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Insulin, hospitals and harm: a review of patient safety incidents reported to the National Patient Safety Agency

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ABSTRACT – Patient safety incidents involving insulin are frequent and cause considerable distress to people with diabetes and anxieties to their families and carers. This article describes an analysis of the National Reporting and Learning System database of patient safety incidents concerning insulin reported from NHS providers in England and Wales over six years. The main causes are discussed and the ongoing developments by the National Patient Safety Agency and partner organisations to reduce insulin errors are described.

KEY WORDS: insulin, medication error, patient safety, prescribing error

Introduction

Serious patient safety incidents involving insulin frequently receive media attention and insulin errors are among the top high alert medicines worldwide.[1–3] Hypoglycaemia resulting from insulin is an important cause of hospital admissions and is common in hospitalised patients.[4] The National Patient Safety Agency (NPSA) is a special health authority working in the NHS in England and Wales and operates the National Reporting and Learning System (NRLS) which receives patient safety incidents reported from NHS organisations in all healthcare sectors. The NPSA reviews these incidents, identifies important risks to patients and issues guidance to the NHS to alert the service to these risks with recommended actions to minimise recurrence.

Method

All medication incident reports which included the term 'insulin' or the proprietary names of insulin products received between November 2003 and November 2009 were searched. Quantitative and qualitative methods were used to analyse the incident data.

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This paper is based on a presentation given by John Scarpello entitled 'Insulin, hospitals and harm' at the joint Association of British Clinical Diabetologists (ABCD) and Royal College of Physicians (RCP) conference 'Diabetes: a hospital perspective', which was held at the RCP on 26 January 2010.

Results

A total of 16,600 incidents involving insulin were identified and 24% reported harm to the patient. There were 18 incidents with fatal and severe outcomes and 1,042 incidents of moderate harm (Table 1).

Incidents were reported at all stages of the medication process. The majority (61%) occurred during insulin administration with a further 17% caused by prescribing errors and 10% at dispensing.

Qualitative analysis showed that the top three medication error types were wrong dose, omitted or delayed insulin, and wrong insulin product which together accounted for 60% of all incidents reported (Table 2).

The main causes of wrong dose incidents were:

- incorrect prescription on admission
- abbreviation of 'units'. With poor handwriting the abbreviations 'U' 'IU' may be read as '0' or 10' and lead to unintended 10 times and 100 times dose errors
- incorrect monitoring of blood glucose and dose adjustment of insulin
- poor documentation of dose administration on inpatient medicine charts
- duplicate dose administration
- errors in calculation of insulin doses for intravenous infusion
- incorrect programming of electronic infusion devices.

Table 1. The degree of harm from incidents involving insulin.

Degree of harm	Incidents	Percentage (%)
Death	6	<1
Severe	12	<1
Moderate	1,042	6
Low	2,914	18
No harm	12,626	76
Total	16,600	100

Table 2. The medication error type involving incidents with insulin.

Medication error type	Incidents	Percentage (%)
Wrong dose, strength or frequency	4,256	26
Omitted and delayed doses	3,390	20
Wrong insulin product	2,390	14
Other	6,564	39
Total	16,600	100

Omitted and delayed insulin resulted from:

- insulin not prescribed on hospital admission and transfer
- failure to prescribe or supply the correct insulin preparation, vial, cartridge or pen
- prescribed insulin product not available in the clinical area or following discharge
- confusion over insulin dose administration when patients were 'nil by mouth'
- insulin dose not administered at an appropriate time to the administration of food (including enteral feeding).

Selection of the incorrect insulin product was described in 2,201 incidents (14% of the total) due in large part to the 'look alike' and 'sound alike' proprietary names, for example:

- Novorapid and Novomix
- Humalog and Humalog Mix
- Humulin S, I and M3
- Humalog and Humulin
- Glulisine and Glargine
- Lantus and Lente
- Hypurine – neutral, isophane, lente

Discussion

Insulin is used by many thousands of patients in the UK and increasingly by those with type 2 diabetes to achieve recommended glycaemic control. Nearly all type 1 patients experience episodes of hypoglycaemia although only a small proportion will require assistance or need hospitalisation. Patients and their carers require careful training in the management and monitoring of their insulin therapy. The safety incidents reported here are almost entirely from acute secondary care and represent only a small fraction of the actual incidents that occur.

Despite considerable under reporting the NRLS database has received information on a large number of incidents described, nearly all of which took place in hospital under direct medical supervision. Similar findings have been reported elsewhere. Analysis of medication error reports to the US Pharmacopoeia MEDMARX reporting programme over a two-year period identified a total of 4,764 insulin errors with approximately 6.6% (n=320) of these causing harm to the patient.[5] Omission errors (leading to hyperglycaemia) and improper dose/quantity (leading to hyper- or hypoglycaemia) were the two most frequently reported types of error associated with insulin in US hospitals.[5] In a further study reviewing prescribing errors in a hospital in the USA, 9.2% of the errors involved insulin. Of the fatal and severe incidents 57% involved prescriptions for insulin.[6]

The risks are largely preventable but require action by several organisations. These include regulators, responsible for packaging and 'look alike' names of insulin products, as well as the healthcare providers who need to ensure a safer hospital environment for all people with diabetes including safer prescribing and use of insulin.

A number of organisations in the UK have developed initiatives to improve the safer use of insulin. In Northern Ireland, the Medicine Governance Team and the Clinical Resources Efficiency Support Team (CREST) have issued guidance on the safe use of insulin in hospitals.[7–8] The NHS Institute For Innovation and Improvement has launched the 'Think glucose programme'.[9] This identified that the provision of consistent, effective and proactive inpatient care for people with diabetes is often inadequate, leaving patients with a poor experience in terms of their diabetes treatment.

National data confirm that, on average, a patient with diabetes spends longer in hospital than a patient without diabetes for the same procedure or condition. The programme provides a package of tried and tested products to support learning and improve awareness in the treatment of patients in whom diabetes is a secondary diagnosis. Implementing a clinical pathway will improve the patient experience and the quality of care, thereby reducing the length of stay.[9]

NHS Diabetes carried out a national inpatient audit in September 2009 and plan future audits.[10] It has also published guidance on the safe and effective use of insulin in hospitalised patients.[11]

The National Patient Safety Campaigns in England and Wales have included the safe use of insulin in the programmes to make the use of high alert medicines safer.[12–13] There are a range of other resources on the safe use of insulin on the NHS Diabetes website.

What the NPSA will do

The NPSA is working with the above programmes in 2010–11 to make the use of insulin safer. The agency has issued a *Rapid response report on reducing harm from omitted and delayed medicines in hospitals* – insulin was identified as a critical medicine in this report.[14]

A rapid response report recommending safer administration of insulin recommends that the term 'unit' is used to describe the dose and strength of insulin therapy is never abbreviated in practice, and that intravenous syringes are never used to measure and administer insulin doses as both these practices are error prone.[15] The guidance will also emphasise the importance of clinical staff receiving adequate training on the safe measurement and administration of insulin products. NHS Diabetes is planning to issue an e-learning package on this topic. Longer term, the NPSA is preparing support materials to assist the NHS design inpatient insulin charts that, in practice, will be safer.

The agency is also working with patient groups and health professionals to develop a design for patient-held information that will better inform patients, carers and healthcare professionals about the insulin products that are being used by individual patients and to reduce errors in practice. The NPSA has published guidance on the design of the dispensing environment to reduce errors.[16] The guidance recommends the use of barcode technology to minimise dispensing errors and the

NPSA continues to promote the use of technology to help with distribution.

Finally, the NPSA intends to work with pharmaceutical manufacturers and regulators to introduce design changes to insulin products that will improve the safe use of these products in practice. The NPSA has already published a design for a patient safety guide to the labelling and packaging of injectable medicines.[17]

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