

Safe use of insulin in hospitalised people with diabetes: New national recommendations

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Article points

1. The *Safe and Effective use of Insulin in Hospitalised Patients* document was produced to minimise the risk of harm from error related to insulin usage in the hospital environment.
2. The document makes 34 recommendations for implementation, either by individual trusts or national organisations.
3. This has significant implications for DSNs, in particular inpatient DSNs, who should have a pivotal role in implementing these recommendations in their trusts.

Key words

- Inpatient care
- Insulin
- Patient safety
- Recommendations

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The document *Safe and Effective use of Insulin in Hospitalised Patients* is one of the documents in the *Inpatient Pack* produced on behalf of NHS Diabetes and launched at the Diabetes UK Annual Professional Conference in March 2010. This document makes 34 recommendations under six main categories that aim to reduce potential harm to inpatients with diabetes from insulin errors. This article describes these recommendations and discusses the implications for nursing practice in the hospital environment.

Improving care for inpatients with diabetes has been a specific focus on the national agenda over the past few years. As a result, NHS Diabetes published a series of documents produced for inclusion in the *Inpatient Pack*, which was launched at Diabetes UK this year.

Two of these documents (written by the Joint British Diabetes Societies [JBDS] on behalf of NHS Diabetes) – national guidelines for the management of hypoglycaemia and diabetic ketoacidosis – have been discussed in the previous two editions of the *Journal of Diabetes Nursing* (Savage and Hilton, 2010; Walden and Stanisstreet, 2010). The final document in this series is *Safe and Effective use of Insulin in Hospitalised Patients* (Fowler and Rayman, 2010). The document was written by Duncan Fowler and Gerry Rayman and was commissioned by Dr Rowan Hilson, National Clinical Director for Diabetes. Prior to publication it was circulated for comment to members of the JBDS and the National Patient Safety Agency (NPSA).

Insulin usage and safety

There is an increasing prevalence of diabetes worldwide, and with more recent developments of incentivised care, such as the Quality and Outcomes Framework (Roland, 2004; NHS Employers, 2009), it is inevitable that the use of insulin to treat diabetes is also increasing. In the USA, insulin usage has been reported at 20–30% of the diabetes population (Koro et al, 2004). In the UK, results from the national inpatient diabetes audit showed that 6% of inpatients with diabetes had type 1 diabetes and 94% had type 2 diabetes, and of these, 29% were insulin treated (Rayman, 2010). It has also been demonstrated that maintaining tight glycaemic targets during illness improves clinical outcomes (Pomposelli et al, 1998; Furnary et al, 2003; Marchant et al, 2009).

As stated in the present document “insulin is a potent, lifesaving medication... but if prescribed or administered inappropriately or inaccurately has the potential to cause harm” (Fowler and

Rayman, 2010). Insulin appears regularly in the top ten high-alert medicines worldwide (Santell et al, 2003; Institute for Safe Medication Practices, 2008; NPSA, 2009), and in a recent rapid-response report from the NPSA (2010) there were 3881 wrong dose incidents reported involving insulin between August 2003 and 2009 in the UK.

The safe and effective use of insulin document was produced to minimise the risk of harm from error. The document makes 34 recommendations for implementation, either by individual trusts or national organisations. These recommendations are split into six broad categories: training, staff, documentation, administration of insulin, guidelines and protocols, and discharge planning. This has significant implications for DSNs, in particular inpatient DSNs (DISNs), who should have a pivotal role in implementing these recommendations in their trusts as their role is to oversee the management of inpatients with diabetes (Davies et al, 2001; Sampson et al, 2006).

Training

There are four main recommendations, which encompass training from undergraduate level to ongoing update sessions within the working environment. At present, undergraduate diabetes training is not standardised, so the level of diabetes education can be variable.

The document suggests there should be dedicated tuition on insulin prescribing, types and administration, and blood glucose monitoring. This training should be for all nursing and medical staff, paramedics and pharmacists. However, education should not stop there; all trusts should implement an induction programme for new staff, reiterating the undergraduate training, and include education on local policies and guidelines, including emergencies such as hypoglycaemia, diabetic ketoacidosis and the systems for incident reporting. Further, it recommends there should be dedicated sessions for junior doctors as part of their ongoing training and mandatory updates for nurses and pharmacists.

An emphasis of this training needs to be practical sessions so staff get hands-on experience

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1. Trusts should employ multidisciplinary diabetes specialist teams, ensuring that all the professionals who deal with diabetes do so in a cohesive way, hopefully providing the best possible care effectively and efficiently.
2. For the recommendations to be useful, diabetes teams will need to gain full backing from the trust executive boards to ensure that staff are allowed protected time to attend these sessions.
3. The document recommends that there should be a move towards electronic prescribing nationally, which should eliminate many documentation errors.
4. Self-administration of insulin should be encouraged. However, there needs to be robust systems in place to ensure that people are assessed as capable of self-administering and dose-adjusting, and that all permissions are documented in the patient's medical notes and all doses given are documented on the insulin chart.

of setting up insulin infusions, using insulin-specific pen devices and point-of-care capillary blood-glucose monitoring.

DSNs, in particular DISNs, are likely to have a substantial role in this training, supported by the diabetes specialist team, as they already have the knowledge and expertise in these areas and many are already delivering similar education to some groups of staff.

Staff

There are two recommendations under the staff section, relating to diabetes specialist teams (DSTs) and link nurses.

The first recommendation is that trusts should employ multidisciplinary DSTs, ensuring that all the professionals who deal with diabetes do so in a cohesive way, hopefully providing the best possible care effectively and efficiently. This team should include at least one DISN to oversee the management of all inpatients via individual patient review and education of ward nurses. It further recommends that these teams be responsible for forging links into primary care to include support for nursing homes, prisons and other institutions, which are areas that often lack expert knowledge and experience.

The second recommendation is the implementation of link-nurse schemes to ensure information is cascaded to all ward nursing staff. In the past, possibly because of resource pressures, these types of schemes have not always been successful. Therefore, it is recommended that these programmes are subject to mandatory attendance.

For these recommendations to be useful, however, diabetes teams will need to gain full backing from the trust executive boards to ensure that staff are allowed protected time to attend these sessions. One option, perhaps, is the introduction of e-learning modules by the DISN, which are becoming more widely used by other specialties. This is something that could be introduced with relative ease as there is now an e-learning course on the safe use of insulin (Healthcare e-Academy and NHS Diabetes, 2010).

Documentation

Unfortunately many of the errors associated with insulin use can occur during documentation, for example the omission of insulin altogether, inaccurate transcribing between primary and secondary care, and potentially fatal overdoses where "u" is written instead of "units", so "6u" is misread as "60 units". Indeed, one death was reported in the NPSA (2010) rapid-response report over the 6-year period as a result of abbreviating the term "unit".

As a result, the six recommendations in this section include that the presence and type of diabetes, along with medication in full, is documented in the patient's notes on admission. In addition, it is recommended that training highlights the dangers of transcription error and that there is medicine reconciliation on admission and discharge.

The document recommends there should be a move towards electronic prescribing nationally, which should eliminate many documentation errors. Until this becomes a more widespread reality, however, there should be separate insulin drug charts where all insulin prescriptions (usual, intravenous [IV] and supplemental) be found in one place to avoid confusion. These charts should also include sufficient space for documentation of blood glucose levels and treatment changes made in response. The NPSA is already working on producing both electronic prescribing guidance and an insulin chart template for other trusts to adapt to their own paper work (Bischler, 2010).

The final recommendation in this section, which is likely to have the biggest impact on the DSN and DISN workload, is that self-administration of insulin should be encouraged. However, there needs to be robust systems in place to ensure that people are assessed as capable of self-administering and dose-adjusting, and that all permissions are documented in the patient's medical notes and all doses given are documented on the insulin chart.

Administration of insulin

The rapid-response report from the NPSA (2010) stated that there were three deaths and 17 other reported incidents between January 2005 and July 2009 where an ordinary IV syringe was used to measure and administer insulin. To address

this, one recommendation in this section is that only appropriate insulin syringes should be used to draw up insulin, i.e. 100 units in 1 mL, 50 units in 0.5 mL, or 30 units in 0.3 mL.

IV insulin should be made up in a standardised strength of 1 unit of soluble insulin in 1 mL of normal saline. Where possible, this should be available in prefilled syringes provided by the pharmacy. It should only ever be delivered using an appropriate syringe-driving pump and only nurses who have had adequate training in the administration of IV drugs and the use of the equipment should be allowed to do this. Also, prescriptions should be double-checked and countersigned to reduce the margins for error. While this practice can sometimes be complained about as time-consuming, it does help to safeguard individual nurses.

Furthermore, separate cannulae should be used for IV insulin administration, and under no circumstances should any other injectable medicines be given via that cannula. The only exception is fluids, as long as there is the use of a Y-connector with a non-return valve. In most situations IV insulin should be accompanied with IV fluids containing glucose, but daily electrolyte monitoring should be undertaken to avoid hyponatraemia and hypokalaemia. Other recommendations include what should be commonplace practice for most ward nurses, such as refrigerating unopened insulins and not sharing pen devices between patients.

The use of continuous subcutaneous insulin infusion (CSII), or “insulin pumps”, is becoming more common in the treatment of people with type 1 diabetes and is therefore going to be seen more often in people with the condition who are admitted to hospital.

All people using CSII will have had intense education and will know about their appropriate usage much better than any ward nurse, so it is important that there are robust policies in place for their continued use in the hospital environment. Here, logic would suggest that the diabetes nurses who are involved in the pump programmes should be responsible for writing these policies to minimise the margin for error. However, ward nursing staff need to be mindful of changes in the patient's condition

(e.g. the immediate postoperative period) when individuals may not be capable of self-caring and ensure there is timely contact with the diabetes team for advice in these circumstances.

The final recommendation in this section relates to the term “sliding scale”. In the past this has been used to describe the practice of giving bolus doses of subcutaneous, soluble insulin in response to blood glucose levels. This practice has been criticised in the literature, as blood glucose levels reflect previous insulin dose, food and activity – they do not predict the correct insulin dose that needs to be administered. This practice is illogical as it responds to hyperglycaemia after it has happened rather than preventing it (Katz, 1997; Queale et al, 1997; Umpierrez et al, 2007). Thus, it is no longer a recommended practice. As this has become less common, the term “sliding scale” has been used to describe variable rate IV insulin infusions and can lead to confusion when a doctor orders the commencement of a sliding scale. Therefore, it is recommended that the term “sliding scale” is no longer used at all.

Guidelines and protocols

This is the longest section with 12 recommendations, although many have been mentioned in previous sections.

The first is that there should be national guidance for many common but potentially difficult situations for inpatients with diabetes. Guidelines for diabetic ketoacidosis (Savage et al, 2010) and hypoglycaemia (Stanisstreet et al, 2010) have already been written, but the document suggests that guidance should also cover hyperosmolar hyperglycaemic states, surgery, labour, antenatal steroid therapy for fetal lung, endoscopy, enteral feeding, insulin-treated hyperkalaemia and end-of-life care.

While national guidance is awaited, local guidelines should be produced by a multidisciplinary team and be made available electronically to allow for ease of access and regular updating. The document supports advice given in the JBDS hypoglycaemia guideline (Stanisstreet et al, 2010) that consideration should be given for the use of “hypo boxes” and that 20% IV glucose is used instead of 50%.

Recommendations reiterate earlier advice of

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1. Prescriptions should be double-checked and countersigned to reduce the margins for error. While this practice can sometimes be complained about as time-consuming, it does help to safeguard individual nurses.
2. All people using continuous subcutaneous insulin infusion will have had intense education and will know about their appropriate usage much better than any ward nurse, so it is important that there are robust policies in place for their continued use in the hospital environment.
3. The document suggests that future guidance should also cover hyperosmolar hyperglycaemic states, surgery, labour, antenatal steroid therapy for fetal lung, endoscopy, enteral feeding, insulin-treated hyperkalaemia and end-of-life care.

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1. Recommendations reiterate earlier advice of mandatory blood glucose-monitoring training and a robust blood glucose-monitoring policy with individualised glycaemic targets.
2. One recommendation, previously not discussed, is that there needs to be a policy for insulin substitution if the patient's normal insulin is not available.
3. The document recommends that discharge planning starts from the earliest given opportunity, not just when the person is medically stable for discharge.
4. It can be argued these recommendations are not something that trusts can afford to ignore. Several of the recommendations are directed at national organisations and some have already been addressed or are currently being worked towards.

mandatory blood glucose-monitoring training and a robust blood glucose-monitoring policy with individualised glycaemic targets. However, it goes further to suggest that national research should be undertaken by all the interested diabetes groups to gain clearer guidance on what glycaemic targets are considered safe in the generalised ward patient with diabetes.

Further recommendations in this section reinforce encouragement of self-management backed up with clear guidelines and assessment pathways that are flexible enough to allow for specialist advice when the patient's condition is such that they temporarily cannot self-manage. One recommendation, previously not discussed, is that there needs to be a policy for insulin substitution if the patient's normal insulin is not available. This, of course, should be avoided where at all possible; what often happens at present, however, is that the patient's chart is signed as "drug not available", meaning that the patient's insulin is omitted, so lists of suitable short-term alternatives should be available.

Discharge planning

Discharge planning has always been an important role for nursing staff. However, with current pressures to reduce length of stay and work more effectively with limited resources, it has become more of a priority for trust executive boards.

The document recommends that discharge planning starts from the earliest given opportunity, not just when the person is medically stable for discharge. For all those inpatients that will be self-caring on discharge the diabetes team should be involved early to ensure the individual is appropriately educated and allow time for relatives and carers to ask questions so that they have all the information they require – further, to ensure that appropriate diabetes follow-up is in place post-discharge.

For those inpatients who will not be able to self-manage on discharge, ward nurses play a pivotal role in liaison with outside agencies, such as district nurses and nursing homes, and DISNs will have to be involved early to advise on continuing care requirements and provide written information where necessary.

Finally, as with all the other documents in

the *Inpatient Pack*, the importance of regular audit is highlighted to ensure that all services demonstrate benefits to the patient and the trust. A list of suitable subjects for audit is provided.

Discussion

Nationally produced documents can sometimes be criticised for being too lengthy and thus sitting on shelves gathering dust. Given the timing of this document, with current government cutbacks, it may also be commented as being unrealistic to implement. However, diabetes bed occupancy has been reported at least 10% (Sampson et al, 2007). Similarly, the national diabetes inpatient audit found there was a median of 15% of inpatients with diabetes, of whom 44.8% required insulin at some point during their hospital stay, and one third of inpatients on regular insulin had experienced an error in treatment (Rayman, 2010).

These errors "may cause direct harm to patients and lead to patient dissatisfaction, prolonged length of stay and potential litigation" (Fowler and Rayman, 2010). Therefore, it can be argued these recommendations are not something that trusts can afford to ignore. Several of the recommendations are directed at national organisations and, as discussed earlier, some have already been addressed or are currently being worked towards.

As for the recommendations for individual trusts, will the cost of implementation outweigh what could potentially be saved? It is unlikely that all trusts will have to start at the beginning and implement all recommendations as some will already be common practice. As for those yet to be implemented, a DST with a DISN could do much of this work without extra resources, as education of different staff groups and policy writing is already part of the DISN role. However, in 2006 only 51.4% of trusts employed a DISN (Sampson et al, 2007), yet there is a growing wealth of literature to suggest the role of the DISN can lead to efficiency savings (Cavan et al, 2001; Davies et al, 2001; National Diabetes Support Team, 2005; Sampson et al, 2006, Gayar et al, 2007).

There is a need to be realistic and be aware that not all trusts will have the financial or

human resources to make all changes in the near future, but if each hospital undertook a baseline audit of insulin errors it could be decided which recommendations are likely to have the biggest impact and start there. Consequently, this should lead to a reduction in the number of referrals to the diabetes service and a reduction in diabetes-related excess length of stay, thereby making both efficiency and financial savings.

Conclusion

It is clear from the sheer volume of incidents related to insulin errors that this is an area that needs attention from DSTs to improve patient safety. DISNs, with support from the multidisciplinary team, are perhaps in the best position to implement many of the recommended changes as they are already the visible link with staff working on hospital wards. If successfully implemented, appropriately audited and practices changed where required, the recommendations in this document should not only lead to improved safety, but also to better glycaemic control, reduced length of stay and overall improvements in patient satisfaction. ■

- Bischler A (2010) Insulin use during inpatient stay – examples of where it can go wrong. Diabetes Inpatient Specialist Nurse UK Group meeting, London, 29 April
- Cavan DA, Hamilton P, Everret J, Kerr D (2001) Reducing hospital inpatient length of stay for patients with diabetes. *Diabet Med* **18**: 162–4
- Davies M, Dixon S, Currie CJ et al (2001) Evaluation of a hospital diabetes specialist nursing service: a randomised control trial. *Diabet Med* **18**: 301–7
- Fowler D, Rayman G (2010) *Safe and Effective use of Insulin in Hospitalised Patients*. NHS Diabetes, London. Available at: <http://tinyurl.com/safeinsulin> (accessed 30.06.10)
- Furnary AP, Gao G, Grunkemeier GL et al (2003) Continuous insulin infusion reduces mortality in patients with diabetes undergoing coronary artery bypass grafting. *J Thorac Cardiovasc Surg* **125**: 1007–21
- Gayar El, Chen H, Sharma B, Qureshi S (2007) Should inpatient DSN numbers be reduced given the NHS cash crisis? *Journal of Diabetes Nursing* **11**: 148–52
- Healthcare e-Academy, NHS Diabetes (2010) Safe use of insulin: e-learning course. Virtual College Ltd, Iikley. Available at: <http://tinyurl.com/33h2xmd> (accessed 05.07.10)
- Institute for Safe Medication Practices (2008) List of high alert medicines. ISMP, Horsham, PA, USA
- Katz CM (1997) How efficient is sliding scale insulin therapy? Problems with a 'cookbook' approach in hospitalized patients. *Postgrad Med* **89**: 46–57
- Koro CE, Bowlin SJ, Bourgeois N, Fedder DO (2004) Glycemic control from 1988 to 2000 among U.S. adults diagnosed with type 2 diabetes: a preliminary report. *Diabetes Care* **27**: 17–20
- Marchant MH Jr, Viens NA, Cook C et al (2009) The impact of glycemic control and diabetes mellitus on perioperative outcomes after total joint arthroplasty. *J Bone Joint Surg Am* **7**: 1621–9
- National Diabetes Support Team (2005) Factsheet No. 10: Working together to reduce length of stay for people with diabetes. NDST, London
- National Patient Safety Agency (2009) *Safety in Doses: Improving the use of Medicines in the NHS*. NPSA, London
- National Patient Safety Agency (2010) Rapid Response Report: Safer administration of insulin. NPSA, London
- NHS Employers (2009) Quality and Outcomes Framework guidance for GMS contract 2009/10: Delivering investment in general practice. NHS Employers, London
- Pomposelli JJ, Baxter JK 3rd, Babineau TJ et al (1998) Early postoperative glucose control predicts nosocomial infection rate in diabetic patients. *JPEN J Parenter Enteral Nutr* **22**: 77–81
- Queale WS, Seidler AJ, Brancati FL (1997) Glycemic control and sliding scale insulin use in medical inpatients with diabetes mellitus. *Arch Intern Med* **157**: 545–52
- Rayman G (2010) Diabetes inpatient audit. Diabetes Inpatient Specialist Nurse UK Group Meeting. London, 29 April
- Roland M (2004) Linking physicians' pay to the quality of care – a major experiment in the United Kingdom. *N Engl J Med* **351**: 1448–54
- Sampson MJ, Crowle T, Dhatariya K et al (2006) Trends in bed occupancy for inpatients with diabetes before and after the introduction of a diabetes inpatient specialist nurse service. *Diabet Med* **23**: 1008–15
- Sampson MJ, Brennan C, Dhatariya K et al (2007) A national survey of inpatient diabetes services in the UK. *Diabet Med* **24**: 643–9
- Santell JP, Cousins DD, Hicks R (2003) USP Drug Safety Review. Top 10 drug products involved in medication errors. US Pharmacopeia, Rockville, MA, USA
- Savage MW, Sinclair-Hammersley M, Rayman G et al (2010) *The Management of Diabetic Ketoacidosis in Adults*. NHS Diabetes, London. Available at: <http://tinyurl.com/24w6ogo> (accessed 30.06.10)
- Savage MW, Hilton L (2010) Managing diabetic ketoacidosis in adults: New national guidance from the JBDS. *Journal of Diabetes Nursing* **14**: 220–5
- Stanisstreet D, Walden E, Jones C, Graveling A (2010) *The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus*. NHS Diabetes, London. Available at: <http://tinyurl.com/334rt95>
- Umpierrez GE, Smiley D, Zisman A et al (2007) Randomized study of basal-bolus insulin therapy in the inpatient management of patients with type 2 diabetes (RABBIT 2 trial). *Diabetes Care* **30**: 2181–6
- Walden E, Stanisstreet D (2010) Managing inpatient hypoglycaemia: The introduction of new national guidelines. *Journal of Diabetes Nursing* **14**: 184–9

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