Medication Safety Committee Guidelines

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Insulin Recommended Safe Practice Guidelines

INTRODUCTION

Insulin therapy is required in a substantial percentage of hospitalized patients. Insulin (all forms) is a high-alert medication that is commonly associated with adverse drug events in hospitalized patients.

The intent of these guidelines is to summarize the insulin safe practices that have been shown to reduce the risk of preventable harm when insulin is used to treat hospitalized patients. Hospitals should use these guidelines to perform a gap analysis to evaluate their current practices and then use the results to develop a plan to improve insulin safety in their organization. These guidelines are not fixed protocols that must be followed, nor are they entirely inclusive or exclusive of all methods of reasonable care that can obtain/produce the same results. Working through the Pharmacy and Therapeutics Committee, each hospital should carefully review the guidelines and adopt and implement the safe practices in a manner that is appropriate for their institution.

Information contained in this tool should not be construed as legal advice or used to resolve legal problems by health care facilities or practitioners without first consulting legal counsel.

COMMITTEE REPRESENTATION

The committee includes nurse, physician, and pharmacist representatives from:

- Association of California Nurse Leaders (ACNL)
- California Association of Health Facilities (CAHF)
- California Board of Pharmacy
- California Department of Public Health (CDPH)
- California Hospital Association member hospitals
- California Hospital Patient Safety Organization (CHPSO)
- California Medical Association
- California Society of Health-System Pharmacists (CSHP)
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**Pharmacy Purchasing 1.1**

- Consider using visual clues, such as affixing a photo to the bin of the insulin that should be stored there, to help ensure the correct vial is returned to the correct bin.
- Do not store different insulin types, such as U-500 Insulin products, and brands in the same bin with a divider; instead, store different insulin types and brands in separate bins labeled accordingly.
- Use both brand and generic names on pharmacy bin labels.
- Use ISMP recommended Tall Man lettering on pharmacy bin labels – for example, HumaLOG, HumuLIN, NovoLIN, NovoLOG.
- If Concentrated Insulins (U-200, U-300 or U-500) are used in the organization, see recommendations in Appendix A – this applies to all aspects of insulin use.
- If insulin pens (other than above) are used in the organization, see recommendations in Appendix B – this applies to all aspects of insulin use.

**Unit Storage of Medications**

**In Pharmacy 2.1**

- Consider using visual clues, such as affixing a photo to the bin of the insulin that should be stored there, to help ensure the correct vial is returned to the correct bin.
- Store different insulin types, strengths and brands in separate bins labeled accordingly.
- Do not keep insulin vials on top of counters or within pharmacy compounding hoods, as insulin could be confused with heparin, which is also measured in units. Put all insulin vials back in the appropriate storage area immediately after use².
- Insulin syringes should be stored separately from tuberculin syringes.

**Inpatient Care Area 2.2**

- Consider if possible, inpatient pharmacy prepares patient-specific syringes for basal insulin doses.
- DO NOT use multi-dose vials for more than one patient as per Center for Disease Control and Prevention (CDC) guidelines.
- All multi-dose insulin products should have proper patient labeling and corresponding expiration dates.
- If insulin products are stored in automatic dispensing cabinets (ADCs), they should be removed from the manufacturer’s carton and placed in individual pockets (single-medication access) to prevent errors in retrieval. All insulin types should be segregated (both ADC and medication room storage).
- Insulin should not be stored at the patient’s bedside. When insulin is needed for self-
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 administration, the insulin should be obtained by a nurse and provided to the patient for observed administration, then returned to a secure area for proper storage.

- Insulin syringes should be stored separately from tuberculin syringes.
- Insulin used to refill insulin pumps should not be stored in the medication room or ADC. Instead, pharmacy should deliver directly to nurse any insulin used for the refilling of cartridges in an insulin pump.
- Pharmacy personnel should store all insulin medications in patient care areas without the original carton (remove packaging container from actual pen/vial).
- Utilize physical and/or electronic alerts to care providers that insulin pens should not be used for multiple patients. Utilize reminders that multiple dose vials are not to be used for multiple patients.

Prescribing

- Avoid complicated and error-prone insulin infusion protocols and limit the number of insulin protocols to minimize confusion.
- Ensure an alternate source of glucose is ordered when NPO/reduction or discontinuation of enteral/parenteral feeding is ordered, especially for patients on an insulin drip or a long-acting insulin to prevent hypoglycemia.
- Always review and evaluate preprinted insulin order sets and insulin infusion protocols by the Pharmacy and Therapeutics (P&T) committee at least annually.
- Nursing staff should provide feedback to ensure uniform understanding and accurate execution of orders/protocols.
- Set criteria for blood glucose levels with upper and lower limits upon which the physician should be notified.
- Ensure a protocol for managing hypoglycemia, which includes criteria for notifying the physician, is available, and ordered whenever insulin is ordered.
- Encourage the use of scheduled subcutaneous insulin order sets with basal, nutritional, and correction components; this glycemic management is the preferred method for achieving and maintaining glucose control in non-critically ill patients.
- Bedside capillary point of care (POC) testing should be ordered for patients receiving insulin. Schedules should be based on patient’s nutritional status:
  - Before meals and at bedtime (AC&HS) for patients who are eating or receiving bolus enteral nutrition,
  - Every 4 to 6 hours for patients who are NPO or receiving continuous enteral/parenteral nutrition.
  - Consider periodic late night blood glucose (BG) testing (e.g. 0200) to monitor for nocturnal hypoglycemia.
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Pharmacy Order Entry & Dispensing

- DO NOT use multi-dose vials for more than one patient per CDC guidelines.
- All insulin infusions should be standardized and prepared within the inpatient pharmacy when possible.
- Ensure pharmacist competency on differentiating between different insulin types and duration of action.
- If doses of insulin are included on the label, they should be listed as “units” or “units = ml”, but not “ml” alone.
- If patient’s own insulin is allowed, independent verification of the product by a pharmacist or prescriber must be performed and documented.
- Pharmacy information system should include appropriate alerts and decision support to reduce risk of input errors. This means the pharmacist should have real-time access to the laboratory information system.
- Pharmacy technicians involved in distribution and preparation of insulin products should be educated regarding the high-alert status of insulin, appropriate safety practices and consequences of error. Double checks will be utilized when possible.
- Pharmacy should establish standard safety-focused practice for pharmacist review of insulin orders, which includes all preparations of IV products for injection.
- Pharmacy-generated medical administration records (MARs) should include appropriate warnings and alerts related to insulin therapy. When a patient is prescribed more than one type of insulin, pharmacy-generated MARs should clearly discriminate between insulin types.
- The insulin concentration (e.g U-100, U-200, U-300) does not follow the name of the insulin on the MAR or other medication lists, with the exception of regular insulin U-500 (Humulin U-500).
- Pharmacy-generated MARs should include specific administration times or time prior to or after meals

Nursing Administration

- Require a second independent check for all intravenous insulin administration, second independent check includes verification of blood glucose result upon which dosing is based.
- Independent check of each subcutaneous dose is not required and is specifically discouraged by ISMP.
- Prior to subcutaneous insulin administration, the practitioner:
  - Confirms that there is an appropriate indication
  - Assesses the patient’s most current blood glucose value
  - Assesses the patient for symptoms of hypoglycemia
  - Informs the patient of their most current blood glucose level
  - Informs the patient of their dose, the full name of the product, and the insulin’s intended action
- Barcode scanning of all insulin doses is required.
  - With multi-dose vials drawn up at the ADC, a flag label should be applied to the syringe
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- Immediately after preparation and then scanned upon administration.
  - For insulin pens – see recommendations in Appendix B
  - For insulin infusions the bag should be scanned prior to initiating the infusion and with each bag change.

- Single-use, auto-disabling fingerstick devices must be utilized in the hospital setting when obtaining blood sample. The glucometer should be cleaned and disinfected after every use, per manufacturer’s instructions, to prevent carry-over of blood and infectious agents³.

- Ensure an alternate source of glucose is ordered when NPO/reduction or discontinuation of enteral/parenteral feeding is ordered, especially for patients on an insulin drip or a long-acting insulin, to prevent hypoglycemia.
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Monitoring

Blood Glucose Monitoring While on Non-Infusion Insulin 6:1
- All patients with diabetes should have an order for blood glucose monitoring, with the results available to all members of the healthcare team.
- Patients with known diabetes should have a hemoglobin A1c level drawn if a recent level is unavailable.
- All patients with high blood sugar values on admission, receiving enteral/parenteral nutrition, or receiving therapies associated with hyperglycemia (e.g. corticosteroids), should have their blood glucose monitored independent of diabetes history.
- Establish blood glucose goals for critically ill and non-critically ill patients using current recommended guidelines (e.g., American Association of Clinical Endocrinologists).
- Bedside capillary point of care (POC) testing schedules should be based on patient’s nutritional status:
  - Before meals and at bedtime (AC&HS) for patients who are eating or receiving bolus enteral nutrition.
  - Every 4 to 6 hours for patients who are NPO or receiving continuous enteral/parenteral nutrition.
- Consider periodic late night BG testing (e.g. 0200) to monitor for nocturnal hypoglycemia.
- POC results should be documented in the medical record with corresponding insulin administration times.
- Verbal communication of POC glucose results are avoided as much as possible and are NEVER routinely used as the only source of information when determining insulin doses.
- Monitor the patient’s nutritional intake. If less than 100% of the meal is consumed, you may need to adjust the prandial insulin dose per institution’s protocol.

Blood Glucose Monitoring Before Starting Insulin Infusion 6:2
- Ensure blood glucose assessment is done immediately prior to beginning insulin infusion.
- If the glucose measurement is above a predefined level, initiate the insulin protocol as ordered.

Prior to Initiation of Continuous Infusion Insulin 6:3
- Discontinue all previous insulin and any oral hypoglycemics.
- Optimal glucose control should be achieved in patients who are NPO and receiving a continuous glucose source (continuous tube feeding, parenteral nutrition, or dextrose containing IV Fluids).
- Use with caution in patients receiving oral feedings or bolus tube feedings.
- Use with caution in patients who are pregnant. Consider an Endocrinology or Perinatology consult before instituting this protocol in pregnancy.
- Require a second independent check for pump programming upon initiation of the insulin infusion and with each dosage change. The second independent check includes verification of blood
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Monitoring Considerations While on Insulin Infusion 6:4
- Blood sugar must be monitored hourly while on continuous insulin infusion

Call the physician when:
- Other orders for insulin (SubQ, IV or in parenteral nutrition) are received without discontinuing the insulin infusion
- Tube feedings, dextrose containing IV Fluids, or parenteral nutrition are started, stopped, interrupted or changed.
- When blood glucose levels fall outside predefined upper and lower limits.

Patients with diabetes or hyperglycemia who are eating should be on a consistent-carbohydrate diet, and glucose monitoring should be ordered before each meal and at bedtime. Typically, oral agents should be discontinued during acute illness unless it is a very brief hospitalization. Oral agents can be restarted as patients approach discharge or transfer to a non-acute setting\(^5\).

It should be emphasized that using a correction scale insulin regimen, also known as “sliding scale insulin,” alone is not appropriate to treat sustained hyperglycemia $(> 140 \text{ mg/dl})^6$.

Transitions of Care
With the availability of Concentrate Insulins (U-200 (both short and long acting), U-300 (long acting) and U-500) insulin pens, it is critical that patient medication lists obtained on admission and provided at discharge are accurate and include both the insulin name and the concentration. Recommendations include:
- Ensure that all staff obtaining medication lists are educated as to the availability of different strengths of insulin and that ascertaining the insulin concentration is incorporated into the process of obtaining a patient medication list as applicable.
- The drug name, patient-specific dose, route and frequency are on the first line of the MAR and patient medication lists and the concentration and any directions on how to prepare the dose are below it.

Prior to Transitions of Care, a process is in place to ensure that patients will have the necessary prescription, supplies, a follow-up care plan, and printed instructions for all prescribed insulin and blood glucose monitoring.

Patients discharged on insulin are assessed for understanding of their self-management, including:
- Demonstration of proper dose measurement and self-administration using the same administration device that will be used at home (e.g. vial and syringe, pen, pump)
- How to monitor glucose values
- The signs and symptoms of hyper- and hypoglycemia and how to respond if these symptoms occur
- Common types of errors possible with their insulin therapy and how to prevent or detect these errors
- The importance of regular follow-up with their primary care provider/specialist, including the date of the next appointment
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Patients who self-administer U-500 insulin using a vial and syringe are taught to use only a U-500 syringe and communicate their doses in terms of the name and concentration of the insulin and the actual dose in units using only the U-500 syringe.

Other Considerations

- Develop policies and procedures on safe and appropriate use of patient’s own insulin pump (allow/disallow) and insulin and ensure they include risk assessment, proper communication and documentation on MAR of self-administered insulin doses. See Appendix C for recommendations.
- Ensure insulin protocol compliance by conducting periodic retrospective record review to assess adherence to insulin protocol and blood sugar monitoring requirements.
- QA program to track and trend hypoglycemic incidents (e.g. D50, glucagon, or oral glucose use) in patients receiving insulin to drive performance improvement efforts.

REFERENCES

1) Reports of insulin pen sharing between patients have continued despite numerous warnings by the ISMP, CDC, and FDA. ISMP has stated that the safe use of insulin pens in the inpatient setting can “only be assured through timely education and ongoing monitoring” (ISMP Medication Safety Alert Newsletter 2012; 17 (1): 1-4).
2) ISMP Med Safety Alert 2002 May 1, 2002
6) http://clinical.diabetesjournals.org/content/29/1/3.full / http://clinical.diabetesjournals.org/content/29/1/3.full#sec-7
11) ISMP Medication Safety Alert! October 20, 2016, Volume 21, Issue 21
Appendix A – Concentrated insulin (U-200, U-300, U-500 insulin) – safe practice recommendations

- Concentrated insulins are only dispensed in patient-specific, labeled pens or in patient-specific, pharmacy-prepared syringes. U-500 insulin vials are only stored in the pharmacy. When using pen devices for concentrated insulins – follow all safe practice recommendations for pen use as noted in Appendix B.
- Design the EHR/CPOE system to only allow ordering of concentrated insulins from a “Concentrated Insulin” order set.
  Order set to include:
  - Glucose monitoring a minimum of 4 times/day – AC and HS.
  - Pharmacy consult for pharmacist to meet with patient/family to confirm insulin concentration and in-home dosing. Consult to be part of the medical record.
  - Dose to be ordered as actual insulin units, not ml or markings on syringe for patients that were using U-500 vials at home.
  - Prescribing route for all pens defaults to subcutaneous route.
  - All concentrated insulins show a comment on eMAR of “HIGH ALERT – CONCENTRATED INSULIN”.
- Pharmacist patient consultation is required at discharge.
Appendix B – Best practices for Safe Use of Insulin Pen Devices in Hospitals

To ensure the safe use of insulin pen devices, hospitals and health systems should . . .

Ordering and Documenting
1. Indicate on all documents/labels/electronic records that the product is an “insulin pen”
2. Indicate on all documents/labels/electronic records that the product is “for individual patient use only”
3. Clearly display the word “pen” in the computerized prescriber-order-entry product description
4. Indicate on all documents/labels/electronic records that product requires “a new needle for each use”

Labeling and Dispensing
5. Include a barcode that is both patient-specific and product-specific on the pharmacy label
6. Ensure that the pharmacy label is affixed only to the barrel of the pen (not the cap)
7. Indicate on the pharmacy label “Warning! Confirm patient. Insulin pens are for use in one patient only”
8. Ensure that the pharmacy label does not obstruct the product name or lot number on the manufacturer’s label
9. Prohibit unlabeled patient-specific insulin pens on unit (i.e. floor stock)
10. Apply tamper-evident tape to the pen device perpendicular to the junction of the cap and barrel
11. Require pharmacy staff to sequentially scan manufacturer’s barcode and patient-specific pharmacy label to confirm correct pen product is being dispensed
12. Ensure that each and every pen device has a patient-specific pharmacy label affixed to it
13. Prohibit labeling a plastic bag in which the labeled pen device is dispensed

Storing
14. Ensure that insulin pen devices are stored in a patient-specific location (e.g. bin, drawer, pocket)
15. Ensure that insulin pen devices are immediately returned to the patient-specific location after each use
16. Ensure that pen needles are stored along with the pen device in a patient-specific location or easily accessible location
17. Ensure that a sufficient supply of insulin pen needles is available on the unit

Administering
18. At the time of bar code scanning, provide a prominent warning to the health professional if there is a mismatch between the patient’s identification wristband and the patient-specific (insulin pen) pharmacy label:
   a. “Warning: Do not administer”
   b. “Mismatched patient” or “incorrect patient”
   c. Suggested steps to correct the error
19. Indicate on the medication administration record, “Warning! Confirm patient. Insulin pens are for use in one patient only.”
20. Ensure that pens are cleaned prior to and after each use
21. Ensure that health professionals use the appropriate administration technique for insulin pens
22. Ensure that health professionals prime the insulin pen prior to administration
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23 Ensure that health professions hold the pen device against the skin for at least 5 seconds after injection is given
24 Use safety pen needles
25 Ensure that health professionals remove the pen needle from the pen device after medication administration
26 Prohibit the withdrawal of insulin from the pen cartridge using a syringe and needle

Policies and Procedures
27 Have hospitalwide policies and procedures for administration of insulin using insulin pen devices
28 Have a systematic and standardized process for educating health professional staff regarding
   a. Insulin pen use for all new nurse hires
   b. Appropriate insulin pen injection technique
   c. One patient, one pen (per CDC and SIPC campaign)
29 Require all health professionals to pass a competency assessment for insulin pens (at the time of hire and periodically thereafter)

Monitoring, Planning, and Evaluating
30 Regularly monitor/observe insulin pen use, including dispensing procedures, storage areas, and medication administration
31 Use a detailed checklist to perform direct observations of injection technique
32 Develop a system to prompt the proper disposal of insulin pens when the order is discontinued
33 Pilot test an order-specific and patient-specific barcode medication administration system to ensure that insulin pens are used in the intended patients prior to hospitalwide implementation
34 Conduct a failure mode effects analysis for insulin pen use
35 Review barcode medication administration scanning reports to ensure appropriate insulin pen use and detect inappropriate use
Appendix C – Safe management of external subcutaneous insulin infusion pumps in hospitalized patients

Note: These guidelines were compiled and vetted by ISMP after reviewing current policies and procedures that have been honed through experience in several large and small US hospitals, a review of the professional literature,1,17 the results of the 2015 ISMP survey on this topic,2 and analysis of reports of errors related to insulin pumps submitted to ISMP or published in the literature. Examples of some of the recommended documents mentioned in the guidelines (e.g.; patient consent/agreement, insulin pump order set, patient bedside worksheet/log) are provided in several of the references5, 11, 12, 14-17 listed at the end of the guidelines.

I. Initial Assessment Process
   Admission Assessment
   1. As part of an initial patient admission assessment, nurses should be prompted to specifically ask all patients if they are using an insulin pump.
   2. If the patient is using an external insulin pump, the nurse conducting the initial patient assessment should notify the patient’s admitting physician. This should set into motion a process to determine whether or not the pump can remain in place and be managed by the patient or a responsible adult representative during hospitalization.

   Patient Selection Criteria
   3. A standard process should be used to determine if the patient is an appropriate candidate to manage his or her own insulin infusion (per prescriber orders) via the insulin pump during hospitalization. Consideration should be given to the following elements when developing patient selection criteria:
      a. The patient, or a knowledgeable, responsible adult representative of the patient, may be an appropriate candidate if he or she is alert, physically capable, able to properly work the pump functions, and willing to manage the pump during hospitalization. If an adult representative will be managing the pump, he or she must be on site and immediately available 24 hours/day, 7 days/week.
      b. At a minimum, the patient or the responsible representative should be assessed for awareness of hypoglycemia symptoms; the ability to calculate and deliver bolus doses; the ability to change the basal rate, set a temporary rate, or suspend insulin delivery; and glucose control prior to hospitalization when using the pump.
      c. Contraindications to self-management of the pump during hospitalization may include:
         i. Altered state of consciousness, including prescribed medications that could alter consciousness
         ii. Lack of orientation to person, place, or time
         iii. Any physical, cognitive, or behavioral problem that would preclude self-management
         iv. Presence of diabetic ketoacidosis or hyperosmolar hyperglycemia
         v. Critical illness (e.g., sepsis), trauma, or a condition that warrants IV administration
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of insulin (e.g., to counteract the glycemic effects of high-dose steroids used for transplant rejection)

vi. Suicidal ideation

vii. The patient or responsible representative is unwilling or unable to provide essential information about the pump and insulin doses (see guideline #9)

evii. The patient or responsible representative is unwilling or unable to sign a consent/agreement that delineates self-management responsibilities (see guideline #13)

ix. The patient or responsible representative cannot provide needed pump supplies during the hospitalization (see guideline #15)

4. An initial determination by the admitting physician to allow the patient (or representative) to manage his or her own insulin via the pump should be verified (within 12 hours) by an endocrinologist, inpatient diabetes management services, or a physician with documented training in insulin pump management (see guideline #19) to ensure the patient has sufficient knowledge to manage his or her pump and make dose adjustments per prescriber orders during hospitalization (as opposed to knowing only enough to get by under normal circumstances at home). Verification is not required if the admitting physician is an endocrinologist, a member of an inpatient diabetes management service, or has documented training in insulin pump management.

II. Next Steps for a Patient Who Does Not Meet Criteria for Self-Management

Discontinuation of the Insulin Pump

5. The insulin pump should be discontinued and alternative insulin orders should be obtained for patients who exhibit the following:

a. The patient or representative exhibits any of the contraindications listed above during an initial assessment upon admission or during ongoing assessments of the patient to identify potential changes.

b. The patient has had two consecutive blood glucose values greater than a hospital-defined limit (e.g., 250 mg/dL) that have not decreased with insulin administration, have not been corrected by insulin pump setting changes as ordered by the prescriber, and have not been reduced by changes in the insertion site or tubing.

c. The patient’s representative is not available on site and/or does not respond to a call/text while on site within a timeframe determined by the hospital.

d. The insulin pump malfunctions and cannot be remedied within 1 hour (see guideline #27).

e. The insulin pump is temporarily halted for longer than 1 hour (see guideline #39).

6. Guidelines should be provided for prescribers converting insulin pump therapy to subcutaneous injections or intravenous infusions if the insulin pump must be discontinued. These guidelines should include a process to help determine the patient’s current total daily dose of insulin via the insulin pump, including the patient’s typical nutritional bolus and correction bolus doses.

7. The hospital should specify how to disconnect an insulin pump, how to label it, and whether to store it or send it home with a responsible family member.
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8. Any decision to reinstate the insulin pump should be based on the same criteria noted in guidelines #3 and 4.

III. Next Steps for a Patient Who Meets Criteria for Self-Management

Insulin Pump Information

9. The patient or responsible representative should assist the nurse in interrogating the insulin pump’s settings and documenting information about the pump and insulin therapy so that it can be placed in the patient’s health record to provide the following information to the healthcare team:
   a. Insulin pump model and manufacturer
   b. Customer support number(s)
   c. Name and concentration of the insulin currently used in the insulin pump
   d. Name and phone number of the patient’s insulin pump educator (if known)
   e. Type of infusion set/inserter
   f. Name and phone number of a person who can help with pump use in case of emergency
   g. Insulin basal rate(s) upon admission
   h. Nutritional bolus doses based on carbohydrate ratio or other specific information about nutritional bolus doses
   i. Correction bolus doses for elevated glucose levels (e.g., correction scale, sensitivity factor [amount of insulin for each increment over target glucose])

Functionality Verification

10. If the insulin pump uses wireless technology, there should be a process in place to ensure that it will work in areas of the hospital where the patient may visit before allowing its use during hospitalization.

11. The biomedical engineering department should be contacted if any problems were encountered when testing the wireless technology or during pump interrogation (see guideline #9) to determine if the pump should be inspected further to verify functionality.

Baseline Blood Glucose

12. The patient’s blood glucose value should be obtained upon admission to serve as a baseline.

Patient Consent/Agreement

13. The patient or responsible representative should sign an agreement/consent delineating the patient’s or representative’s responsibilities and clarifying the conditions that could lead to insulin pump discontinuation. Examples are provided below:
   a. Responsibilities
      i. Use of a hospital-supplied glucometer for glucose testing upon which dosing is based (see guidelines #32 and 33)
      ii. Use of a hospital-supplied insulin for refills (see guideline 325)
      iii. Make changes in basal rates only if prescribed by the physician
      iv. Change the tubing a rotate the site every 72 hours and as needed (see guideline
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#34)

v. Provide own insulin pump supplies (except insulin) (see guideline #15)
vi. Document on a worksheet/log and show nurses all insulin bolus doses and changes in basal rates (see guidelines #43 and 45)
vii. Report symptoms of hyper and hypoglycemia (see guideline #27)
viii. Report insulin pump problems and error/alert messages (see guideline #37)

b. Conditions that could lead to disconnecting the insulin pump
   i. Physician’s orders
   ii. Changes in the patient’s abilities, judgment, or medical condition (see guideline #3)
   iii. Certain procedures (see guideline #38 and 41)
   iv. Unavailability of the patient’s representative (see guideline #5)
   v. Other reasons deemed necessary by the medical staff

14. If the patient or representative is unable or unwilling to sign the agreement/consent, the insulin pump should be discontinued and disconnected from the patient. If the patient or representative is unable or unwilling to sign the agreement/consent and refuses to discontinue the insulin pump, the patient’s physician and risk management should be notified immediately.

Patient Provision of Supplies
15. Patients should provide their own pump supplies (except insulin when a refill is necessary), and have at least a 5- to 7-day supply, to start, of reservoirs/syringes/cartridges for the insulin, infusion sets and tubing, and a set of extra batteries.

IV. Inpatient Management of the Patient Who is Self-Managing the Insulin Pump

Orders for Insulin Pumps
16. The hospital pharmacy and therapeutics committee (or a similar committee) should specify the insulin product(s) that are available for insulin pump refills.
17. Order sets should be established and used when prescribing patient self-management of insulin via the patient’s insulin pump. At a minimum, the following orders/order types should be included in all order sets:
   a. An order to leave the insulin pump in place and allow the patient (or representative) to self-manage the insulin pump and insulin doses based on prescriber orders
   b. Basal rate(s) settings
   c. Algorithms for nutritional bolus doses and correction bolus doses
   d. Target blood glucose range
   e. Frequency of blood glucose monitoring
   f. An order to allow the patient or representative to assist with site and tubing changes
   g. When to temporarily halt the insulin pump as indicated for certain procedures (see guidelines #38-42)
   h. An order to implement a standard hypoglycemia treatment protocol as needed (see guideline #28)
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i. An order to notify the prescriber if the patient experiences poor glycemic control, becomes unable or unwilling to manage the pump or document all doses on the worksheet/log, is or will be made NPO, requires pump discontinuation, or the pump is halted for more than 1 hour.

Consultations

18. The outpatient healthcare provider responsible for the patient’s ambulatory insulin infusion pump should be contacted upon the patient’s arrival in the hospital for input as needed.
19. A consult should be completed within 12 hours of inpatient hospital admission by an endocrinologist, inpatient diabetes management service, or a physician with documented training in insulin pump management. The consultant should assess and verify the appropriateness of the insulin pump settings, and ask the patient or responsible representative to demonstrate his or her competency with using the insulin pump. The consultant must either agree with the appropriateness of continuing insulin therapy via the insulin pump or recommend discontinuation. The consultant should document either decision in the patient’s medical record.
20. A consult with a diabetes educator should be initiated in inpatient admission to evaluate the patient’s knowledge of insulin pump management and provide education and support if necessary. If the diabetes educator identifies gaps in the patient’s (or responsible representative’s) knowledge that might adversely impact self-management of the pump during hospitalization and that cannot be remedied via education, discontinuation of the pump should be recommended to the admitting physician.
21. A consult with a nutrition specialist should be initiated on inpatient admission to reinforce the patient’s or representative’s carbohydrate counting skills

Staff Competency and Education

22. An in-house expert or outside consultant who is knowledgeable about most insulin pumps should be readily available to healthcare practitioners for questions or concerns.
23. A process should be in place to facilitate education of healthcare practitioners about the basic components of insulin pumps, the models most likely to be encountered based on the hospital’s past experiences, and interrogating the pumps’ settings.
24. The hospital should maintain easily accessible resources about insulin pumps being used in the community, including at a minimum, the manufacturers’ clinical services contact numbers for troubleshooting (often available on the back of pumps), and pump menu maps (available from pump companies) that show where certain information in the pumps can be found.
25. A process should be in place to ensure that clinical staff know how to turn the insulin pump off in case of an emergency.

Ongoing Patient Assessment

26. Nurses should evaluate the patient’s (or representative’s) continue appropriateness for self-management of the insulin pump at least once per shift and report any changes to the physician.
27. Practitioners should review with patients using an insulin pump or their representatives the signs
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and symptoms of hyper- and hypoglycemia. Patients and representatives should be instructed to report any signs to the nurse, including hyperglycemia nonresponsive to bolus does.

28. The hospital’s hypoglycemia protocol policy should be followed for patients with insulin pumps who experience clinically significant hypoglycemic events.

29. Nurses should assess the insulin pump insertion site for signs of bleeding, leakage, irritation, infection, and/or discomfort at least once per shift, and if present, instruct the patient to change the insertion site (see guideline #34).

30. Nurses should specifically verify with the patient that there have been no insulin pump alarms indicating pump suspension or malfunction at least every shift.

31. If a nurse finds that the patient’s insulin pump tubing is kinked, disconnected, or loose, the patient is instructed to remedy the problem if possible or report its continuance to a nurse if unresolved.

Blood Glucose Monitoring

32. Blood glucose monitoring should be conducted by the patient or representative with a hospital-provided glucometer in the presence of a nurse or trained staff designee, and the results should be recorded by a nurse or designee in the patient’s medical record.

33. Any blood glucose values used as the basis for bolus insulin doses or prescribed changes in the basal rate should be obtained from the hospital-provided glucometer and witnessed by a nurse or designee.

Patient Management of Insertion Site, Tubing, Refills, and Insulin Pump Problems

34. The patient should rotate the catheter site and change the infusion set using aseptic technique in the presence of a nurse at least every 72 hours. More frequent catheter site changes may be needed if the site is red, swollen, itchy, leaking, bleeding, or uncomfortable, if a delivery alarm occurs that is not caused by a tubing problem, or if the patient experiences two consecutive blood glucose readings greater than a hospital-defined limit (e.g., 250 mg/dL) that are not responsible to insulin administration and insulin pump setting changes.

35. Patients or representatives should refill the insulin pump reservoir/cartridges/syringes using insulin dispensed for the patient by the hospital pharmacy only.

36. Nurses should verify the insulin (preferably via barcode scanning against the insulin refill order on the medication administration record) prior to refill and before the insulin pump is restarted.

37. The patient or representative should report to a nurse all error or alert messages issued by the pump and refer to the manufacturer’s guidelines or contact the clinical support telephone line directly if the insulin pump requires troubleshooting. If the issue is not resolved in 1 hour, an alternative insulin should be prescribed and the pump discontinued.

Temporarily Halting the Insulin Pump

38. An insulin pump should not be exposed to electromagnetic fields or ionizing radiation and should be temporarily removed by the patient or responsible representative prior to any procedure that may cause such exposure (e.g., MRI, CT scan, PET scan, intravenous pyelogram, mammogram, x-ray, nuclear medicine studies, radiation therapy) and reconnected immediately after the
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procedure is completed. Signage is recommended in radiology suites instructing patients to inform the technician if they are wearing an insulin pump.

39. If the insulin pump is removed for longer than 1 hour, the prescriber should be contacted for alternative insulin delivery. If the disruption anticipated to last longer than 1 hour, the prescribed alternative insulin should be administered 30 minutes prior to pump removal.

40. Patients should be allowed to discontinue their insulin pumps temporarily (under 1 hour) to shower.

41. For patients receiving general anesthesia or sedation for a procedure, the physician overseeing the anesthesia/sedation plan should evaluate the patient before the procedure to determine the appropriateness of continuing the insulin pump during the procedure. If discontinuation is recommended, patients should be started on an alternative source of insulin once the pumps has been removed.

42. Before resuming the pump, any alternative insulin administered while the pump was halted or removed should be taken into consideration when deciding on the basal rate to avoid hypoglycemia, or the pump should be resumed only after the alternative insulin is expected to be cleared.

Documentation of Therapy and Monitoring Results

43. Patients or responsible representative should be provided with a documentation worksheet/log to keep at the bedside to record all basal rates, carbohydrate counts and nutritional doses, correction doses, glucose monitoring results, site changes, and other related clinical data.

44. Nurses should monitor the patient’s documentation record at least once per shift and contact the prescriber if there is a problem with patient compliance with the required documentation.

45. Patients or the responsible representative should communicate all insulin self-administered through the pump to a nurse at the time of administration.

46. Nurses should document all basal and bolus doses of insulin on the patient’s medication administration record in the patient’s health record.

47. Nurses should document the type of insulin pump, catheter site assessments, site rotations, tubing changes, refills, and ongoing patient assessments and education in a designated area of the patient’s health record.

Discharge Education

48. Prior to discharge with an insulin pump, a diabetes educator should evaluate the patient to ensure he or she knows how to fully use the insulin pump and the importance of regular follow-up with the physician managing their pump. The patient should also know where to find the resources to resolve any issue that might arise with pump after their discharge.

References:

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