How to minimise insulin errors

by Jane Diggle, Specialist Diabetes Nurse Practitioner, West Yorkshire

What and why

- In 2018, Diabetes UK reported that over 1 million people in the UK relied on insulin to manage their diabetes.[1]
- Insulin is a high-risk medication and, with the launch of different insulin concentrations and biosimilar insulins (see *New insulin developments*), it is crucial for all healthcare practitioners involved in prescribing, preparing or administering insulin to possess the knowledge and competency to do so safely.

Citation: Diggle J (2022) How to minimise insulin errors. *Diabetes & Primary Care* **24**: [Early view publication]

The impact of insulin errors

Insulin is recognised worldwide as a high-alert medication associated with a heightened risk of significant patient harm when errors occur.

The National Reporting and Learning System (NRLS) receives patient safety incidents reported from NHS organisations in England. From 2013 to 2014, it received 5990 such reports involving insulin in the community nursing, medical and therapy service; community pharmacy; and general practice settings.

These included eight incidents of severe harm and 245 of moderate harm.

Most incidents occurred during insulin administration, while others were caused by prescribing errors or were related to the dispensing of insulin.

References can be found in the online version of this article.

New insulin developments

Biosimilar insulins

These biological copies of older manufactured insulins are not identical but are similar to the original products in terms of quality, efficacy and safety. Several are available, including:

- **Abasaglar**® (insulin glargine 100 units/mL)
- **Admelog**® (insulin lispro 100 units/mL)
- **Insulin lispro Sanofi** (insulin lispro 100 units/mL)
- **Semglee**® (insulin glargine 100 units/mL)
- **Trurapi**® (insulin aspart 100 units/mL)

Ultra-rapid-acting analogue insulins

- **Fiasp**® (fast-acting insulin aspart)
- **Lyumjev**® (fasting-acting insulin lispro)

New insulin concentrations

Most of the commonly used insulins provide 100 units per mL. However, the following higher-concentration insulins are available:

- **Humalog**® **U200** (insulin lispro 200 units/mL)
- **Toujeo**® (insulin glargine 300 units/mL)
- **Tresiba**® **U200** (insulin degludec 200 units/mL)

Main causes of insulin error[2]

Error type	Causes
Wrong dose	• Incorrect prescription (especially on admission to hospital) • Abbreviation of "units" (poor handwriting, with "U" or "IU" read as 0 or 10) • Incorrect monitoring of blood glucose and dose adjustment of insulin • Poor documentation of dose administration (especially on inpatient charts) • Duplicate dose administration • Errors in calculation of insulin doses for intravenous infusions • Incorrect programming of electronic infusion devices
Omitted or delayed insulin	• Insulin not prescribed on hospital admission • Failure to prescribe or supply the correct insulin preparation or device • Prescribed insulin product not available (during hospital stay or at discharge) • Confusion over administration in patients designated "nil by mouth" • Insulin not administered at appropriate time (especially in relation to meals)
Wrong insulin product	• "Look alike/sound alike" names (described in over 2000 incidents)

Reducing errors in primary and community care

Healthcare professionals and service providers should ensure that:[2]

- All regular and single insulin (bolus) doses are measured and administered using an insulin syringe or commercial insulin pen device. **Intravenous syringes must never be used for insulin administration**.
- The term "**units**" is used in all contexts. Abbreviations, such as "U" or "IU", are never used.
- All clinical areas and community staff treating patients with insulin have **adequate supplies** of insulin syringes and subcutaneous needles, which staff can obtain at all times.
- A **training programme** should be put in place for all healthcare staff (including medical staff) expected to prescribe, prepare and administer insulin.
- **Policies and procedures** for the preparation and administration of insulin in clinical areas are reviewed to ensure compliance with the above.

NICE NG28 guidance[3] recommends, when initiating insulin therapy, to:

- Provide a structured programme of education and active insulin dose titration that encompasses:
  - Injection technique, including rotating injection sites and avoiding repeated injections at the same point within sites.
  - Continuing telephone support.
  - Self-monitoring.
  - Dose titration to target levels.
  - Dietary advice.
  - The DVLA's *Assessing fitness to drive: a guide for medical professionals*.
  - Managing hypoglycaemia.
  - Managing acute changes in plasma glucose control.
  - Support from an appropriately trained and experienced healthcare professional.
- Continue to offer metformin for people without contraindications or intolerance.
- Review the continued need for other blood glucose-lowering therapies.
- Ensure the risk of medication errors with insulins is minimised.

To avoid any confusion, ALWAYS prescribe insulin by the brand name.

Consult the product SmPC (available at www.medicines.org.uk) for the most up-to-date product information.

Be aware that several insulins have similar-sounding names, but very different time–action profiles. Prescribing or administering the wrong insulin can cause serious harm.

It is good practice to issue an insulin passport when insulin is initiated or changed. Credit card-sized insulin passports for all insulins are available to healthcare professionals directly from the manufacturers.

Insulin type	Insulin mode of action		
	Mealtime/bolus	Pre-mixed	Basal
Human	Actrapid® Humulin® S Insuman® Rapid	Humulin® M3 Insuman® Comb 25 Insuman® Comb 50	Intermediate-acting Humulin® I Insulatard® Insuman® Basal
Analogue	Rapid-acting Admelog® Apidra® Humalog® U100 Humalog® U200 Insulin lispro Sanofi NovoRapid® Trurapi® Ultra-rapid-acting Fiasp® Lyumjev®	Humalog® Mix25 Humalog® Mix50 NovoMix® 30	Long-acting Abasaglar® Lantus® Levemir® Semglee® Toujeo® U300 Ultra-long-acting Tresiba® U100 Tresiba® U200

Insulin safety checklist

If you administer insulin:

- ❑ Be aware that in care home settings the patient may not be in their own room or may not be able to confirm their identity – always confirm this before administering the insulin.
- ❑ Check that the prescription chart is matched to the correct individual.
- ❑ Ensure the insulin has been stored correctly and is within expiry date.
- ❑ Check that it is the correct insulin (as per prescription chart) and in the correct delivery device.
- ❑ Measure blood glucose level **before** giving insulin.
- ❑ Check that the timing of the injection is appropriate in relation to food intake, where this is relevant.
- ❑ Check that the correct dose is drawn up/dialled – the medicine chart **must** clearly indicate the number of units with no abbreviations of this term, and the insulin should be prescribed by brand name.
- ❑ Use best practice injection technique (see **Resources** box).
- ❑ **Never** withdraw insulin from a pen cartridge or disposable pen.*
- ❑ Ensure an insulin syringe, **not** an intravenous syringe, is used where insulin is prescribed in vials.
- ❑ Use a safety-engineered device when administering insulin to a third party (these should be provided by the employer to reduce the risk of needlestick injury).[6]
- ❑ Never recap pen needles.
- ❑ Dispose of sharps safely, as per local guidelines.

Where an individual self-injects insulin, ensure they understand:

- ❑ Which insulin they are taking (including the brand name and device).
- ❑ When the insulin should be given (e.g. 30 minutes before meals).
- ❑ What dose should be delivered (e.g. based on their self-monitored blood glucose levels, food intake, activity levels, etc).
- ❑ How their particular insulin works.
- ❑ The risks of hypoglycaemia, its signs and symptoms, how to prevent it, and how to treat it.
- ❑ Good injection technique (see **Resources**) is crucial to achieve the expected absorption and action of insulin.
- ❑ Examination of injection sites should be part of a regular review.
- ❑ Safe disposal of sharps.

NEVER extract insulin from a pen device or refill cartridge

*Using an insulin syringe and needle to withdraw insulin directly from a pen device or cartridge can result in significant overdose and risk of **severe harm** and **death.**[4] See PCDS statement[5] for more information.

Resources

Injection technique

No matter how efficacious an insulin is, its effects will be suboptimal if it is not administered correctly. **Correct injection technique is key.**

For best practice injection technique, refer to:

- *Diabetes & Primary Care* – How to support best practice injection technique
- Injection Technique Matters – resources including best practice guidelines, toolkits and patient leaflets
- Forum for Injection Technique – *The UK & IRE injection and infusion technique recommendations* (5th edition II)

Preventing hypoglycaemia

Hypoglycaemia is the commonest side effect of insulin therapy. Avoidance of hypoglycaemia **must always** take priority over achieving targets. Refer to:

- *Diabetes & Primary Care* – How to prevent, identify and manage hypoglycaemia in adults with diabetes

Free insulin safety e-Learning module

If you **EVER** prescribe, prepare or administer insulin, make sure you have undertaken recent insulin training.

The Six Steps to Insulin Safety is a **free** e-learning module for healthcare professionals. Updated in 2022, the module covers all the recent developments in insulin management, including new products and formulations, and new guidance in directly related areas such as driving legislation.