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Acute Care
ISMP Medication Safety Alert!®
Educating the Healthcare Community About Safe Medication Practices

Ambulatory pump safety: *Managing home infusion patients admitted to the ED and hospital*

Before the 1980s, patients had to be hospitalized to receive various types of infusion therapies to treat diseases unresponsive to oral medications. Since then, the availability of lightweight ambulatory pumps has made infusion therapy possible in alternative settings outside the hospital, including in the home. A new market research study suggests that the use of ambulatory pumps is commonplace and will continue to grow at an annual rate of about 9% over the next 5 years.[1]

This growth is tied to an increasing geriatric population, expanding prevalence of chronic diseases such as cancer and diabetes, and positive patient outcomes in a less expensive home setting. Ongoing technology developments and newer applications of ambulatory pumps in the home are further driving an increase in their use. Today, ambulatory pumps are being used to deliver various medications (**Table 1**) to treat a wide array of diseases and conditions, from diabetes to chronic pain. This mode of delivery typically involves using a needle or catheter under the skin to administer medications, blood products, nutrition, or hydrating solutions via the intravenous, subcutaneous, epidural/intrathecal, percutaneous, intrawound, intrahepatic, or other parenteral routes.

As with any medication delivery system, patient safety can be jeopardized if the devices are mishandled when filling, programming, attaching, and monitoring the pumps. The ambulatory pump marketplace is diverse, so the devices rarely have standard components. This poses a unique challenge for healthcare providers when patients using these devices are admitted to an emergency department (ED) or hospital. Often, healthcare providers are not familiar with all the ambulatory pumps in use, and most patients who use these devices are ill informed, leading to serious errors—the most dangerous of which is overinfusion. For example, just recently in our June 18, 2015 newsletter, we described numerous overinfusions of fluorouracil caused by misprogramming a **CADD** ambulatory infusion pump and misusing a rate-specific elastomeric **EASYPUMP**. In our November 20, 2014 newsletter, we published an event in which both a patient and clinicians in the ED mistakenly believed an elastomeric **DOSIFUSER** pump had malfunctioned and delivered an overinfusion of fluorouracil when it had not, leading to the omission of a large portion of the prescribed chemotherapy after the infusion was disconnected prematurely.

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Table 1. Examples of medications/medication classes and solutions commonly administered at home via ambulatory pumps.

Analgesics
Antiemetics
Antimicrobial, antifungal, antiviral agents
Antineoplastic agents
Antispasmodic drugs, including baclofen
Biologic drugs
Blood factors
Corticosteroids
Diuretics
Epoprostenol or treprostinil
Hematopoietic agents
Heparin
Hormones, including insulin and growth hormones
Hydration
Immunologic medications
Inotropic medications
Monoclonal antibodies
Parenteral nutrition
Tocolytics

SAFETY briefs

Auvi-Q ticking sound normal but scary.

AUVI-Q is the **EPINEPH**rine autoinjector (**Figure 1**) that gives voice instructions to "talk" people through the injection process when the medication is needed for an anaphylactic reaction. You may recall an article we published in our April 24, 2014, newsletter about the ticking sound the device makes if it isn't properly disposed of after use. This sound has caused some frightening moments in emergency departments (EDs). To use the injector, it must be removed from its case, and the needle guard across the bottom of the device must be removed (view the Auvi-Q demonstration at: www.auvi-q.com/auvi-q-demo). The needle automatically retracts after use. But, if the outer case isn't replaced, the battery will continue to drain and, eventually, the device will emit a "ticking" sound as the battery dies out. Unfortunately, the demonstration video on the Auvi-Q website does not instruct users to replace the cover after use.

Figure 1. Replace Auvi-Q case after use to prevent a ticking sound as the battery dies.

Recently, an ED employee heard a ticking sound emitting from a sharps container in the utility room. A "suspicious package" code was initiated, and appropriate officials, including local police and fire departments, were contacted for assistance to investigate. The ED was temporarily closed until the Auvi-Q injector was identified as the ticking "suspicious package" and the area was deemed safe.

The Auvi-Q talking directions instruct pa-

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Insulin pumps provide another example of a unique challenge to clinicians when patients with these devices present for treatment. Insulin pumps have been used for more than 35 years. There are nearly a dozen different devices available in the US today. In 2007, about 374,000 patients with type 1 diabetes were using insulin pumps.[2] Today, more than half a million patients with type 1 and type 2 diabetes are using insulin pumps.[3,4] Yet, few healthcare clinicians working in hospitals have a comprehensive understanding of these devices. When patients with insulin pumps are evaluated in the ED or admitted to the hospital, they typically have more knowledge and expertise with using the pump for insulin delivery than the medical professionals who are handling their care.[1]

So, what happens in your hospital when a patient using an ambulatory pump to deliver a medication or solution is admitted to the ED or hospital? What if the patient is unresponsive and cannot help identify the medical device found at his or her waist? Simply discontinuing the therapy may **NOT** be the most clinically appropriate or safest solution. Turning off the ambulatory pump without understanding its purpose and contents could lead to serious, even fatal, events.[5] For example, in a 2014 consensus statement, the American Association of Clinical Endocrinologists and the American College of Endocrinology encourage hospitalized patients and their admitting physicians to not discontinue an insulin pump, but rather to consult the specialist responsible for the patient's insulin pump management if the patient cannot manage his or her own pump.[4] Another example includes the serious consequences of interrupting a continuous infusion of an IV prostacyclin (epoprostenol or treprostinil) used to treat pulmonary hypertension.

But continuing the infusion without knowing how to manage the pump may not be a clinically appropriate or safe alternative either, especially if the patient is not well enough to assist with managing the device. Even allowing a very capable patient to manage his or her own ambulatory medication pump can be risky.[5] For example, it may be impossible to determine if the device is working properly or where to find replacement parts or batteries if clinicians don't know how to operate that particular pump. Clinicians may not know how to turn off the pump in an emergency or refill the device when it is empty.[6] Serious errors are possible. With insulin pumps, for example, errors have been reported in which a patient self-administered a dose of insulin via an ambulatory pump without telling the nurse, and the nurse administered the same dose via an injection. Also, if the patient's condition changes or they must undergo surgery, the ambulatory pump may need to be managed by clinicians or turned off temporarily.[5]

ISMP is interested in learning how hospitals are handling patients who arrive for treatment with an external ambulatory pump, with a goal of publishing guidelines associated with this situation. We have prepared a short survey to learn about your practices, concerns, and patient outcomes. We encourage all US hospitals to participate in this important survey. See **page 4** for the survey, which can be accessed at: www.ismp.org/sc?id=612. We would appreciate your online responses by **October 30, 2015**.

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tients to bring the used container to the "doctor" to obtain a new prescription for the device. Presumably, a patient brought the device to the ED. The device had then been discarded in the sharps container. The outer case had not been replaced and the battery died, resulting in the ticking sound. Sanofi, which markets Auvi-Q, is aware of the issue.

Another product, **EVZIO** (naloxone injection, autoinjector), does not share this problem thanks to a design change made prior to marketing the device to prevent a ticking sound when the battery dies. Hopefully, Sanofi will make a similar change to Auvi-Q.

It's important for clinicians to be aware of this potential problem. The ability to quickly receive and triage high acuity patients is essential. But when things like this happen, patients who need emergency medical services might be diverted to other facilities, delaying treatment. Confusion about the ticking sound may also delay prehospital care by first responders during a true emergency.

Brintellix-Brilinta: Name change needed.

HIGH-ALERT

We recently received a report about an elderly patient who was harmed as a result of a mix-up between **BRINTELLIX** (vortioxetine), used for major depressive disorders, and **BRILINTA** (ticagrelor), an antiplatelet agent used in patients with acute coronary syndrome. The patient was given a prescription for Brilinta 90 mg, but Brintellix 10 mg was dispensed. The patient fell and was admitted to a hospital after taking Brintellix for 9 days. The fall resulted in a periorbital hematoma (black eye) but no fractures. The dispensing error occurred in a pharmacy where the two drugs were stored side-by-side, and the wrong container was selected. It is not clear if barcode scanning was available. If it was, then had the prescription been entered into the pharmacy computer system accurately, it is likely that scanning would have prevented the mix-up.

Errors can also happen when selecting medications during order entry/verification. Typing the first few letters of the brand name

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Mix-ups among "V" drugs

Confirmation bias likely played a role in a recent pharmacy admixture error in which **VFEND** (voriconazole) 200 mg diluted in 0.9% sodium chloride was prescribed but **VENOFER** (iron sucrose) 200 mg diluted in 0.9% sodium chloride was prepared and dispensed. Earlier in the day, an experienced pharmacy technician had correctly prepared a Venofer 200 mg dose for another patient, and a pharmacist had checked it prior to dispensing. Later in the day, the same technician picked up a newly printed label to begin preparing the next IV admixture. The label stated "voriconazole (VFEND) 200 mg in sodium chloride 0.9%," but the technician misread the label as Venofer 200 mg in sodium chloride 0.9%. She quickly noticed the letters common to both brand names—V, F, N, and E—and the 200 mg dose, and her mind immediately thought of the admixture, Venofer, which she had prepared earlier in the day.

Believing she had the correct product in mind, normal human cognition caused her to stick to her initial assumption (called an *anchoring heuristic*) and to avoid pursuing alternative thoughts on what the label said (called *premature closure*). Once confirmation bias kicked in, the brain rejected any disconfirming evidence that would have alerted her to the error. Similarly, the pharmacist checking the product suffered from confirmation bias. He immediately saw the brown-tinted solution in the bag and thought of the Venofer infusion he had checked earlier in the day. Thus, when reading the label, he too saw Venofer, not Vfend, 200 mg. People have a tendency to judge the likelihood of properly identifying products by how easily the idea sprang to mind (called *availability heuristic*). In this case, the brown-tinted solution quickly sealed the pharmacist's belief that the label said Venofer, not Vfend. Multitasking was another factor that contributed to confirmation bias, as the pharmacist was trying to cover two very busy areas in the pharmacy during a lunch break.

This patient was critically ill, and omission of the antifungal medication could have been serious. Also, administration of unintended iron could have resulted in a hypersensitivity reaction. Fortunately, an astute nurse questioned why the antifungal medication was brown, and the error was detected.

The pharmacist and technician have suggested omitting the brand names on labels for Venofer and Vfend, along with one additional IV infusion with a typical 200 mg dose that could be misread—**VIMPAT** (lacosamide), an anticonvulsant. The generic names of these three products are very different and less likely to be mixed up. However, the drug name on the label is also what appears on order entry screens and medication administration records, so be sure to consider how this strategy would affect physicians and nurses before making the change. One important strategy to prevent errors with medications with similar names and doses is to utilize barcode scanning of products during the IV admixture process to prevent a drug selection error.

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

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may lead to either one name or both appearing on the screen, and the wrong item could be selected.

We added these names to the 2015 ***ISMP List of Confused Drug Names*** (www.ismp.org/sc?id=606). The US Food and Drug Administration (FDA) also warned healthcare professionals and patients about Brintellix and Brilinta errors (www.ismp.org/sc?id=611) on July 30, 2015, noting that over 50 reports had been received, most of which were sent by the manufacturer. Takeda, the company that sells Brintellix, has initiated electronic messages to pharmacists about the risk of mix-ups. Dose limits in order entry systems can help detect mix-ups if 90 mg of Brilinta is ordered but Brintellix is selected in error. But given the large number of ongoing error reports and the potential for patient harm, a name change for one of these products is in order. Brintellix was approved in 2013. Brilinta was approved in 2011. Usually, when a name is changed, we have observed that it is by the company whose product was approved most recently.

Special Announcements

ISMP webinar

Join us on **September 29** for our next webinar, ***Expanding Our Reach: Inpatient Pharmacists Reducing Readmissions Within a Health System***. Our speakers will describe a successful pilot program using pharmacists at the point of discharge to prevent readmissions due to medication misadventures. For details, please visit: www.ismp.org/sc?id=349.

ISMP Cheers Awards

Last call—nominations for this year's Cheers Awards will be accepted through September 11. Join us for a gala at The Chicory in New Orleans on December 8 as we celebrate this year's winners! Please visit www.ismp.org/Cheers/ to submit a nomination, register for the gala (click on Support), or make a donation to support ISMP medication safety efforts.

ISMP Survey on the Use of External Ambulatory Pumps in Hospitals

ISMP is interested in learning how hospitals are managing patients who present for treatment with a medication, blood product, nutrition, or hydrating solution infusing via an external ambulatory pump. An external ambulatory pump is a portable infusion device typically connected to a needle or catheter under the skin, which is used to administer products continuously over an extended period at home via various parenteral routes of administration. This survey is designed to collect information about three categories of ambulatory infusion pumps: insulin pumps, elastomeric pumps, and IV pumps (nonelastomeric) that deliver drugs such as epoprostenol, analgesics, or chemotherapy. **Pumps that are fully implanted under the skin (e.g., SyncroMed II) are excluded from this survey.** Please complete the survey by **October 30** and submit your responses to ISMP at: www.ismp.org/sc?id=612.

1 Please answer the following questions for each of the three categories of ambulatory pumps in the table, using the answer key below.

Key: Y=Yes S/P=Sometimes or Partly N=No DK=Don't Know NA=Not Applicable

Questions		Insulin Pumps					Elastomeric Pumps					IV Pumps (nonelastomeric)				
		Y	S/P	N	DK	NA	Y	S/P	N	DK	NA	Y	S/P	N	DK	NA
a)	Does your hospital have a policy, procedure, or guidelines regarding the management of patients who present for care with a medication or solution being delivered via an ambulatory pump?															
b)	Is it your policy to halt use of ambulatory pump infusions during the patient's hospitalization after switching to a hospital pump or device, or an alternative treatment (e.g., insulin injections)?															
c)	Do you have a standard process to determine if the patient is an appropriate candidate to manage his or her infusion (per physician's orders) during hospitalization?															
d)	Would suicidal ideation exclude a patient from access to and self-administration of a medication via an ambulatory pump?															
e)	If the patient requires assistance managing the pump, do you require a knowledgeable support person (e.g., family member) or staff member to remain available in the hospital at all times?															
f)	Do you have a process in place to ensure that a wireless ambulatory pump will work in areas of the hospital where the patient may visit before allowing its continued use?															
g)	Before continued use, must the ambulatory pump be inspected by the biomedical engineering department to verify it is functioning properly?															
h)	Do you require the healthcare provider responsible for the patient's ambulatory pump infusion to be contacted upon the patient's arrival for input as needed?															
i)	Do you specify the content required for complete orders for medications or solutions to be delivered via an ambulatory pump (e.g., basal rate, bolus doses, infusion rate, related monitoring)?															
j)	If the patient is a candidate for self-management of the pump, do you require a prescriber with specialized knowledge about the pump, medication being infused, and patient to provide orders for its continuation in consultation with the admitting physician?															
k)	If the patient will be managing the infusion via an ambulatory pump, must he or she sign a patient agreement or consent form specifying the risks and delineating the responsibilities?															
l)	If patients are self-managing their infusions via ambulatory pumps, do you provide them with a flow sheet to document all doses, monitoring results, site changes, rate changes, and other related clinical data?															
m)	If patients are self-managing their infusions via ambulatory pumps, is the device and medications or solutions infusing via the pump on the patient's medication administration record (MAR)?															

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Questions		Insulin Pumps					Elastomeric Pumps					IV Pumps				
		Y	S/P	N	DK	NA	Y	S/P	N	DK	NA	Y	S/P	N	DK	NA
n)	If patients are self-managing their infusions via ambulatory pumps, do you require a nurse to document medication/product administration at least daily on the MAR or other comparable record?															
o)	Must the medication or solution being administered via the pump or used to refill the pump be dispensed from, or verified by, the hospital pharmacy?															
p)	If an ambulatory pump requires a refill of the product while the patient is hospitalized, do you have guidelines to follow regarding who can prepare the solution, fill the device, and program it, and how to carry out these processes?															
q)	Are any required refills of ambulatory pumps carried out by clinicians who have specific competencies related to the device and its refill?															
r)	Do all ambulatory pump refills of medications or solutions require an independent double check by another clinician before restarting the pump?															
s)	If the ambulatory pump or medication is investigational, do you specify from where the medication will come if a refill is necessary?															
t)	Do you have an in-house expert who is knowledgeable about most ambulatory pumps, who can be called for consultation when necessary?															
u)	Are clinicians who might encounter ambulatory pumps educated about the pumps seen most often in their respective healthcare settings?															
v)	Does the organization maintain a set of resources about ambulatory pumps being used in the community that clinicians can easily access?															
w)	Do you require anesthesia to evaluate patients prior to surgical procedures requiring general anesthesia to determine the appropriateness of continuing the therapy infusing via an ambulatory pump during the procedure?															
x)	Do you specify how to communicate to other healthcare professionals that the patient is receiving medications or solutions via an ambulatory pump?															
y)	Do you specify how ambulatory pumps will be managed to avoid exposure to ionizing radiation or magnetic fields during a radiology procedure?															
z)	Do you have a process in place to ensure that clinical staff know how to turn the pump off in case of an emergency?															
aa)	Do you ensure that patients discharged with home infusion therapy understand how to use/monitor the ambulatory pump and medication or solution?															
bb)	Do you provide patients with written information about how to stay safe when discharged with home infusion therapy via an ambulatory pump?[5]															
cc)	Do you specify how to disconnect an ambulatory pump, where to store it, and when to reconnect it if it must be temporarily discontinued or the patient is not a candidate for continued use of the ambulatory pump during hospitalization?															
dd)	Do you specify how to manage patients who have had an ambulatory pump infusing medications or solutions discontinued while hospitalized?															

2 How many times during the past 2 years have you encountered a patient using an ambulatory pump upon admission to the ED or hospital?
☐ Never ☐ 1-5 ☐ 6-10 ☐ More than 10

3 How many times during the past 2 years have you encountered a patient using an ambulatory pump upon admission to the ED or hospital that you had not been trained to manage (e.g., unsure how to fill, program, check remaining content, verify and/or change the site)?
☐ Never ☐ 1-5 ☐ 6-10 ☐ More than 10

4 Are you aware of any errors that have occurred in your facility during the last 2 years involving an ambulatory pump?
☐ No ☐ Yes ☐ If yes, please list the name of the medication or type of solution, and briefly describe the error and the patient's outcome.

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5 Please select the category that best describes your hospital's bed size.
☐ Less than 100 beds ☐ 100-250 beds ☐ 251-400 beds ☐ Greater than 400 beds ☐ Other: Not a hospital

6 Please select the category that best describes your profession.
☐ Physician ☐ Other Prescriber ☐ Pharmacist ☐ Nurse ☐ Diabetes Educator ☐ Infusion Therapy Nurse ☐ Other

7 Please select the category that best describes your position.
☐ Staff ☐ Supervisor ☐ Manager ☐ Director ☐ Administrator ☐ Other