

Recommendations for the Safe Management of Patients with an External Subcutaneous Insulin Pump During Hospitalization

Please note: These recommendations 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 recommendations (e.g., patient consent/agreement, insulin pump order set, patient bedside worksheet/log) are provided in several of the references^{6,11,12,14-17} listed at the end of the recommendations.

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 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 recommendation # 9)
 - viii. The patient or responsible representative is unwilling or unable to sign a consent/agreement that delineates self-management responsibilities (see recommendation # 13)
 - ix. The patient or responsible representative cannot provide needed pump supplies during the hospitalization (see recommendation # 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 service, or a physician with documented training in insulin pump management (see recommendation # 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.

> Recommendations—continued from page 1

- 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 recommendation # 37).
 - e. The insulin pump is temporarily halted for longer than 1 hour (see recommendation # 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.
 - 8) Any decision to reinstate the insulin pump should be based on the same criteria noted in recommendations # 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/insert
 - 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 recommendation # 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 recommendations # 32 and 33)
 - ii. Use of hospital-supplied insulin for refills (see recommendation # 35)
 - iii. Make changes in basal rates only if prescribed by the physician
 - iv. Change the tubing and rotate the site every 72 hours and as needed (see recommendation # 34)
 - v. Provide own insulin pump supplies (except insulin) (see recommendation # 15)
 - vi. Document on a worksheet/log and show nurses all insulin bolus doses and changes in basal rates (see recommendations # 43 and 45)
 - vii. Report symptoms of hyper- and hypoglycemia (see recommendation # 27)
 - viii. Report insulin pump problems and error/alert messages (see recommendation # 37)

> Recommendations—continued from page 2

- 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 recommendation # 3)
 - iii. Certain procedures (see recommendations # 38 and 41)
 - iv. Unavailability of the patient's representative (see recommendation # 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 recommendations # 38-42)
 - h. An order to implement a standard hypoglycemia treatment protocol as needed (see recommendation # 28)
 - 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 on 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 manufac-

> **Recommendations**—continued from page 3

turers' 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) continued 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 and symptoms of hyper- and hypoglycemia. Patients and representatives should be instructed to report any signs to the nurse, including hyperglycemia nonresponsive to bolus doses.
- 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 recommendation # 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 responsive 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 recommendations 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 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 is 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 disconnect 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 pump has been removed.

> **Recommendations**—continued from page 4

- 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 representatives 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 issues that might arise with pump use after their discharge.

References

- 1) Global home infusion therapy market will reach a valuation of US \$27 billion by 2020: Persistence Market Research [news release]. New York, NY: Market Media; July 24, 2015. www.ismp.org/sc?id=607
- 2) ISMP. Managing hospitalized patients with ambulatory pumps: findings from an ISMP survey—Part 1. *ISMP Medication Safety Alert!* 2015;20(23):1-3. www.ismp.org/sc?id=2817
- 3) Bruttomesso D, Costa S, Baritussio A. Continuous subcutaneous insulin infusion (CSII) 30 years later: still the best option for insulin therapy. *Diabetes Metab Res Rev.* 2009;25(2):99-111.
- 4) Chait J. Insulin pumps: not just for type 1. *Diabetes Self-Management.* Published August 31, 2006. Updated June 20, 2014. www.ismp.org/sc?id=608
- 5) Grunberger G, Abelseth JM, Bailey TS, et al. Consensus statement by the American Association of Clinical Endocrinologists/American College of Endocrinology insulin pump management task force. *Endocr Pract.* 2014;20(5):463-89. www.aace.com/files/insulin-pump-management-cs.pdf
- 6) Bailon RM, Partlow BJ, Miller-Cage V, et al. Continuous subcutaneous insulin infusion (insulin pump) therapy can be safely used in the hospital in select patients. *Endocr Pract.* 2009;15(1):24-9.
- 7) American Diabetes Association. Standards of medical care in diabetes—2016. *Diabetes Care.* 2016;39(suppl 1):S1-S112.
- 8) Carson SL. Patient-supplied medication infusion devices in the emergency department: are you ready? *J Emerg Nurs.* 2012;38(3):267-9.
- 9) ECRI Institute. Resources for managing the use of patient-supplied equipment. *Health Devices.* 2007;36(9):294-301.
- 10) ECRI Institute. Patient-supplied equipment. Executive Summary. *Medical Technology.* May 2008;8(3):1.
- 11) Leonhardi BJ, Boyle ME, Beer KA, et al. Use of continuous subcutaneous insulin infusion (insulin pump) therapy in the hospital: a review of one institution's experience. *J Diabetes Sci Technol.* 2008;2(6):948-62.
- 12) Cook CB, Boyle ME, Cisar NS, et al. Use of continuous subcutaneous insulin infusion (insulin pump) therapy in the hospital setting: proposed guidelines and outcome measures [erratum in *Diabetes Educ.* 2006;32(1):130]. *Diabetes Educ.* 2005;31(6):849-57.
- 13) Healthcare Technology Foundation, ECRI Institute. Home infusion: a safety guide for patients and caregivers. 2013.
- 14) Noschese ML, DiNardo MM, Donihi AC, et al. Patient outcomes after implementation of a protocol for inpatient insulin pump therapy. *Endocr Pract.* 2009;15(5):415-24.
- 15) Lee SW, Im R, Magbual R. Current perspectives on the use of continuous subcutaneous insulin infusion in the acute care setting and overview of therapy. *Crit Care Nurs Q.* 2004;27(2):172-84.
- 16) Nassar AA, Partlow BJ, Boyle ME, Castro JC, Bourgeois PB, Cook CB. Outpatient-to-inpatient transition of insulin pump therapy: successes and continuing challenges. *J Diabetes Sci Technol.* 2010;4(4):863-72.
- 17) Lansang MC, Modic MB, Sauvey R, et al. Approach to the adult hospitalized patient on an insulin pump. *J Hosp Med.* 2013;8(12):721-7.

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