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ISMP
An ECRI Affiliate

Nurse AdviseERR®
Educating the Healthcare Community About Safe Medication Practices

Adverse glycemic events and critical emergencies

PROBLEM: For years, insulin errors have been linked to harmful adverse events, often resulting in serious hypoglycemia or hyperglycemia. Glycemic management in patients with diabetes and/or the acutely ill who are receiving insulin can be challenging, especially since the frequency and timing of necessary blood glucose assessments are often patient specific. Furthermore, communication breakdowns; inaccurate home medication lists; untimely medication reconciliation; insulin mix-ups; and delays in assessments, nutritional intake, and initiation of glycemic management protocols, may lead to a critical medical emergency and can also complicate care during such emergencies.

ECRI and the Institute for Safe Medication Practices (ISMP) Patient Safety Organization *(PSO)* analyzed 100 adverse glycemic events reported to the PSO between May 2018 and April 2020 that led to or occurred during a critical medical emergency, such as a rapid response team call or a cardiopulmonary arrest. All of the analyzed events fell within category E (temporary harm) through I (death) according to the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) Index for Categorizing Medication Errors (www.ismp.org/ext/816).The key contributing factors, along with a few examples of the reported errors, are summarized below.

Key Contributing Factors

Omissions or delays in initiating glycemic management protocols. In approximately 30% of the analyzed events, hypoglycemia and hyperglycemia management protocols did not exist, were not ordered, or were not initiated when indicated, leading to a failure in addressing blood glucose values below or above normal limits. In some cases, prescribers were unaware of low or high blood glucose levels, and a glycemic management protocol and/or treatment was not initiated until the patient's condition deteriorated.

The blood glucose level of an unresponsive hospitalized patient with a history of hypoglycemia was checked using a glucose meter and was found to be 55 mg/dL. The patient failed to respond to repeated attempts to arouse her, including a sternal rub, so a rapid response team was called. Still unresponsive, the patient was transferred to a critical care unit. However, a glycemic management protocol was never initiated, and treatment with a rescue agent (intravenous [IV] dextrose) was not provided. Additionally, no further measurement of the patient's blood glucose was ordered or obtained.

Medication administration issues. Administration issues caused by look-alike insulin names or label mix-ups and/or knowledge deficits accounted for approximately 25% of the analyzed glycemic events. A few errors were associated with documentation issues or too-rapid administration of an IV 50% dextrose solution leading to infiltration and phlebitis. However, most administration-related errors involved giving the wrong type of insulin (long-acting vs. short-acting), the wrong dose of insulin, or the wrong drug (i.e., administering insulin instead of the prescribed medication).

Insulin administered without consideration of dietary intake. Nearly 20% of the analyzed events were associated with patients receiving their usual full dose of insulin despite being NPO (nothing by mouth) or unable to consume a meal in a timely manner after receiving insulin. More than half of these patients were prescribed prandial (meal-

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SAFETY wires

Topical gel dispensed in an ENFit syringe given via G-tube. A chronic pain management provider prescribed a topical gel containing amitriptyline 1% and ketamine 1% for an inpatient with a gastrostomy tube (G-tube). The pharmacy-compounded gel (1 mL) was packaged in ENFit syringes, which were labeled with the ingredients and topical route of administration. While administering several oral liquid medications packaged in ENFit syringes via the patient's G-tube, a nurse accidentally administered the topical gel that way, too. The topical gel was scheduled for application at the same time as the enteral liquid medications. Fortunately, there were no systemic effects from the drug, and the patient was not harmed.

Although it may not be considered "unit dose," it would be safer to package compounded topicals in available

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Nominations open for CHEERS AWARDS

Each year, ISMP honors individuals, organizations, and groups from various healthcare disciplines that have demonstrated an exemplary commitment to medication safety through innovative projects with an ISMP CHEERS AWARD. The CHEERS AWARDS will be presented in December—more to follow on the celebration! Nominations for this year's CHEERS AWARDS will be accepted through **September 9, 2022**. ISMP accepts external nominations, including self-nominations. Please refer to **page 6** (of the PDF) for a checklist of **DOs** and **DON'Ts** when submitting a nomination for a CHEERS AWARD. For details and to submit a nomination, visit: www.ismp.org/node/123.

Supported by an educational grant from Fresenius Kabi

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related) and basal (long-acting) insulin, but the doses were not adjusted to account for their dietary intake.

A rapid response team was called to the bedside of an unresponsive patient who was seizing. The patient's point-of-care blood glucose was only 23 mg/dL at that time. A nurse began administering a 50% dextrose solution IV, and within 3 minutes, the patient was alert and her blood glucose was 100 mg/dL. The patient had received her prandial insulin (11:00 am) more than 2.5 hours before lunch arrived on the unit. The patient was then encouraged to eat a full lunch.

Omissions or delays in monitoring patients. In nearly 15% of the analyzed events, healthcare practitioners failed to order blood glucose monitoring when it was indicated, failed to perform (or document) blood glucose monitoring despite specific orders, or were never notified regarding critical blood glucose values.

A rapid response team was called for a patient with diabetes with hypoxic respiratory failure. The patient was treated with oxygen supplementation and 10% dextrose solution IV and then transferred to an intensive care unit, where no point-of-care glucose monitoring was ordered or performed. The next day, the patient's laboratory blood glucose value was 62 mg/dL in the morning and 33 mg/dL in the afternoon; however, the attending physician was never notified by the laboratory or the primary care nurse of the critically low glucose value of 33 mg/dL, and the patient was never treated. Several days later, when the patient experienced a cardiopulmonary arrest, a venous blood glucose was drawn which was 30 mg/dL. The patient became totally unresponsive and was placed on life support.

Home medication history and reconciliation errors. Six percent of the events were related to errors associated with obtaining an accurate list of home medications used for glycemic management upon hospital admission, or untimely medication reconciliation. In one event, medication reconciliation and prescribing of a new patient's antidiabetic medications taken at home did not occur until 24 hours after admission. These events resulted in suboptimal glucose management during hospitalization or upon discharge.

A patient taking insulin at home was hospitalized for an unrelated condition. During hospitalization, he was switched to oral antidiabetic medications with positive glycemic outcomes. The attending physician prescribed these oral medications upon discharge, intending for the patient to discontinue the insulin. Because medication reconciliation did not occur at discharge, the patient did not know to stop taking insulin. The patient continued taking insulin at home, as well as his newly prescribed oral antidiabetic medications, resulting in significant hypoglycemia and hospital readmission.

Other contributing factors. A few (4%) of the analyzed events were related to other contributing factors. These included glycemic management processes that had not been clearly established, such as failing to address the possibility of hypoglycemia in patients receiving IV insulin for a positron emission tomography (PET) scan viability study. Another contributing factor included rescue medications that were unavailable due to shortages.

Safe Practice Recommendations: Based on the contributing factors uncovered during our analysis of adverse glycemic events, implement the following best practices:

General/Operational

Develop glycemic management protocols. Establish standard protocols and/or order sets to guide the treatment and monitoring of clinically significant hypoglycemia and hyperglycemia, including hyperosmolar hyperglycemic state and diabetic ketoacidosis.

Ensure rescue agents are available. Ensure appropriate rescue agents (e.g., juice, glucose gel, glucagon, 10% or 50% dextrose) are readily available to clinicians, with direc-

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tubes or jars. Yet, packaging topical products in oral syringes appears to be a common practice at many hospitals, compounding pharmacies, and outsourcing pharmacies. After conversion to ENFit, oral syringes may no longer be available since ENFit syringes can be used in place of oral syringes. Such was the case at the hospital that reported this error.

The hospital is now exploring unit dose blisters that are typically used for repackaged solid oral dosage forms for packaging and dispensing of low-volume topical ointments and gels. Still, whenever a substance meant for one route is placed in packaging meant for another route, the chance of administering the medication by the wrong route is increased. For example, we have previously reported errors related to accidental injection of topical thrombin that was placed in a parenteral syringe (www.ismp.org/node/234).

Topical medications should never be placed in a parenteral syringe, since the consequences of administering a topical medication by a parenteral route could be devastating. The primary strategy for preventing this type of error is to package a topical medication in a container that practitioners would expect, such as tubes or jars. But if your hospital must use an ENFit or oral syringe to package a topical product, affix a prominent auxiliary label stating, "For External Use Only," over the syringe cap (**Figure 1**), as well as on the immediate container to cover any incorrect route-specific instructions. (Some syringes state, "For enteral use" or "For oral use," which would communicate the wrong route.) Pharmacy should track

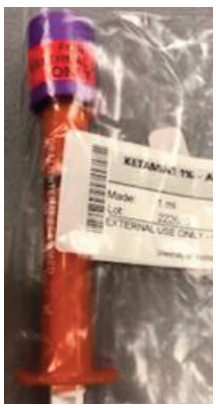

Figure 1. If you must package a topical product in an enteral or oral syringe, affix an auxiliary label stating, "For External Use Only," over the cap and to the immediate container.

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tions for when to use each rescue agent, proper administration to treat adverse glycemic events, and follow-up. During shortages, suitable alternatives should be available.

Take steps to avoid insulin mix-ups. Limit the number of different types of insulin on the formulary, and avoid close storage of medications with look-alike names or labeling/packaging. Display both the generic and brand names of insulin products on computer screens, labels, and any other format used to communicate the drug names in the facility. Also, use tall man lettering with bolded text for the unique letter characters of look-alike insulin names (e.g., Huma**LOG** and Humu**LIN**; Novo**LOG** and Novo**LIN**) when displayed in computer order entry systems, order sets, protocols, guidelines, medication administration records, automated dispensing cabinet (ADC) screens, infusion pump screens, drug storage bins, and hospital pharmacy labels.

Dispense hyperkalemia kits. Have the pharmacy dispense a hyperkalemia kit to patient care units, which includes a 3 mL vial of regular insulin (or a standard rapid-acting insulin); alcohol swabs; 50% dextrose injection; an insulin syringe that allows needleless IV administration; directions for preparation, administration, and patient monitoring requirements; and a label for the syringe (to apply after preparation but before administration).

Upon Patient Admission

Obtain the best possible medication history. Carry out a good faith effort to capture a thorough and comprehensive medication history upon admission. Verify the medications, doses, indications, and adherence to medications on the patient's home medication list using multiple resources (e.g., outpatient pharmacy records, prior admission documentation, discharge history, interview of family members, review of actual medication containers). Always actively involve the patient and/or caregiver, if possible.

Ensure timely medication reconciliation. Require a verified home medication list, medication reconciliation, and the prescribing of necessary home medications as soon as possible after hospital admission.

Hypoglycemia and hyperglycemia risk assessment. Require the admitting nurse to conduct a risk assessment of all patients receiving insulin upon admission and periodically thereafter to identify individuals at high risk for developing hypoglycemia (e.g., low body weight, basal insulin dose greater than 0.25 units/kg, basal insulin-only dosing, concomitant oral antidiabetic medications, history of hypoglycemia) or hyperglycemia (e.g., infection, pancreatitis, trauma, alcohol abuse), and specifically target these patients for preventative interventions.

Prescribe needed blood glucose monitoring. For patients with diabetes mellitus or requiring critical care or procedures, assess the patient's need for point-of-care or venous blood glucose monitoring and assessments, and order these as needed. Ensure the electronic health record (EHR) compiles any orders for glucose monitoring and assessments in one designated place so it is accessible to all clinicians. Discuss blood glucose monitoring results during patient care rounds and during staff communications.

Initiate protocols. Initiate glycemic management protocols/order sets for all patients with diabetes mellitus, non-diabetes critical care patients receiving insulin, and/or any patient who experiences a point-of-care or venous blood glucose value above or below a specific target value.

During Hospitalization

Coordinate meal delivery. In conjunction with meal delivery, develop a coordinated process to promote timely blood glucose checks (no longer than 1 hour before meal delivery, 0 to 30 minutes is preferred) and administration of prandial insulin (within 15 minutes of the start of a meal).

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patients with feeding tubes (which will soon all be ENFit). When possible, avoid scheduling topical medications packaged in an oral or ENFit syringe at the same time oral or enteral drugs are administered.

Good catch! A close call was reported when a nurse retrieved a vial of pantoprazole, a proton pump inhibitor, from an automated dispensing cabinet (ADC) and discovered a few vials of etomidate mixed in with the pantoprazole. Although barcode scanning was used to refill the ADC, the process only requires one medication vial to be scanned among the many vials that were being replaced, so the misfill was not caught. Serious patient harm could have occurred if etomidate, an intravenous (IV) anesthetic, which is a non-barbiturate hypnotic, had been administered instead of pantoprazole.

Figure 1. Look-alike vials of etomidate (left) and pantoprazole (right) from AuroMedics.

This is not the first time such a mix-up has been reported with AuroMedics products. Many of their injectable products packaged in clear glass vials have the same blue and white label colors and blue caps. The company uses various geometric shapes on the primary display panel (**Figure 1**) to help differentiate the products. This label design strategy does not appear to be effective given a long history of error reports sent to ISMP for these products. For example, we have previously reported a mix-up between pantoprazole and bupivacaine (a neuromuscular blocking agent) vials from AuroMedics (www.ismp.org/node/31450). Administering bupivacaine IV instead of pantoprazole could prove fatal.

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Assess nutrient intake before insulin administration. Before insulin administration, require practitioners to assess the patient's nutrient intake, including the time and the amount eaten at the last meal, and the timing of the next meal. Consider using a system of alerting the dietary staff (e.g., colored menus) to monitor meal consumption and/or to notify a nurse when delivering a tray to a patient receiving prandial insulin.

Assess nutrient intake for changes in eating. Establish a standardized process to alert an authorized prescriber regarding any significant changes in a patient's carbohydrate intake, which may require an adjustment of the usual insulin doses. Insulin doses, including prandial and basal doses, should only be held or modified with a prescriber's order or via explicit directions in an existing protocol or order set.

Employ barcode scanning. Utilize bedside barcode scanning technology prior to drug administration to verify the drug and patient.

Centralize information. Ensure all patient-specific, diabetes care-related information, including blood glucose values and significant changes in carbohydrate intake (e.g., NPO status, changes in enteral or parenteral nutrition), is located in one designated place within the patient's EHR so it is accessible to all clinicians. This may involve collaboration with your respective EHR vendor and informatics staff.

Communicate critical blood glucose values. Define clinically significant hypoglycemia parameters in terms of symptoms and blood glucose levels at which prescribers should be notified. Also, establish critical blood glucose values at which the laboratory staff are required to notify a specified practitioner (e.g., primary care nurse, prescriber).

Managing Glycemic Events

Permit emergency treatment. Establish protocols and/or coupled order sets that permit the emergency administration of an appropriate rescue agent by a qualified clinician for clinically significant hypoglycemia based on identified symptoms and/or a specified minimum blood glucose level. Investigate and track the use of rescue agents as a potential opportunity to improve overall glycemic control.

Treatment of clinical symptoms. Provide care to patients based not only on their venous or point-of-care blood glucose values, but also according to their clinical symptoms and preexisting conditions, even when their symptoms are inconsistent with a current blood glucose value.

Reassessment. Establish a minimum and maximum blood glucose value (point-of-care or venous) that prompts a prescriber to conduct a patient, nutrition, and drug therapy reassessment to determine if modification of the diet and/or glycemic management treatment is warranted. If a pattern above or below the established blood glucose values occurs, consider requiring a team of prescribers, nurses, pharmacists, and dietitians to conduct the reassessment in a collective manner.

Consultation. For patients with uncontrolled hyperglycemia or hypoglycemia, consider consulting an endocrinologist or clinician trained in diabetes or insulin management.

Upon Discharge

Educate the patient. Upon discharge, educate patients/caregivers about any changes in their pre-hospitalization home medication list, highlighting discontinued or newly prescribed medications.

Other

Additional recommendations. The ***ISMP Guidelines for Optimizing Safe Subcutaneous Insulin Use in Adults*** (www.ismp.org/node/93) can be accessed for additional recommendations to help prevent insulin errors and improve patient outcomes.

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We have reported this concern, with recommended labeling changes, to the US Food and Drug Administration (FDA) and the manufacturer. Please review which products you purchase from AuroMedics and consider purchasing some from a different manufacturer to better distinguish between the products' appearance. And always utilize barcode scanning before administering any medications to the patient.

Hidden pork content in Colace capsules. Did you know that some medications, including the stool softener, **COLACE** (docusate sodium), have ingredients sourced from pigs in their gelatin capsules? A nurse reported that a Muslim patient had recently ingested multiple doses of Colace without realizing the gelatin was sourced from pigs. Unfortunately, the container and product labeling do not specify the porcine (pig) content.

There are a few reasons this information is important. People may have food allergies or intolerances, or they may want to avoid animal products for religious, cultural, or dietary reasons. So, knowing the origin of the ingredients contained in their medications is important.

We contacted Avrio Health, the manufacturer of the brand product Colace (there are several generic formulations as well), and confirmed that the gelatin used in Colace capsules is made from pigskin, but the labeling and package insert do not specify this. It appears that, under current regulations, the label is not required to detail the animal source of the gelatin.

Please share this information with your colleagues and patients. And, if you or your patients have concerns about the inactive ingredients contained in other medications, either prescription or over-the-counter (OTC), don't hesitate to ask a pharmacist for help finding this information. If they don't know or are unsure, you can always try contacting the drug manufacturer for more information about their products.

Newsletter Readers Act upon ISMP Recommendations

ISMP would like to extend its sincere appreciation to 74 readers who completed our ***ISMP Medication Safety Alert! Nurse AdviseERR Readership Survey*** between April and June 2022. It had been almost a decade since we last surveyed newsletter readers about their overall satisfaction with this newsletter (www.ismp.org/node/32565). Please know that your recent input is highly valued and will be used to improve the newsletter. A brief description of the survey results follows.

Respondent Profile

Most survey respondents were nurses (68%); or quality, risk, or safety practitioners (27%); followed by pharmacists (5%). Respondents reported their position as frontline staff (30%), educators (28%), managers or directors (23%), medication safety specialists (5%), administrators or executives (3%), or other varied positions (11%).

When and How the Newsletter is Read

More than nine out of ten respondents read the newsletter immediately when received (43%) or within a week of publication (49%). Most respondents (64%) read the PDF newsletter or the online newsletter version (35%), which is available on the ISMP website. Most read the newsletter from a computer screen (68%) and/or from a printed copy (27%). Few respondents read the newsletter from a phone (1%) or a tablet (4%) screen.

Sharing the Newsletter with Others

Nearly two thirds of respondents (59%) reported that the newsletter is shared with them and others in the organization as a PDF file. Respondents reported sharing the newsletter with all nurses (35%) or select nurses (43%).

Newsletter Length and Format

Most respondents agreed or strongly agreed that the newsletter information was presented in an easy-to-read, organized manner (97%) and all responded that it was presented at an appropriate academic level. They felt that the content stimulated discussion among colleagues (81%), and 91% of respondents reported using the newsletter to educate staff and/or students. Ninety-five percent of respondents found the length of the newsletter and the number of pages to be just right.

Implementing Recommendations

Most respondents strongly agreed (66%) or agreed (17%) that the newsletter has helped to reduce or prevent harmful medication events. Most reported that they have used information from the newsletter to make improvements in their personal practice habits (98%), in their unit or department (90%), or system-wide (89%). Additionally, 69% of respondents reported visiting the ISMP website for more information. More than two-thirds (70%) of respondents strongly agreed or agreed that their organization uses the ISMP ***Action Agenda*** to assess risk and reduce the frequency of medication errors.

Overall Satisfaction

All respondents strongly agreed or agreed that the newsletter increases their understanding of medication errors and how to prevent errors and serves as a credible, respected, and reliable source of information on medication safety. Nearly all (99%) felt the recommendations presented in the newsletter were practical, helpful, and relevant to their practice.

Conclusion

ISMP recommendations are built upon the learning that accompanies a thorough analysis of medication errors reported to the ***ISMP National Medication Errors Reporting Program*** (www.ismp.org/MERP), literature review, and our peer review process. Thank you to those who report medication safety issues to ISMP so we can share the lessons learned. And kudos for putting the newsletter to good use and adopting many of the published error-prevention strategies! We look forward to our continued service to you and encourage your ongoing comments about the newsletter via: ismpinfo@ismp.org.

Special Announcements

Apply for a Just Culture scholarship

The Just Culture Company, in cooperation with ISMP, will award three ***Judy Smetzer Just Culture Champion Scholarships*** annually to honor Judy Smetzer, BSN, RN, FISMP, a retired ISMP vice president. Applications for next year's scholarships are due by **July 31, 2022**, after which ISMP will select the scholarship awardees. For details about the scholarships and to apply, visit: www.ismp.org/node/30840.

ISMP featured in podcast

The June podcast from *Nursing 2022* features an interview with ISMP President Emeritus Michael Cohen, discussing coronavirus disease 2019 (COVID-19) vaccine-related mistakes and the implications of criminalizing medication errors. To listen to the podcast, go to: www.ismp.org/ext/945.

One hour FREE CE

Obtain one hour of **FREE** nursing CE credit by reading the past six issues (January through June 2022) of the *ISMP Medication Safety Alert! Nurse AdviseERR* newsletter. All you have to do is answer 10 questions based on articles we published in this newsletter. Once you take the test and receive a passing score, a certificate will be sent to your email—it is that easy! Please visit: www.ismp.org/nursingce.

To subscribe: www.ismp.org/node/138

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Report medication and vaccine errors to ISMP: Please call 1-800-FAIL-SAF(E), or visit www.ismp.org/report-medication-error. ISMP guarantees the confidentiality of information received and respects the reporters' wishes regarding the level of detail included in publications.

DOs and DON'Ts for submitting an ISMP Cheers Award Nomination

Do you know an individual or an organization/group collaborative that you want to nominate for an **ISMP Cheers Award**? Here are some helpful tips to make sure your nomination meets the criteria. **Nominations that are incomplete or do not meet the criteria outlined below will not be considered.**

DO

Nominate an Individual or Organization/Group Collaborative that:

- Clearly identifies a high-risk, error-prone medication safety initiative
- Demonstrates successful implementation of the initiative
- Provides measurable outcomes
- Utilizes innovative, proactive medication error-reduction strategies based on ISMP's philosophy and recommendations in ISMP newsletters, ISMP ***Action Agendas***, ISMP guidelines, and other ISMP resources
- Participates in medication safety committees, teams, and/or does advocacy work
- Will share the initiative with others (at no cost)
- Exemplifies a commitment to the promotion of medication safety

Complete the nomination form:

- Ensure all fields are filled in accurately and completely.
- Provide your information as the submitter.
- Provide information about the nominee (self nominations are accepted).
- Provide a paragraph summarizing why you believe this nominee should receive an award.
  - In your own words, please highlight the project/nominee description, the impact of the initiative, and/or the nominee's commitment to medication safety (five to ten sentences).
- After submitting the nomination, upload documentation to support the nomination (e.g., a full description of the nomination and safety initiative, slides, data tables, diagrams, figures, meeting minutes, pamphlets, curriculum vitae [CV]).
- Additional forms and information required for **Organizations**:
  - An Interdisciplinary Commitment Declaration
  - Proof of accreditation by an appropriate professional body (e.g., The Joint Commission)
  - Proof of executive leadership commitment by completing a Leadership Declaration

Submit your nomination, along with supporting documents and forms, by September 9, 2022.

DON'T

Don't submit a nomination that does not clearly identify a high-risk, error-prone medication safety initiative.

Don't submit only one or two sentences about the nominee without supporting documentation.

Don't forget to complete all the information on the nomination form before submitting.

Don't enter pages of information into the summary text box (summarize the project/nominee in only five to ten sentences).

Don't forget to upload a full description of the nomination, medication safety initiative, and additional documentation to support your nomination after completing the initial form (after you submit the nomination).

Don't forget to submit all your information by September 9, 2022.

For a list of past **ISMP Cheers Award** winners, click here.