A MULTI-INCIDENT ANALYSIS BY ISMP CANADA

Insulin Medication Incidents in the Community

Carolyn Kasprzak, RPh, PharmD , Consultant Pharmacist, ISMP Canada, Clinical Pharmacist, Quinte Health Care, Belleville
Certina Ho, RPh, BScPhm, MISt, MEd, PhD, Project Lead, ISMP Canada, Lecturer, Leslie Dan Faculty of Pharmacy, University of Toronto

OVERVIEW

Insulin is a life-saving pharmacological therapy used in the management of blood glucose in patients with Type I diabetes (who are insulin deficient) and patients with Type II diabetes whose blood sugar levels are not well-managed with oral anti-hyperglycemic agents alone. There is a multitude of different insulin products available on the market. Insulin may be administered by a syringe, pen, or pump and there are various insulin preparations including rapid-acting, short-acting, long-acting and pre-mixed. Although insulin use is integral to diabetes management, it can be harmful when used incorrectly. Insulin has been identified as a high-alert medication in the community setting.[1] An excessive dose of insulin may cause life-threatening seizures and coma (via hypoglycemia); conversely, an under-dose of insulin may lead to life-threatening ketoacidosis or hyperosmolality (via hyperglycemia). In 2006, ISMP Canada identified insulin as one of the top 10 medications reported as causing harm as a consequence of medication error.[2] ISMP Canada has also identified insulin as one of the top three prescription medication classes involved in medication incident related deaths occurring outside regulated healthcare facilities[3] and furthermore as one of the top five medications involved in medication incidents associated with death occurring in all environments.[4]

This article provides an overview of a multi-incident analysis of medication incidents involving insulin voluntarily reported to the ISMP Canada's Community Pharmacy Incident Reporting (CPhIR) program (http://www.cphir.ca). The following sections contain an overview of the reported medication incidents and highlight the common themes identified through a multi-incident analysis. Specific examples of reported incidents are provided for you to reflect and develop system-based improvements that can be customized to your practice setting.

MULTI-INCIDENT ANALYSIS OF INSULIN MEDICATION INCIDENTS

Reports of medication incidents involving insulin were extracted from the CPhIR program between January and December 2014. A total of 226 incidents were retrieved and 81 met inclusion criteria and were included in this qualitative, multi-incident analysis. The 81 medication incidents were reviewed by an ISMP Canada Analyst and categorized into four main themes (Table 1). (Note: Incident examples provided in Tables 2 to 5 were limited to what was inputted by pharmacy practitioners to the "Incident Description" field of the CPhIR program.)

TABLE 1: Main Themes and Subthemes from the Multi-Incident Analysis of Insulin Medication Incidents

MAIN THEMES	SUBTHEMES
Product Selection (related to unique insulin properties)	Prescribing Order Entry Dispensing
Therapeutic Regimen Change	
Dosage Calculations	
Storage Requirements	

TABLE 2: Theme 1 - Product Selection (related to unique insulin properties)

Incident Example	Possible Contributing Factors	Commentary
Subtheme 1: Prescribing		
A number of weeks back, she went to the doctor who asked her what insulin she was on and she told her the new one that starts with an L. The doctor assumed Lantus®, but it was Levemir®	• Multiple formulations of same insulin type • Look-alike, sound-alike drug names • Knowledge deficit on drug names • Confirmation bias	• Physicians should consider asking patients for a current and comprehensive medication list before prescribing new medication(s) or re-ordering refill of current medication(s).
Subtheme 2: Order Entry		
Upon checking to see if [the] patient required any further prescriptions filled, [the pharmacist] noticed that the dose of the Humulin® N had "changed" to what the directions of the Humulin® R used to be. Upon further inspection, pharmacist noticed that no dose change was supposed to occur and the person who entered inadvertently entered the wrong type of insulin into the prescription.	• Look-alike, sound-alike drug names • Patient concurrently using multiple insulin products • Lack of independent double checks • Confirmation bias	• Incorporate warning flags in pharmacy software to alert for potential mix-up during insulin selection at pharmacy order entry. [5, 7] • Perform independent double checks throughout the entire pharmacy workflow. This may include verification with the patient regarding the current insulin product(s) being used at drop off. [5, 8] • Highlight information related to look-alike/sound-alike insulin products as a part of pharmacy staff training. [5, 9]
Subtheme 3: Dispensing		
The patient noticed his insulin box was different than what he had before. He should have received Novolin® ge NPH and had been given Novolin® ge 30/70 in error.	• Look-alike, sound-alike packaging • Proximity of storage of look-alike/sound-alike insulin products • Lack of independent double checks • Environmental distractions • Confirmation bias	• Implement auxiliary alerts (e.g. labels or stickers) regarding look-alike/sound-alike drug pairs on insulin storage bins. [5] • Perform independent double checks throughout the entire pharmacy workflow. When a patient picks up his/her insulin, include a physical review (i.e. packages, labels, insulin product) as they are provided to the patient. [5, 8, 10] • Organize the pharmacy environment to create a safe and efficient working area. For instance, segregate insulin products by storing them according to their onset of action (i.e. rapid-acting, short-acting, intermediate-acting, long-acting), rather than by brand, in well-differentiated areas of the refrigerator (e.g. on different shelves) [5, 9, 10] • Instruct patients and their family members to ask questions if they notice any unexpected changes in either the insulin packaging or product at the time of receiving the medication or at any other time. [10]

TABLE 3: Theme 2 - Therapeutic Regimen Change

Incident Example	Possible Contributing Factors	Commentary
Prescription had specific instructions for use and was copied over by an old one with just "use as directed" on it. Direction was kept as before but there was a change in directions on the prescription, from 48 to 44 units.	• Copying previous prescriptions • Lack of independent double checks • Confirmation bias	• Consider programming the pharmacy software or developing policies to restrict the process of copying from previous prescriptions for all insulin prescriptions (or high-alert medications) to prevent confirmation bias at order entry. [5] • Perform independent double checks throughout the entire pharmacy workflow. For example, during order entry or pick-up, verify with patient the most current prescription orders and directions from the prescriber. • Encourage patients to actively participate in a dialogues with the pharmacist when providing medication counselling (i.e. confirm appearance of medication, directions for use and appropriate technique for administration). [5, 6, 8]
Instructions were to stop Lantus®, and glyburide, and to start NovoMix® 30. The drugs were inactivated on the client's profile but the change to [the glyburide] prescription was not given to the blister pack department.	• Lack of communication between pharmacy staff members • Lack of independent double checks	• Develop a system for communication with respect to patient medication therapy changes/updates within the pharmacy (e.g. when a patient's regimen changes or if patient is admitted to hospital, etc.) for multi-medication compliance aids. • Perform independent double checks throughout the entire pharmacy workflow. [5, 6, 8] For example, when filling compliance packs, verify printed prescription labels with patient's most current prescription orders. • Consider performing a comprehensive diabetes-focused medication review when a patient has a significant change in insulin therapy (e.g. addition of insulin, switching to a new insulin formulation) to ensure adequate communication of patient's regimen between the patient and pharmacist. Pharmacist should also communicate and update the patient profile accordingly, so that other pharmacy staff members are aware of the changes.

TABLE 4: Theme 3 - Dosage Calculations

Incident Example	Possible Contributing Factors	Commentary
Poor physician handwriting. Entered as "Use 4 mLs before supper." Should be "Use 4 UNITS before supper. Prescription for 4-10 units of insulin a day x 90 days [was] entered as 45 mLs [as the total quantity dispensed]. Only 15 mLs were required.	• Knowledge deficit on insulin dosing units • Illegible handwriting on prescription	• Physicians should consider using standardized pre-printed order forms to avoid insulin unit related dosing and calculation errors. [5, 6] • Prescribers are encouraged to write all insulin orders in units instead of millilitres (mL) and to spell out "units" rather than writing "U". [11, 12]
Refill came up as early refill. Wrong days' supply was put on original [prescription].	• Knowledge deficit on conversion from insulin units to millilitres and total number of days' supply	• Develop policies for pharmacy staff to document handwritten calculations for insulin quantity during order entry and again by a different staff member during the dispensing process as an independent double check to enhance accuracy. [13] • Highlight information related to insulin dosing calculations (e.g. conversion from insulin units to millilitres) as a part of pharmacy staff training.
Doctor ordered insulin syringes for up to 100 units, [but] we filled for 1/2 cc (up to 50 units) [syringes].	• Variety of syringe sizes available	• Highlight information related to insulin syringe sizes as a part of pharmacy staff training.

TABLE 5: Theme 4 - Storage Requirements

Incident Example	Possible Contributing Factors	Commentary
The prescription was entered early morning, [the] pharmacist [saw the] patient walking in assuming [the] patient was in to pick up prescription. Patient walked around the store, said she would return, and [the] insulin was put in the drawer instead of the fridge.	• Environmental distractions • Confirmation bias	• Develop or reinforce existing policies and procedures with regards to dispensing refrigerated products. Refrigerated products should always be returned to the fridge immediately after filling (i.e. even if the patient says they are returning soon).

CONCLUSION

Medication incidents involving insulin in the community setting are common and have the potential to cause detrimental harm. Due to the unique characteristics of insulin, there are distinctive insulin-related medication incidents that occur in community pharmacy practice. The results of this multi-incident analysis are intended to educate health care professionals on the vulnerabilities that contribute to these insulin-specific medication incidents. Key points of focus include correct insulin product selection, limiting errors when insulin regimens are changed, proper calculation of insulin doses and adequate storage of insulin products. PC

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