

Review Article

Common errors with insulin use and potential solutions

Lovely Gupta¹, Mahendra Singh², Deepak Khandelwal³

Medication error is the most unacceptable event in the course of treatment. Errors related to the use of insulins are common in clinical practice at various levels. Such errors may lead to serious consequences like episodes of hypoglycemia and hyperglycemia related to iatrogenic overdosing or under-dosing of insulin. This review aims to highlight the prevailing errors associated with the use of insulins and the action plan to prevent or minimize them.

[J Indian Med Assoc 2018; 116: 31-3]

Key words : Insulin, diabetes, hypoglycemia, errors, nurse, pharmacist, health care, drug administration.

The United States National Coordinating Council for Medication Error Reporting and Prevention defines a medication error as “any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer¹. It can involve any one of the following processes: Prescribing, Ordering, Dispensing, Distribution, Preparation, Administration, Labelling, Packaging, Nomenclature, Communication, Education, Use and Monitoring of Treatment. Such errors can lead to adverse drug reactions, drug-drug interactions, lack of efficacy, sub-optimal patient adherence, poor quality of life, bad patient experience, significant health and economic consequences such as increased use of health services, preventable medication-related hospital admissions and death^{2,3}. Estimating the prevalence of medication errors is difficult due to the varying definitions and classification systems, however it is very important to minimise medication error at various possible levels like patient level, pharmacy level, nursing level, doctor level and others too^{4,5}.

Insulin therapy is an important treatment for management of hyperglycemia in diabetes and almost all patients with any type of diabetes need treatment with insulin at least once in their lifetime. Inherent with low therapeutic index, insulin is a high-alert medication in terms for possible errors in both inpatient and outpatient settings and is among top five medications shown to be associated with medication error⁶. Error related to insulin use may result in episodes of hyperglycemia including diabetic ketoacidosis as well as episodes of hypoglycemia which may be severe on some occasions leading to even coma and death.

- Errors in insulin use are most unacceptable event
- Over/under dosing leads to hypoglycemia / hyperglycemia
- A holistic approach and preventive action plans can minimize it
- Education and vigilance is the key from doctors to patient level.

Levels of Medication Error for Insulin :

Errors related to use of insulin are possible at all levels including at the level of doctor, nurse, pharmacist, and patient. Factors associated at various levels with insulin medication errors have been discussed in Table 1⁷⁻¹⁵.

Action Plan for Prevention of Errors Associated with Insulin Use :

Reducing medication errors and improving medication safety in health care requires the prevention strategies at different levels discussed above. Insulin is one of the high risk medications in terms of possible errors and requires clear policies regarding insulin usage in the hospital setup. Most of the errors can be easily prevented through basic education and close vigilance at every level. Proper communication and documentation is also important at every level and any confusion related to type, dose, route of insulin should be checked directly with the prescribing doctor. Other strategies which have shown to reduce all kind of medication errors are regular measurement of safety related performance indicators, building relationships between care professionals, strengthening technical systems for sharing records, education manuals and reference lists, incorporating safety-related information into the training of health professionals, measuring and monitoring patient safety improvements over time, using checklists to improve the quality of care, using electronic tools for accurate health records, empowering and encouraging patients, and strengthening the workforce¹⁶⁻¹⁹. Action plan to decrease insulin related medication error has been summarised in Table 2²⁰⁻²⁴.

¹PhD Scholar, Department of Food & Nutrition, Lady Irwin College, Delhi University, New Delhi 110001

²Clinical Pharmacist, Maharaja Agrasen Hospital, Punjabi Bagh, New Delhi 110026 110026

³Department of Endocrinology, Maharaja Agrasen Hospital, Punjabi Bagh, New Delhi and Corresponding Author

Table 1 — Common medication errors with the use of insulins

Doctor's level :-

- Training issues
- Illegible/incomplete prescription
- Use of error prone abbreviation (especially "U" instead of the word "units")
- Therapeutic duplication
- Poor communication

Pharmacy level :-

- Training issues
- Storage issues/poor labeling
- Substitution without communicating with concern doctor

- Confusion due to sound alike insulins (Dispensing Insulin-R in place of Insulin-N)
- Providing syringe inappropriate to vial (40 IU syringes with 100 IU/ml vials)
- Poor communication to patients

Nursing level :-

- Lack of knowledge
- Poor nursing practice/negligence/poor documentation
- Improper storage/improper handling
- Wrong insulin identification
- Inaccurate loading
- Wrong timing/route of administration
- Multiple use of syringe/pen needle
- Poor communication or handover practices

Patient Level :-

- Illiteracy/ communication issue/language barrier
- Improper storage at home
- Using inappropriate syringes (using 40 IU syringes with 100 IU vials/cartridges)
- Inaccurate loading
- Faulty injection techniques or faulty use of insulin delivery devices (like Injecting without removing inner cap of needle)
- Poor adherence (eg, fear about insulin injections)

Conclusion :

Insulin is among high risk medications prone for medication error. Most of the medication errors are a result of a system failure rather than an individual failure. A holistic approach and preventive action plans can help totally cut such medical mistakes and prevent associated morbidity and mortality. Education and vigilance is the key and requires at every level from doctors to patient level.

REFERENCES

- 1 <http://www.nccmerp.org/about-medication-errors> (last accessed 26 Jan 2018)
- 2 Likic R, Maxwell SR — Prevention of medication errors: teaching and training. *Br J Clin Pharmacol* 2009; **67**: 656-61.
- 3 Keers RN, Williams SD, Cooke J, Ashcroft DM — Causes of

Table 2 — Action plan to prevent insulin medication errors at various levels

Doctor's level :-

- Regular physician education programs
- Prescriptions in legible manner/typed with clear/detail instructions
- Prescription must contains insulin name, dose, route, frequency and timing (eg, before food/with food/after food)

- Avoiding abbreviations
- Effective communication towards nursing staff and patient

Pharmacy level :-

- Regular education of pharmacist
- Maintain proper labeling of insulins
- Dispatching appropriate insulin syringes with vials
- Double check system/special policy for the dispense of concentrated insulins
- Effective communication with patient
- If there is any doubt related to insulin dose/type/frequency then communicate to concern doctors.

Nursing level :-

- Regular education programs
- Effective communication and documentation
- Educate patients about insulin adherence and solve patient queries related to insulin
- If there is any doubt related to insulin dose, route and frequency then communicate to concern doctors

Patient Level:-

- Education and counseling regarding disease/insulin therapy for patients/family members
- Educate patients to differentiate various insulins
- Utilize colour code of insulins/syringes/pen for illiterate patients
- Education regarding correct use of insulin delivery devices/injection technique/insulin storage etc.
- Prepare a schedule about insulin administration
- Utilize family support

Organization (Hospital) level:-

- Start drug information centre
- Perform safety rounds to confirm proper safety checks
- Arranging regular education for resident doctors/nursing staff/pharmacist
- Appointing diabetic educator
- Making special discharge policy for patients on insulin
- Patient education materials (providing leaflets regarding insulin storage/technique/injection sites etc.)

- medication administration errors in hospitals: a systematic review of quantitative and qualitative evidence. *Drug Saf* 2013; **36**: 1045-67.
- 4 Wittich CM, Burkle CM, Lanier WL — Medication errors: an overview for clinicians. *Mayo Clin Proc* 2014; **89**: 1116-25.
 - 5 Aronson JK — Medication errors: definitions and classification. *Br J Clin Pharmacol* 2009; **67**: 599-604.
 - 6 Geller AI, Shehab N, Lovegrove MC, Kegler SR, Weidenbach KN, Ryan GJ, *et al* — National estimates of insulin-related hypoglycemia and errors leading to emergency department visits and hospitalizations. *JAMA Intern Med* 2014; **174**: 678-86.
 - 7 Truong TH, Nguyen TT, Armor BL, Farley JR — Errors in the Administration Technique of Insulin Pen Devices: A Result of Insufficient Education. *Diabetes Ther* 2017; **8**: 221-6.
 - 8 Grissinger M, Lease M — Misadventures in insulin therapy: are you at risk? *J Natl Med Assoc* 2003; **95**: 1S-16S.
 - 9 Bourne RS, Shulman R, Jennings JK — Reducing medication errors in critical care patients: pharmacist key resources and relationship with medicines optimisation. *Int J Pharm Pract* 2018; Jan 4.
 - 10 Kalra S, Gupta Y — Insulin technique. *Sri Lanka Journal of Diabetes Endocrinology and Metabolism*. 2015; **5**: 85-90.
 - 11 Brady AM, Malone AM, Fleming S — A literature review of the individual and systems factors that contribute to medication errors in nursing practice. *J Nurs Manag* 2009; **17**: 679-97.
 - 12 Prescrire Editorial Staff — Insulin use: preventable errors. *Prescrire Int* 2014; **23**: 14-7.
 - 13 Trimble AN, Bishop B, Rampe N — Medication errors associated with transition from insulin pens to insulin vials. *Am J Health Syst Pharm* 2017; **74**: 70-5.
 - 14 Cohen MR — Pharmacists' role in ensuring safe and effective hospital use of insulin. *Am J Health Syst Pharm* 2010; **67**: S17-21.
 - 15 Deal EN, Liu A, Wise LL, Honick KA, Tobin GS — Inpatient insulin orders: are patients getting what is prescribed? *J Hosp Med* 2011; **6**: 526-9.
 - 16 Grissinger M, Gaunt MJ — Reducing harm in patients using insulin. *Consult Pharm* 2014; **29**: 290-302.
 - 17 Dutton J, McCaskill K, Alton S, Levesley M, Hemingway C, Farndon L — Changing roles in community health care: Delegation of insulin injections to health care support workers. *Br J Community Nurs* 2018; **23**: 14-9.
 - 18 Bates DW — Preventing medication errors: a summary. *Am J Health Syst Pharm* 2007; **64**: S3-9; quiz S24-6.
 - 19 Bates DW — Using information technology to reduce rates of medication errors in hospitals. *BMJ* 2000; **320**: 788-91.
 - 20 Likic R, Maxwell SR — Prevention of medication errors: teaching and training. *Br J Clin Pharmacol* 2009; **67**: 656-61.
 - 21 Brindley J — Undertaking drug calculations for oral medicines and suppositories. *Nurs Stand* 2017; **32**: 56-63.
 - 22 Andres J, Clements JN — A practical guide to concentrated insulin for pharmacists. *J Pharm Pract* 2014; **27**: 481-6.
 - 23 Bain A, Nettleship L, Kavanagh S, Babar ZU — Evaluating insulin information provided on discharge summaries in a secondary care hospital in the United Kingdom. *J Pharm Policy Pract* 2017; **10**: 25.
 - 24 Lefkowitz M — Do different body colors and labels of insulin pens enhance a patient's ability to correctly identify pens for injecting long-acting versus short-acting insulins? *J Diabetes Sci Technol* 2011; **5**: 136-49.