlights the importance of medicines reconciliation, but also identifies the need for reconciliation at times other than just admission. Organisations should review the need to expand reconciliation beyond adult admission to hospital proposed by the National Institute for Health and Clinical Excellence (NICE). 

4.3.7 Insufficient resources
Reported medication incidents often suggest that high workload pressures and demands, long hours, fatigue and reduced staff levels have contributed to error. Examples where there was a concern are shown below.

[Staff member] was taking patient who has a right sided dialysis catheter off Dialysis. She called for a heplock check which is normal procedure from a staff nurse who confirmed the lock to be 2ml per lumen for a right sided permcath then rushed back to her own patients as unit was very busy. In her haste she failed to register that the patient required a citralock. (No harm)
Unfortunately due to compromised staffing levels that the senior nurse for medicine holding bleep and on call site manager were aware of, the medicines round for lunchtime was delayed. Patient should have received Madopar medication for his Parkinson’s disease at 11.00hrs and noon. Staff members gave this once they realised it had been delayed at 14.00hrs. (No harm)

• Asked to rewrite Oramorph prescription for 2 patients as the nursing staff had run out of space in the margins to note that it had been given. One chart ran out of space 5 days previously and the other 3 days before. Both had been handed over to the day staff the night before. One patient had to go without medication till rewritten. It is unacceptable to be asked to rewrite charts for this at 5 in the morning when it has clearly been needed for several days. (Low harm)

Interruptions during medicine administration have been identified as a patient safety concern. A number of potential solutions, including tabards that indicate that staff administering medicines should not be interrupted and redesign of work systems, have been proposed.

4.4 Discussion
Acute adult services remain the highest reporters of medication error. Complex use of medicines, pressure on resources and problems with communication at care transfer require organisations to consistently review their processes and documentation.

While a number of themes remain unchanged from those reported in Safety in doses (2007), new themes have emerged. Incidents associated with previously issued NPSA guidance on methotrexate, amphotericin, strong potassium and infusion devices show that there is no room for complacency. Organisations should ensure that they have processes embedded within their organisation to provide ongoing assurance that these risks continue to be managed.

Action points
Acute sector organisations should continue to review previously implemented safer practice recommendations to ensure that robust implementation is maintained.

In order to address other areas of risk, actions should include the following:
• The setting of standards for what constitutes a delayed or omitted medicine in each clinical area. These standards should be audited and incidents analysed locally to identify causes of delay or omission.
• Communication of key medicines-related information at the point of transfer of care – both internal and external – should be reviewed to identify high-risk areas requiring action.
• Medication incidents that identify insufficient resources as a major cause of the incident should be investigated and action taken to minimise recurrence of these incidents.

4.5 References
What can we learn from incidents in the mental health and learning disabilities sector?

- Omission in the administration of anticonvulsant medicines was the most frequent type of incident reported by the learning disabilities sector.
- Medicines reconciliation across the primary–secondary care interface was identified as a high risk.
- Incidents involving methadone and clozapine were the most frequently seen in the sample of incidents reviewed.
- Modern mental health services are predominantly based in the community; however, very few reported incidents were from the community sector of services.
- New approaches to the provision of modern mental health services have increased the number of interfaces requiring communication/transfer of information, hence increasing the potential for medication errors.
- Steps should be taken to increase the reporting of, and learning from, medication incidents that occur in the mental health sector, and should enable the improvement of medicines management systems.
- There are fewer pharmacy resources in mental health services than in acute care and this may increase the risk of medication errors.
- Medicines for physical health problems were frequently involved in incident reports.
5.1 Introduction
The overview in this chapter resulted from the analysis of a sample of data consisting of 400 incidents reported during 2007. Relatively little is known about medication incidents in environments providing mental health and learning disability services, particularly in the community, where most patients receive treatment. There is also very little known about the causes of medication incidents and the impact of sector-specific risk factors such as cognitive impairment.

This chapter highlights themes that are largely peculiar to the analysis of incidents from this healthcare sector. Where not mentioned, other themes and trends for this specialty can be considered as reflecting those represented in chapter 2 (What are the patterns of reporting?).

5.2 Where did reported incidents occur?
Modern mental health services are predominantly based in the community; however, very few reported incidents were from the community sector of services. Almost 10 per cent of the sample analysed related to non-residential community environments (community mental health facilities, day-care services and outpatient departments). To understand failures in medication processes in mental health settings, incidents in the community need to be captured and reporting from the community needs to improve.

5.3 Reporting levels and quality of reports
As previously mentioned, the level of reporting and quality of national and local incident descriptions should be improved to enable local and national learning. The name of the medication involved in the incident is frequently omitted, incident descriptions often lack important detail, and possible causes are rarely recorded. More information is needed about medication incidents in the community and their possible causes. Mental health and learning disability services need to implement clear and consistent systems for reporting medication incidents to enable an appreciation of the scale of the problem and identification of causative factors.

5.4 Medicines for physical health problems
Medicines prescribed for physical health problems were commonly associated with error within mental health services (28 per cent). Medicines that posed a potential high risk included anticonvulsants (four per cent), insulin (two per cent) and anticoagulants (one per cent). There may be a lack of knowledge in relation to the safe use of medicines used to treat co-existing physical health conditions, and this has a significant potential for harm.

Omission of prescribed anticonvulsant therapy was reported frequently in learning disability services, potentially leading to seizures. There may be a number of reasons contributing to these types of incident, including issues relating to concordance, and strategies need to be in place to ensure that these medicines are used as prescribed.

Example of omission of medicines for epilepsy
Client did not receive their morning dose of anticonvulsants. This error was identified in the early afternoon, however local guidelines were not followed; the anticonvulsants were still not administered. The client had seizures resulting in an admission to an acute hospital. (Moderate harm)

An NPSA report published in 2006 confirmed that prescribing practice in mental health services can be variable. The report stated that:

“...the quality of prescribing practice in mental healthcare, as judged by indicators derived from evidence of best practice, varies greatly from practitioner to practitioner and from service to service.”

5.5 Communication between health services
One commonly stated cause of incidents was poor communication between different sectors of the health service – a common theme across all healthcare sectors. This was highlighted as a particular issue for mental health services in the NPSA's 2006 report. When people transfer from one sector to another, for example on admission to
hospital, there is a greater risk of medication error occurring\textsuperscript{4, 5}. Following the launch of the Mental Health National Service Framework\textsuperscript{6} new teams have been established such as Early Intervention in Psychosis and Crisis and Home Treatment. This new approach to the provision of mental health services has increased the number of interfaces, potentially increasing the likelihood of communication errors\textsuperscript{1}.

Medication reconciliation across the primary–secondary care interface may be particularly associated with risk due to the complexity of medicines regimens. This area has been identified as a research priority by NICE\textsuperscript{7}.

One specific problem highlighted by the analysis was communication between primary and secondary care services in relation to the supply of methadone.

**Example of incident involving communication and the supply of methadone**

Patient’s Methadone prescription was put on hold whilst he was an inpatient at Mental Health Ward. He called into his usual Pharmacy to have his medication then he went back on to the ward and was given his Methadone dose again. The Pharmacy failed to contact either the ward or the service to check if he was discharged. (Low harm)

**5.6 Self-administration**

Admissions to mental health inpatient units are often much longer than admissions to other hospitals, therefore self-administration is common in mental health services and is often considered part of the rehabilitation process. Currently the RLS dataset does not record self-administration as a separate error category and so identification of incidents related to self-administration is difficult. In the sample analysed, self-administration errors were the most common type of error in the ‘other type of error’ category. Some incidents related to confusion over what medicines patients had self-administered, possibly as a result of inadequate supervision or a lack of continued assessment of the patient’s suitability for self-administration.

**Example of incident involving self-administration**

The patient told staff that she was confused as to whether or not she had taken her medication for that morning. On investigation she had taken the medication for the entire day in error. (Low harm)

**5.7 Reporting more serious medication incidents**

Serious incidents may not be reported to the RLS because historically mental health organisations have been used to reporting them as Serious Untoward Incidents (SUIs) on the Strategic Executive Information System (STEIS), which in 2007 did not feed into the RLS (the RLS now has access to these data). Most mental health pharmacists will be aware of SUI reports relating to the intended or unintended (e.g. overdose) use of psychotropic medication. No such reports were present in the sample of incidents analysed, these incidents should be reported to both the RLS and STEIS.

**Example of a fatality which was not reported to the RLS**

A 20-year-old male with a long history of schizophrenia, stabilised on Clozapine 900mg a day and Amisulpride 400mg BD presented to his GP with abdominal pain and a 2-day history of constipation. He was prescribed medication, returned home but his condition deteriorated. An ambulance was called; he collapsed and died before reaching hospital. Post mortem revealed infarction of the bowel and bowel ischaemia resulting from impacted faeces\textsuperscript{8}. (Death)

**5.8 What medicines are frequently involved in patient safety incidents?**

The two medicines most often mentioned in the sample of incidents analysed that were reported by mental health services were methadone (seven per cent) and clozapine (five per cent). Other antipsychotics (excluding clozapine) accounted for 18 per cent of reported incidents and benzodiazepines 11 per cent.
The high number of reports relating to methadone and clozapine may be because they are viewed as high-risk medicines, and because of the nature of the client groups to which they are prescribed.

Example of methadone incident

Received a telephone call from pharmacy informing us that they had given the patient a wrong dose of methadone which wasn’t prescribed. Instead of 50ml, he has been given 120ml of methadone. Confirmed his key worker was absent. Confirmed we don’t hold his telephone number on record. Given his latest address and also rang his previous address – there was no answer. No answer when we knocked on patient’s door. Pharmacist rang back and was given advice from doctor to seek accident and emergency help. (No harm)

Example of clozapine incident

3 night doses of Clozapine not administered by staff (over 3 nights). New prescription chart for clozapine 400mg at night and 2 x 25mg tablets written separately. The clozapine 400mg doses were administered but the 50mg doses (2 x 25mg) were not administered. (No harm)

5.9 Pharmacy services

Pharmacists and pharmacy staff have a key role to play in the identification and prevention of medication incidents. Compared with acute trusts, most mental health trusts have relatively limited clinical pharmacy services9. Mental health services and service users may therefore be at greater risk of medication errors by virtue of lower levels of pharmacy involvement in patient care.

5.10 Discussion

More information is needed about medication incidents occurring in mental health and learning disability services to enable national learning to be derived.

Medication incident reporting rates in mental health and learning disability services are improving but further development of incident reporting cultures is needed in all care environments, in particular in the community. The potential for learning from very serious incidents may be lost because such incidents may be reported solely to STEIS.

The complexity of care pathways in mental health services increases the potential for medication incidents to occur.

Action points

Mental health organisations should increase the reporting of, and learning from, medication incidents. Serious incidents should be reported via the RLS as well as STEIS in England.

Particular attention is required for incidents arising from:

- communication/transfer of information across healthcare interfaces;
- medicines reconciliation;
- medicines prescribed for physical conditions;
- self-administration systems; and
- the use of methadone and clozapine.

5.11 References


What can we learn from incidents in the primary care sector?

- Most patient safety medication incidents currently reported from primary care result in no harm to the patient.
- The most common interface where incidents are reported is between secondary and primary care, when patients are discharged from hospital or following outpatient appointments.
- Particular problems appear to be related to faxed prescriptions and discharge summaries.
- Mismatching (i.e. a medicine being given to the wrong patient) was the most frequently seen error type in prisons.
- Reporting levels of medication incidents in primary care continue to be low relative to the volume of healthcare provided.
6.1 Introduction
Primary care is the setting in which most patients have contact with NHS healthcare services. Levels of activity have risen substantially over the past 10 years, with the number of consultations in GP practices growing by around 70 million to almost 290 million in 20061.

The data presented in this chapter are taken from the RLS, although the relatively few reports received from this sector mean that the data may not be representative of the true scale of incidents occurring in primary care.

This chapter highlights themes that are largely peculiar to the analysis of incidents in this healthcare sector. Where not mentioned, other themes and trends for this specialty can be considered as reflecting those represented in chapter 2 (What are the patterns of reporting?).

6.2 Reporting
Incident reporting rates in primary care continue to be low in comparison with the acute sector. Although the vast majority of care is carried out in the community, the number of incident reports from primary care represents only 10 per cent of the total medication-related reports received by the RLS.

Work is being taken forward by the NPSA to increase patient safety incident reporting from general practice. This includes exploring the concept of themed reviews that will concentrate on a rolling programme of specific clinical themes. There is also work under way to test a method of identifying patient safety events in Significant Event Audits (SEA). SEA in general practice is being promoted and supported by a number of national bodies through the use of the SEA toolkit (www.npsa.nhs.uk/nrls/improvingpatientsafety/primarycare/significant-event-audit/), launched in October 2008 (Royal College of General Practitioners/NHS Education Scotland/Quality Improvement Scotland/NPSA).

Community pharmacies continue to be encouraged to report patient safety incidents, including prescribing errors. Confidentiality remains a concern for some contractors, and the NPSA continues to assure community pharmacists, GPs and dentists that reports are confidential.

6.3 Degree of harm
The vast majority of incidents reported to the RLS from primary care remain no harm incidents. These incidents may none the less contain valuable learning, and the NPSA often looks at, and takes learning from, no harm incidents.

Patient safety incidents resulting in the death of the patient

- I saw and assessed a patient with a chest infection who had started chemotherapy for carcinoma of the oesophagus the previous week. I was not aware that this chemotherapy could cause anaemia and that if he had an infection an FBC should be performed. The patient was admitted and subsequently died. His cause of death was cardiorespiratory failure due to septic shock. When I reviewed his care, I found that a letter warning the GP about the possibility of neutropenic sepsis was issued by the oncologist but not seen by the GP. (Death)
- Patient was agitated and in pain, care plan checked. Decision to increase syringe driver in situ from diamorphine 10mg to 20mg over 24 hours. District nurses discussed what size syringe to use. Drew up diamorphine 20mg into a 20ml syringe. The next day the district nurses realised that this dose would go through too quickly. Contacted nurse on call who refused to visit patient to check. Stated that dosage was within the maximum dose. Patient died. (Death)
6.4 Stage in process where errors occur
A third of reports received from general practice relate to prescribing errors. The following example highlights the kind of error that can occur.

- Digoxin toxicity due to too high a dose of digoxin for age and renal function. Patient had become confused over the preceding weeks and the digoxin level was 3.2 mcg/litre. (Moderate harm)

Most reported incidents from general practice are related to the administration of medicines, and there continues to be a large number of incidents concerning vaccinations, particularly in paediatric patients. Nurses are often responsible for the administration of vaccines and the culture of reporting in this particular group of healthcare professionals is far more developed than among doctors.

- Practice nurse arranged for child to be immunised with booster dose of hib/men c. Child given immunisation. Later practice nurse discovered this immunisation had been given one month previously. This immunisation had not been recorded in red book but had been recorded on the computer. (No harm)

Most reported errors in community pharmacy, unsurprisingly, relate to the dispensing or preparation of medicines (93 per cent). Work will be undertaken this year to encourage community pharmacies to report interventions they make on prescribing errors, which many of them may collate routinely. As community pharmacists undertake new roles, particularly following the Pharmacy White Paper, this balance may change and errors other than dispensing errors may increasingly be reported.

Very few patient safety reports are received from general dental practice, and, of those that are received, 73 per cent relate to the administration of medicines.

A relatively high proportion of reports received from dental practice relate to allergic reactions to medicines that could not have been foreseen. These should be reported to the MHRA via the Yellow Card Scheme.

6.5 Types of medication incident occurring in primary care
Wrong/unclear dose, strength or frequency remains the most regularly reported medication incident error type in primary care. Again, this is consistent with the report Safety in doses (2007).

Examples of the wrong/unclear dose, strength or frequency supplied in primary care
- Patient was prescribed Digoxin 62.5mcg. Digoxin 250mcg was dispensed instead. Patient felt unwell for few days. Patient’s family contacted the pharmacy where the record was checked and the overdose identified. Doctor was called in and patient was examined. Patient collapsed and later died in hospital. (Death)
- Patient was given 120mg Dilzem SR (1bd) instead of Dilzem SR 60mg (1bd). The patient started feeling ill and then collapsed before being taken into hospital where it was realised he was given the wrong strength. (Moderate harm)
- Prescription presented for atenolol 50mg. Labelled correctly but 100mg tabs dispensed in error. Patient took incorrect strength for seven days. Error identified in hospital when patient admitted for planned knee surgery. Surgery had to be cancelled as patient was bradycardic. (Moderate harm)
Examples of the wrong medicine being supplied

- On reviewing patient’s own medication brought into hospital, it was discovered that the patient had Atenolol 100mg tablets labelled by the community pharmacist as Allopurinol 100mg tablets. It was confirmed that the patient should be taking Allopurinol 100mg. SHO cardiology informed – patient had been admitted due to collapse due to bradycardia. Community pharmacist informed of the situation. (Moderate harm)
- Prescription for Tamsulosin 400mcg capsules. Dispensed Tolteridone 4mg capsules. Patient (93 yrs age) admitted to hospital with urinary retention. Patient now discharged but catheterised. (Moderate harm)

Examples of allergy-related incidents

- Patient had anaphylactic reaction to ibuprofen. Paramedics called and administered adrenaline. Advised re NSAIDS in future continue to have antihistamines and also Epipen for further problems. Known aspirin allergy on computer records. (Moderate harm)
- Patient with history of Penicillin allergy was prescribed a 2 week course of Augmentin after having dental extraction. Patient returned complaining of a burning sensation of mouth/neck and was advised to stop taking Augmentin. (Low harm)

6.6 Medication incidents occurring between interfaces of care

The most common interface where incidents are reported is between secondary and primary care when patients are discharged from hospital or following outpatient appointments. Particular problems appear to be related to faxed prescriptions and discharge summaries, although this may just be because these are common means of communication between healthcare sectors. The following examples highlight the type of incident reported.

- Clinic letter was faxed to GP surgery. Surgery faxed back quickly questioning drug dosage. Two typing errors were highlighted, reducing course of oral steroids should have read 15mg not 50mg. Methotrexate should have read weekly, not daily. Clinic letter has been amended and correct copy sent to surgery. (No harm)
- Patient had been given 26 units of insulin to control diabetes whilst in hospital. Discharge referral stated to recommence care at home. Had been receiving 44 +46 units of insulin at home. Family informed staff of concern that blood glucose levels low. (No harm)
- Dose of medication had been adjusted from 40mg 2BD to 1BD by the hospital. Computer had not been updated. Hospital letter was not checked before medication prescribed by locum GP. (Low harm)

Problems between the primary care and secondary care interface are not the only ones seen. Other examples include the following.

General practice and community nursing interface example

- Patient housebound and on Warfarin. District Nurse attends as per our instructions to do INRs. Request faxed to DN to recheck INR. DN failed to show. Practice alerted and DN immediately informed by practice nurse. INR finally done by which point too high (3.8). The practicalities of fax receipt at DN office have been investigated. It appears the fax machine is shared by 2 separate groups – there are no named in-trays or other systems in place to help prevent mix-ups. (Low harm)
Between the hospital and general practice when service provision is transferred – examples

- In 2005 a patient taking warfarin died from a cerebral haemorrhage. When I investigated I discovered that she had not had an INR test for some time. After much work, we decided that the way to improve safety of warfarin prescribing was to take over INR testing ourselves. The patient this report relates to is blind, housebound and often fails to follow instructions. Her blood testing for methotrexate was performed at the same time as her INR by a nurse employed by the Hospital Trust. When the practice took over the INR testing work, the nurse stopped calling. The Trust nurse did not alert the practice to the additional testing required; the GP and Practice Nurse dealing with the INR tests and changeover did not pick up the need for other tests; the patient and her daughter did not request methotrexate testing; the practice system did not identify that she was no longer being tested and repeat scripts were issued until the errors were picked up at a rheumatology clinic. Solving each of these is a challenge. The practice repeat prescribing system will have to be changed so that the doctor signing the scripts has the dates and results of the latest tests to hand when signing the script. (No harm)

Examples of incidents reported from prison settings

- Staff were unable to administer tea time medications to the inmates because prison staff had put the prisoner numbers in the centre office. [Staff name] 2 (who was in charge) stated he would not open the office as on patrol state. So the prisoners did not have tea time medication. (No harm)
- Whilst administering medication to inmates misread numbers and inadvertently administered the medication to the wrong inmate. (No harm)

6.7 Prisons

Analyses of data relating to medicines in prisons, for which primary care trusts now have responsibility, show a slightly different pattern than other care settings. Mismatching, i.e. medicine being given to the wrong patient, was the most frequently seen error type (apart from ‘other’), followed by omitted medicines.

Between practitioners and patients – example

- Patient misunderstood dosing instructions and thought she was told to miss two weeks warfarin not two days – did not look properly at dosing label in her anticoagulant book. (No harm)

6.8 Discussion

Reporting rates in primary care continue to be much lower than in other sectors relative to the volume of patient care. As primary care organisations become more familiar with their commissioning role, and governance structures become more established, it is hoped that reporting to the RLS will increase and more learning will be extracted from this sector.

Many of the medication-related risks identified in this review are consistent with those previously reported in Safety in doses (2007). Emerging themes of note include issues relating to communication at the interfaces and medicines use in prisons.

Action points

Primary care organisations should seek to contribute to national learning from medication incidents by improving incident reporting in all locations. Actions in relation to specific areas of medication-related risk should include:

- a review of processes for the accurate and timely transfer of medication-related information across all interfaces, but in particular in conjunction with the acute sector; and
- a review of arrangements for medicines management in prisons within their remit, in particular in relation to systems for the supply of medicines and matching treatment with patients.
6.9 References

Summary

What can we learn from incidents involving the treatment of children?

- The three most common medication incident types in children were wrong/unclear dose, strength or frequency, omitted/missed dose and wrong medicine.
- Incident reports involving paracetamol, gentamicin, morphine, vaccines, insulin products and intravenous fluid management were frequently reported.
- Other types of medication incident included poor documentation, miscommunication between clinical areas and errors in self-administration of medicines.
- New themes identified were errors arising from electronic prescribing and patient monitoring systems.
7.1 Introduction
The overview represented in this chapter resulted from the analysis of an initial sample of data consisting of 400 incidents reported during 2007.

The age category in reports is poorly completed by reporters and less than half give an indication of the exact age of the patient involved. This reduces the potential for learning from paediatric incident reports sent to the NPSA. The majority of incident reports to the RLS are received from the acute sector.

This chapter highlights themes that are largely peculiar to the analysis of incidents from the acute healthcare sector. Where not mentioned, other themes and trends for this specialty can be considered as reflecting those represented in chapter 2 (What are the patterns of reporting?).

See also the NPSA’s Review of patient safety for children and young people. (Available at: www.npsa.nhs.uk/nrls/improvingpatientsafety/children-and-young-people/)

7.2 What are the common incidents?
Medication incidents involving children are reported from all stages of the medication process although, as also reflected in the literature for paediatric medication errors, the majority (56 per cent) were related to administration.

7.2.1 Prescribing
A wide variety of prescribing errors were reported where doses were prescribed as volume of liquid rather than the actual dose (ml rather than mg), along with dose calculation errors being common. Both these types of errors also occurred in drug administration.

- Patient was prescribed and given chlorpheniramine (Piriton) and alimemazine (Vallergan), both of which are sedative antihistamines. Having both as required. No ill effects noted. Nursing staff unaware of antihistamine properties of alimemazine. (No harm)

- Zidovudine prescribed for patient. Dose prescribed by the medical registrar 2.75ml. This was dose given. Prior to giving the next dose realised should have been prescribed as 2.75mg. (No harm)

- Prescription of prostaglandin infusion incorrect (under-prescribed). Needed 5 nanograms/kg/min but actually given 0.5 nanograms/kg/minute. Prescription had been checked by two nurses and a medical registrar. Error discovered 24 hours later when infusion was being renewed. (No harm)

7.2.2 Dispensing
Labelling errors were a common theme in dispensing errors and were involved in one in 20 paediatric medication errors reported.

- Patient came to clinic for vincristine. Wrong dose dispensed by pharmacy. The dose dispensed was 1mg instead of 1.5mg. Discussed with doctor and pharmacist. The vincristine dose was returned to the pharmacy department and correct dose was dispensed. (No harm)

- A prescription was written for trimethoprim 18mg at night. The pharmacist correctly endorsed the prescription that 1.8ml of trimethoprim 50mg in 5ml should be supplied, but the bottle was labelled to give a dose of 18ml, i.e. a 10-fold overdose. Fortunately the child’s mother spotted the error and did not administer the dose. (No harm)

- When discharging patient and checking his discharge medication it was noted that two bottles of ibuprofen were incorrectly labelled as paracetamol with inappropriate dosing. If these medicines had been given to the patient without checking the labels carefully, or if mum had given the dose according to the label, the patient would have received an overdose and also the wrong drug. (No harm)

7.2.3 Administration
As with older patients, drug administration by the intravenous route was most common in paediatric administration errors (31 per cent), followed by the oral route (28 per cent).
7.3 Type of medication incident

Wrong dose errors are recognised in the literature to be the main cause of paediatric medication error and this is reflected in the analysis. The three most common medication incident types in children were wrong/unclear dose, strength or frequency, omitted/missed dose and wrong medicine. These three medication incident types make up 71 per cent of the total errors in children reported – the same trend as in older patients.

7.3.1 Wrong dose, strength or frequency

Almost half of the errors in the paediatric sample were in this category and a number of factors were common. Medicine doses in children and babies are often based on dose per kg of body weight. It is therefore essential that, where possible, an up-to-date and accurate patient body weight measurement is taken and that equipment is maintained and frequently checked for accuracy. A number of errors involved patients being weighed in pounds but recorded in ounces, patients being weighed fully clothed or old weights used inappropriately. Wrong frequency incidents were commonly seen in neonatal incidents, as the need to give medicines less frequently in the first four weeks of life was not accounted for.

One of the common reasons for the wrong frequency administration errors is failure to sign the prescription chart after administration, leading to the belief that a medicine has not been given and therefore leading to double dosing. Failure to maintain a legible prescription chart, often because of poorly handwritten prescriptions, is another frequently cited contributing factor.

Examples of wrong dose/strength or frequency

- Weighing scales had been tampered with. This resulted in child being weighed in lbs instead of kgs. Therefore wrong dose of Paracetamol suppository given. Should have had 120mg and 240mg was administered in error. (No harm)
- Chemotherapy delayed for second day due to incorrect calculations which were based on old weight therefore wrong surface area. Dose originally prescribed is approximately 10% greater than patient should receive. (Low harm)
- Patient transferred from NICU with Prostin running at 15 nanograms/kg/min = 0.75ml/hour. After review from the cardiology registrar on call it was decided to change the infusion to that of the usual practice on the ward. However it was later realised this was incorrect, with the patient receiving 30 nanograms/kg/minute instead of 15 nanograms/kg/minute. The rate was immediately decreased to 0.75ml/hour, and the calculations were re-checked by the night sister. (No harm)
- Patient admitted earlier in day with fractured femur. Admitting doctor prescribed usual medications. One of which was alimemazine (Vallergan) which was prescribed at 3ml of 7.5mg/5ml solution. When due it was found that the only strength available was 30mg/5ml. The orthopaedic registrar was reviewing patient and he re-wrote the prescription as 3.75ml of 30mg/5ml solution, this was given at 22.00hrs. Later in shift was noted that normal strength alimemazine (Vallergan) is 7.5mg/5ml and patient had therefore received 22.5mg instead of 4.5mg. (Low harm)
Dose calculations and numeracy skills
Dosage calculations are frequently required to determine the correct dose when prescribing a medicine for a child or baby. Due to the frequent unavailability of medicine formulations tailored to the needs of children, complex calculations are often required when preparing a medicine prior to administration. The injectable route is the most commonly reported route of administration and presents challenges, but calculation errors are frequently seen for all routes of administration. It is obviously important that dosage calculations are performed accurately and independently checked by a second person. Support for staff when calculating the most complex and/or high-risk medicines is often provided by the pharmacy in the form of dose calculation charts and guidelines for prescribing, preparing and administering drugs.

An increasing number of organisations are requiring that clinical personnel involved in the prescribing, administration and/or supply of medicines undergo an annual numeracy competency assessment. There are now a number of commercial software packages available to support competency assessment, some of which are tailored to paediatrics.

7.3.2 Omitted and delayed dose incidents
Issues linked to omission or delay in the provision of medication are the second most frequently reported incident type in paediatrics and are common to all patients within acute care (see section 4.3.1). Organisations should set standards for acceptable delay periods and monitor performance and reported incidents to identify root causes, thereby enabling remedial action to be taken. This is a key recommendation for the acute sector as a whole.

- Baby born 18.48hrs. SHO bleeped 19.55hrs, unable to attend (handover). I went to see baby after handover at 21.15hrs. Prescribed zidovudine, bloods/Hep B done. Told 2 midwives specifically that zidovudine had to be given by 22.30hrs. On ward at 22.40hrs enquired about baby. Drug chart not yet sent to Pharmacy. No zidovudine on birth centre or ward. Zidovudine not given until after 23.00hrs (more than 4 hours after birth). (Moderate harm)

- Child admitted with compound fracture of tibia. Advised all clerking complete but no analgesia prescribed and no insulin prescribed. (Low harm)

7.3.3 Wrong medicine
Incidents involving ‘look-alike’ and ‘sound-alike’ medicines occur across all specialties in acute care and can lead to mis-selection of an incorrect medicine. Strategies for purchasing and storage should take this into account, particularly for high-risk medicines (see section 4.3.2).

Vaccines
Vaccines are frequently associated with medication incident reports, particularly in children, where they represented 20 per cent of incidents involving wrong drugs in the sample analysed. Vaccines may be administered when they are contraindicated, when they have previously been administered and where parental consent has been refused. Poor systems for documentation of vaccination records are often implicated.

Examples of vaccine-related incidents
- BCG vaccine given at chest clinic. Patient is HIV positive and her records say she should not have any live vaccines. We found out when we received the blue vaccine form. (Low harm)
- A baby who attended for MMR injection was given Hib/MenC in error. He had already received the Hib/MenC immunisation a month earlier. (Low harm)
- Patient was due to receive pre-school immunisation booster which according to recommended schedule includes MMR vaccine. I had had a conversation with mother when she stated she did not wish her child to receive MMR vaccine. Patient was brought to the appointment by her grandmother with the child’s red record book and in error I gave the MMR vaccine to the patient with the DPT/Polio vaccine. (No harm)
7.3.4 Other types of medication incident

Documentation and miscommunication
Problems were noted arising from documentation and miscommunication issues; this is common to acute care (see section 4.3.5).

Self-administration example
- Patient asked if she could self-administer her injection prior to being discharged next day. She did this under supervision of a staff nurse but it was noted soon after that the patient had administered the whole vial of 18,000 units when only 16,000 had been prescribed. (No harm)

7.4 What are the most common medicines involved?
From the sample reviewed, the five most frequently reported medicines involved in paediatric incidents were paracetamol, gentamicin and morphine, in addition to vaccines and insulin products which have previously been discussed.

Examples of incidents involving paracetamol
- Patient given double the dose of paracetamol due to staff member not recording previous ‘dose given’ on the drugs chart. (No harm)
- Baby prescribed paracetamol intravenously at a dose of 15mg/kg. Literature on use of this drug in neonates is limited but suggests that the half life is longer; therefore it was recommended to reduce the dose to 10mg/kg by the ward pharmacist. (No harm)
- Patient attended with burns, given loading dose of paracetamol 30mg/kg. Family then informed me that they had given 72mg (3ml) at home already but referred to it as Calpol. (No harm)

Examples of incidents involving gentamicin
- Gentamicin was prescribed 18 hourly. However, wrong boxes crossed out on the chart, this meant baby would have ended up having one dose 12 hours apart instead of 18 hours apart. (No harm)
- Patient was given intravenous gentamicin 420mg at 21.30hrs via a central line. It was given as a bolus and neat. However protocol states it must be diluted and given as an infusion over 20 minutes. (No harm)
- On handover from day to night shift, noted that 08.00hrs gentamicin had not been signed for, all other drugs signed for. Checked by ringing nurse who had looked after baby this morning. She realised that she had not given the 08.00hrs dose of gentamicin. (Low harm)

A pilot study looking at the potential for introducing a ‘care bundle’ to help reduce gentamicin-related incidents in the neonatal care environment has been undertaken collaboratively between the NPSA and the Royal College of Paediatrics and Child Health.

Examples of incidents involving morphine
- Subcutaneous morphine prescription states child weight as 88kg but the front of the prescription sheet shows weight to be 80.85kg. Also dose says 0.2mg/kg but only prescribed 7.5mg. (Moderate harm)
- Patient had a morphine infusion in progress since midnight for the purposes of sedation whilst ventilated. At morning handover it was noted that the infusion rate was set at 0.1 ml/hour. This rate was too slow and should have been infusing at 1.0 ml/hour as per prescription. (No harm)
- Patient returned from theatre with another patient’s morphine syringe attached and running. Anaesthetist already present – morphine stopped and correct syringe attached. (No harm)

Examples of incidents involving insulin
- Patient was given intravenous gentamicin 420mg at 21.30hrs via a central line. It was given as a bolus and neat. However protocol states it must be diluted and given as an infusion over 20 minutes. (No harm)
- On handover from day to night shift, noted that 08.00hrs gentamicin had not been signed for, all other drugs signed for. Checked by ringing nurse who had looked after baby this morning. She realised that she had not given the 08.00hrs dose of gentamicin. (Low harm)

Insulin
The NPSA received a number of reports of confusion and mis-selection of insulin products, although this issue is not isolated to the paediatric community (see section 4.3.4).
7.5 New themes identified
Two new themes were identified in the dataset involving information technology: electronic patient monitoring systems (intensive care patient monitoring systems) and electronic prescribing systems. They highlight that electronic prescribing and monitoring systems are unlikely to be the answer to avoiding medication errors, but rather are more likely to be the source of new and different errors to those previously recognised.

Electronic patient monitoring systems examples
- Duplication of paracetamol doses due to administration having been signed for electronically but not on paper drug chart and vice versa. (No harm)
- Phenytoin serum level misread on Carevue resulting in subsequent inappropriate dosing. (Low harm)

Electronic prescribing systems examples
- Electronic prescribing system allowed a paracetamol dose to be given too early as it did not alert the nurse to the drug being prescribed ‘regularly’ and ‘when required’ at the same time. (No harm)
- Patient was prescribed two naloxone infusions simultaneously on the electronic prescribing system. (No harm)

7.6 Medicines for Children Research Network (MCRN)
The unavailability of medicines on the market tailored to the dosing needs of children and babies has long been recognised as a significant risk factor. While some improvement has been made, the pharmaceutical industry has progressed little in meeting the specific needs of children.

The MCRN works in close partnership with the pharmaceutical/biotechnology industry to maximise the development of safe and effective medicines and formulations for children. The Network supports company-sponsored and investigator-initiated (industry-funded) studies in over 100 NHS sites serving approximately six million children. It is, however, going to take many years before suitable licensed formulations for children are comprehensively available; therefore, in the meantime, the problems that the need to use unlicensed and off-label medicines creates must still be faced. Further information can be found at: www.mcrn.org.uk/

7.7 Discussion
Many of the overarching trends identified by this analysis are well documented, but new themes include those associated with the introduction of information management technology. The most frequently occurring incident type is wrong/unclear dose, strength or frequency, where reported incidents are more than double the proportion reported for medication incidents across all age categories.

Action points
Local risk reduction strategies should focus on minimising the most frequently reported medication risks for children. These include:
- neonatal medication errors;
- dose calculation errors for all children;
- risks associated with poor documentation of medication use; and
- the safe use of paracetamol, gentamicin, morphine, vaccines, insulin products and intravenous fluids.

7.8 References
What can we learn from incidents involving the treatment of elderly patients?

- The way the body handles medicines changes as people get older, making older people more susceptible to harm from dosing errors.
- Choice of formulation may be important, particularly in older people with swallowing difficulties.
- Multiple disease states in elderly patients tend to lead to polypharmacy, which can mean very confusing medicine regimes for older patients.
- The increased use of ‘patients’ own drugs’ in hospitals can add additional risk.
- Patients’ concordance with their treatment may be reduced if they are on a complicated regime.
- People who are confused, depressed or have poor memory may have difficulty in taking medicines.
8.1 Introduction

The incident data sample analysed consisted of 400 reported incidents. Seventeen reports were considered not to be medication errors, of which four were adverse drug reactions associated with ‘normal’ use of the medicine. The remaining 383 incidents were analysed and grouped by themes.

This chapter highlights themes which are largely peculiar to the analysis of incidents from this healthcare sector. Where not mentioned, other themes and trends for this specialty can be considered as reflecting those represented in chapter 2 (What are the patterns of reporting?).

As people get older, their use of medicines tends to increase. Four in five people over 75 take at least one prescribed medicine, with 36 per cent taking four or more medicines. Alongside this comes increasing challenges to ensure that medicines are prescribed and used effectively, taking into consideration how the ageing process affects the body’s capacity to handle medicines. Multiple diseases and complicated medication regimes may affect patients’ capacity and ability to manage their own medication regime.

In the document *Medicines and Older People: Implementing medicines-related aspects of the NSF for Older People* the Department of Health highlighted the following issues as being particularly relevant to medicines management in older people:

- Many adverse reactions to medicines could be prevented.
- Some medicines are under-used.
- Medicines are sometimes not taken.
- Inequivalence in repeat prescription quantities causes wastage.
- Changes occur in medication after discharge from hospital.
- There can be poor two-way communication between hospitals and primary care.
- Repeat prescribing systems need improvement.
- Dosage instructions on the medicine label are sometimes inadequate.
- Access to the surgery or pharmacy can be a problem.
- Carers’ potential contribution and needs are often not addressed.

- Detailed medication review minimises unnecessary costs.
- Some long-term treatments can be successfully withdrawn.

Appropriate medicines management systems should be in place so that the medication needs of older people are regularly reviewed and discussed with older people and their carers; information and other support is provided to ensure that older people get the most from their medicines; and avoidable adverse events are prevented. Many of these issues are still relevant as shown by the data below, identified for this report.

The problems that occur with drug use in elderly patients tend to be due to one or a combination of the following three factors:

- polypharmacy;
- altered pharmacokinetics;
- altered pharmacodynamics.

8.2 Inappropriate dose for an elderly patient

Age-related changes in drug handling make older people more susceptible to drug effects. The most important and predictable change is a reduction in renal drug clearance. Hepatic metabolism reduces with age, potentially increasing plasma concentrations of some drugs with extensive first pass metabolism (e.g. propranolol, metoclopramide and many opioids). Pharmacodynamics can also be significantly altered with increasing age because of changes in the responsiveness of target organs. In general, older people have an increased sensitivity to drugs, particularly those acting on the central nervous system. These issues make errors in dosing, such as those seen below, particularly hazardous in older people.

- Patient was administered a bolus of 10mg morphine at once instead of small doses of 2mg, in error. (No harm)
- Patient administered 1mg of lorazepam instead of the prescribed 0.5mg, in error. (No harm)
8.3 Formulation/swallowing issues

Oropharyngeal dysphagia, which refers to difficulty with swallowing in the mouth and throat or pharynx, is estimated to affect 22 per cent of the world’s population over 50 years old. In acute hospitals, it is estimated to affect 20–30 per cent of patients and, within long-term care settings, between 59 per cent and 66 per cent of residents have dysphagia6. This is important as medication will often need modification, e.g. to liquids, but these may also need thickening to enable administration.

Dysphagia is often a symptom of a disease process common in elderly people such as stroke, Parkinson’s disease or dementia. Other diseases as well as the ageing process can predispose individuals to dysphagia. People with dysphagia are at risk of reduced nutritional and fluid intake.

The NPSA is currently undertaking a programme of work to raise awareness of the risks associated with the management of dysphagia. The NPSA has established a Dysphagia Expert Reference Group consisting of speech and language therapists, dieticians, caterers and nurses who will be undertaking a review of the National Descriptors for Texture Modification in Adults to ensure that they are meaningful to all relevant healthcare staff.

The NPSA is also in the process of developing and testing some food-related signage, which will include signage for texture-modified diets and fluids to assist healthcare workers in identifying individuals with dysphagia and their dietary/fluid modification requirements.
discharge to ensure that patients are sure of changes to treatment.

Benefits to organisations include saving of staff time at admission and discharge, and minimisation of medicines wastage.

The increased use of POD scheme in hospitals can also bring problems. The medicines are usually stored in individual ‘POD lockers’ near to the patient. The process of reissuing the medicines from the ward POD lockers is now separate from the pharmacy discharge dispensing process and, in some instances, patients leave hospital without their medicines. If POD lockers are not emptied when the patient is discharged, the patient being discharged is without their medicines and the medicines remain in the locker when the next patient is admitted to the bed. This may result in the next patient receiving the wrong medicines either during their inpatient stay or on discharge, as well as the discharged patient missing a number of doses before alternative supplies can be made. While these types of errors could apply to the general patient population, polypharmacy, changes in pharmacokinetics and pharmacodynamics, and confusion may mean that elderly patients are particularly at risk in these situations.

A number of incident reports were associated with POD lockers. Issues seen include patients receiving someone else’s medicines, inappropriate self-medication and patients leaving the hospital without their medicines.

Example – Drug prescribed for the wrong patient as a result of POD locker error

- Medroxyprogesterone 100mg BD prescribed for the patient after being found in her locker by staff nurse. The medicine belonged to another patient who had been in same bed but discharged one week earlier. (No harm)

Example – Drowsiness after taking wrong patient’s medicines after discharge from hospital

- Patient informed staff that he could not understand his medication that was given to him when he left. Patient asked to bring the medication in the following day – discovered medication inside was not for this patient although he had taken the tablets as prescribed. Patient was drowsy and disorientated. (Low harm)

8.6 Concordance

Patients’ concordance with their treatment may be reduced if they are on a complicated regime. Even if an unnecessary medicine is not causing side effects, a patient may be taking one medicine at the expense of remembering to take something else. However, confusion over treatment regimes is not the only reason that elderly patients do not take their medication as intended by the prescriber.

- Patient was refusing to take her tablets and threw the pot of pills over the floor. On making up a second batch of tablets, the staff nurse accidentally confused the identity of the correct patient with that of the lady next to her. She was therefore given metformin, folic acid, omeprazole and amoxicillin in error. The patient was penicillin allergic. (No harm)

8.7 Medicines compliance aids

Often, older people have problems with the practicalities of medicine use. People who are confused, depressed or have poor memory may have difficulty in taking medicines. Medicine regimens should be kept as simple as possible. Multi-compartment compliance aids or medicine reminder charts may be useful. However, people with cognitive impairment often require help from carers or relatives.
Many of the themes identified were not necessarily specific to the age group of the patients in the sample of data. However, six incidents were associated with the use of compliance aids such as compartmentalised medicine boxes into which medicines are dispensed. Patients will receive incorrect medicines if the compliance aid is not filled accurately or according to the patient’s current prescription.

**Duplicate doses from duplicate compliance aids**
- Patient took two doses of the same medication from two different dosette boxes and blister pack. Nurse contacted the GP and pharmacy to report the overdose and multiple packs. (No harm)

**Patient administered wrong dose from compliance aid**
- The patient blister pack had the wrong doses in and over the weekend, the patient had been given the wrong dose from the pack. Doctor informed and the pack returned to the pharmacy and a new one dispensed. (No harm)

8.8 Discussion
Patient safety incidents occur frequently in elderly patients who should be considered as a group to be particularly vulnerable to medication-related incidents. Incidents should be reviewed on an age-related basis to identify risks peculiar to these patients.

Action points
Initiatives to help reduce medication incidents involving elderly patients should include:
- a review of local arrangements for managing medication-related therapy for patients with swallowing difficulties; and
- a review of processes associated with medication concordance and compliance in elderly patients, particularly the use of patients’ own medicines and compliance aids.

8.9 References
An overview of medication safety literature published during 2007
9.1 Introduction
This chapter gives a brief overview of published research on medication safety in 2007. The review is inevitably selective, and aims to pick out some common themes and to complement the analysis of RLS data.

Any review of patient safety research must consider the limitations placed on research by inconsistent and incomplete reporting systems. Whether the research involves an analysis of error types, root causes of error or an evaluation of a solution, its value to practitioners is dependent on how accurately errors are defined and reported.

9.2 Method
The search of literature published in 2007 covered the Medline, Embase and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases. The search strategy used free text and thesaurus terms to capture literature on medication errors, pharmacy-based errors, potential causes of patient safety incidents (such as medicines packaging) and potential solutions. A total of 529 studies were retrieved, and abstracts were reviewed for relevance and fit with the following criteria: research quality, relevance to the NHS and themes in this report. A total of 37 full-text articles were obtained, and articles were appraised using Critical Appraisal Skills Programme (CASP) criteria. Studies of poor quality, small local studies with no transferable learning and research without relevance to the NHS were excluded. However, there were few high-quality, generalisable studies, and some illustrating themes of interest are included despite a number of quality limitations. This underlines the urgent need for large, high-quality investigations and systematic reviews to create reliable evidence on medication safety to guide practitioners’ actions.

9.3 References

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<tr>
<th>Reference</th>
<th>Country</th>
<th>Reference Type</th>
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<tr>
<td>Franklin BD, O’Grady K et al. The impact of a closed-loop electronic prescribing and automated dispensing system on the ward pharmacist’s time and activities. <em>International Journal of Pharmacy Practice</em>. 2007; 15: 133-139.</td>
<td>UK</td>
<td>Acute care</td>
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<tr>
<td>Olsen S, Neale G et al. Hospital staff should use more than one method to detect adverse events and potential adverse events: incident reporting, pharmacist surveillance and local real-time record review may all have a place. Qual Saf Health Care. 2007; 16: 40-44.</td>
<td>UK</td>
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**Mental health**

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*A compilation of abstracts is available on request from the NPSA.*
Summary of action points
10.1 Summary of action points

1. NHS organisations should review the number and completeness of medication incident reports received locally to identify whether current arrangements are enabling local learning and action to minimise the risk of harm to patients.

Actions might include:
- comparing the organisation’s reporting performance in relation to similar organisations (gap analysis questioning, ‘how are we doing?’);
- assessing the local reporting culture and identifying and managing local barriers to incident reporting;
- investigating all incident reports with outcomes of death and severe harm, to ensure that action is taken to minimise any recurrence of these incidents and also to ensure that these incident reports relate to actual harm rather than potential harm;
- increasing the percentage of medication incident reports where the name of the medicine(s) is included in the appropriate data field;
- increasing the percentage of incident reports where the age field is completed for children and elderly patients; and
- providing regular reports (concerning medication incident reports and actions to minimise harm) to clinical governance and medicines management groups in the organisation.

2. The information and incident examples in chapter 3 of this report relating to deaths and severe harm should be used to risk assess and, where necessary, improve the safety of local medication management systems.

3. Acute sector organisations should continue to review previously implemented safer practice recommendations to ensure that robust implementation is maintained.

In order to address other areas of risk, actions should include the following:
- The setting of standards for what constitutes a delayed or omitted medicine in each clinical area. These standards should be audited and incidents analysed locally to identify causes of delay or omission.
- Communication of key medicines-related information at the point of transfer of care – both internal and external – should be reviewed to identify high-risk areas requiring action.
- Medication incidents that identify insufficient resources as a major cause of the incident should be investigated and action taken to minimise recurrence of these incidents.

4. Mental health organisations should increase the reporting of, and learning from, medication incidents. Serious incidents should be reported via the RLS as well as STEIS in England.

Particular attention is required for incidents arising from:
- communication/transfer of information across healthcare interfaces;
- medicines reconciliation;
- medicines prescribed for physical conditions;
- self-administration systems; and
- the use of methadone and clozapine.

5. PCOs should contribute to national learning from medication incidents by improving incident reporting in all locations. Actions in relation to specific areas of medication-related risk should include:
- a review of processes for the accurate and timely transfer of medication-related information across all interfaces, but in particular in conjunction with the acute sector; and
- a review of arrangements for medicines management in prisons within their remit, in particular in relation to systems for the supply of medicines and matching treatment with patients.

6. Local risk reduction strategies should focus on minimising the most frequently reported medication risks for children. These include:
- neonatal medication errors;
- dose calculation errors for all children;
- risks associated with poor documentation of medication use; and
- the safe use of paracetamol, gentamicin, morphine, vaccines, insulin products and intravenous fluids.
7. Initiatives to help reduce medication incidents involving elderly patients should include:
   - a review of local arrangements for managing medication-related therapy for patients with swallowing difficulties; and
   - a review of processes associated with medication concordance and compliance in elderly patients, particularly the use of patients’ own medicines and compliance aids.

10.2 The NPSA Safe Medication Workshop 2008
The NPSA hosted a workshop attended by over 200 senior pharmacists and stakeholders from primary, secondary and mental health sectors on 15 October 2008 in London.

A full report of the workshop and copies of the slide presentations are available at:
www.npsa.nhs.uk/nrls/medication-zone/forum/
Appendix
Data tables supporting charts

Data for Chart 1 (page 13)

Medication incidents by stage of medication process – all care settings, 2007

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<tr>
<th>Stage in the medication process</th>
<th>Total</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Administration/supply of a medicine</td>
<td>35,982</td>
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<tr>
<td>Preparation and dispensing</td>
<td>12,726</td>
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<tr>
<td>Prescribing</td>
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<tr>
<td>Monitoring</td>
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Data for Chart 2 (page 14)

Medication incidents by incident type, 2007

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<th>Medication error category</th>
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<th>Percentage</th>
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<td>Wrong/unclear dose, strength or frequency</td>
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<td>Omitted medicine/ingredient</td>
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<td>Wrong drug/medicine</td>
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<td>Wrong quantity</td>
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<td>Unknown</td>
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<td>Wrong/omitted/passed expiry date</td>
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<td>Wrong formulation</td>
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<td>Patient allergic to treatment</td>
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<td>Wrong storage</td>
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<td>Wrong method of preparation/supply</td>
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<td>Wrong route</td>
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<td>Contraindication to the use of the medicine in relation to drugs or conditions</td>
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<td>Adverse drug reaction (when used as intended)</td>
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<td>All other medication incident types</td>
<td>18,453</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>72,482</td>
<td>100</td>
</tr>
</tbody>
</table>

Data for Chart 3 (page 18)

Medication incidents that report death and severe harm by stage of medication process, 2007

<table>
<thead>
<tr>
<th>Stage</th>
<th>Death</th>
<th>Severe harm</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescribing</td>
<td>12</td>
<td>20</td>
<td>32</td>
</tr>
<tr>
<td>Preparation/dispensing</td>
<td>5</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>Administration</td>
<td>17</td>
<td>29</td>
<td>46</td>
</tr>
<tr>
<td>Monitoring</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>63</td>
<td>100</td>
</tr>
</tbody>
</table>

Data for Chart 4 (page 18)

Types of medication incident that report death and severe harm, 2007

<table>
<thead>
<tr>
<th>Incident type</th>
<th>Death</th>
<th>Severe harm</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unclear/wrong dose or frequency</td>
<td>17</td>
<td>16</td>
<td>33</td>
</tr>
<tr>
<td>Wrong medicine</td>
<td>7</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>Omitted/delayed medicines</td>
<td>6</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Contraindicated medicine</td>
<td>3</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Adverse drug reaction</td>
<td>1</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Allergy to medicine</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Wrong route</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Mismatching patients</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>63</td>
<td>100</td>
</tr>
</tbody>
</table>