Avoiding Problems With Insulin Pens In the Hospital
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Problem: A variety of insulin pen injectors (“pens”) are currently available in the U.S. Intended primarily to facilitate accurate patient self-administration of insulin, these pens are also used in hospitals. Switching from insulin vials to pens has become popular, with the pens offering several advantages:

- Each pen is pre-labeled by the manufacturer with the product name and strength. With unit-based preparation of insulin from vials, there is a risk that syringes will be unlabeled.
- Each pen is individually labeled with the patient’s name.
- The pen provides insulin in a form ready for administration.
- Less nursing time is needed to prepare and administer insulin.
- There is less medication waste compared with dispensing full insulin vials for each patient.

Despite these advantages, some hospitals that switched to insulin pens are reconsidering their decision, although other facilities have used the technology successfully and safely. This article describes some common problems that have been encountered with the pens in an effort to guard against failures that could harm both patients and health care practitioners.

Needlestick injuries. Nurses have accidentally stuck a finger with a contaminated needle during pen delivery of insulin. Sometimes nurses pinch a thin patient’s skin together when administering a subcutaneous (SQ) injection. A needlestick injury may occur if the nurse does not maintain a 90-degree angle during the injection, because the needle may travel through the patient’s skin and into the nurse’s finger, which is holding the pinched skin.

Along with misalignment of the angle of injection, it may be difficult to visualize the injection site during pen delivery of insulin. Poor visualization has been reported as a contributing factor with this type of needlestick injury.

Some insulin pen needles are not available with a needle guard; this can present another potential source of needlestick injury after the injection has been given. Although a needle guard might not prevent injury during administration, as when pinching the patient’s skin together, it can prevent exposure to a contaminated needle after the injection.

Errors in technique. Nurses have reported seeing a “wet spot” on the skin after injection and thought that the spot might be insulin. They worried that the patient might not have received the full dose, particularly because they could not visualize the medication as it was delivered. In some cases, the wet spots left at the injection site turned out to be a very small amount of insulin residue left on the skin as a result of priming the pen before injection. In other cases, the wet spots involved substantial amounts of insulin.

The plungers or buttons of some pens are difficult to push down, making it easy to accidentally lift the needle out of the skin when delivering the insulin, thus leaving a wet spot.

Insulin can also leak out of the injection site if the needle is not left in for about 6 seconds after the insulin is injected; this can be another source of a wet spot.

As another example, the nurse or patient might not tip and roll insulin suspension (e.g., NPH, insulin mixtures) pens for proper mixing before use. This can result in large clumps of aggregated insulin flowing from the pen during the first injection, followed by subtherapeutic doses in subsequent injections.

Using the pen like a vial. The wide variety of pen designs makes it difficult for practitioners to become competent in the use of all possible devices. If nurses are not sure how to use a pen or if they encounter problems when trying to use it, they sometimes try to solve the problem by withdrawing the insulin from the pen cartridge using a sterile needle and insulin syringe. In these cases, the pen cartridge is used as a multiple-dose vial for a single patient. In other cases, pen cartridges are used as floor stock for multiple patients, with a new sterile needle and insulin syringe used for each puncture into the cartridge’s membrane.

Manufacturers do not recommend removing insulin from the cartridge unless an emergency exists and the pen is malfunctioning. Large air pockets or bubbles left behind in the cartridge after aspiration of some of the insulin with a needle can result in dosing errors or in SQ injection of air if the pen is used to deliver a subsequent dose.

Using the same pen for more than one patient. The Institute for Safe Medication Practices (ISMP) has learned that some practitioners were using one patient’s insulin pen for another patient. Some nurses thought that it was acceptable to place a new disposable needle on the pen that had already been used and to use it to deliver a dose to another patient, similar to when a multiple-dose vial might be used for different patients. In at least two studies, biological contamination of insulin occurred in up to 50% of all insulin pen cartridges that had been used. It appears that air bubbles and pathogenic contaminants can enter the cartridge after injection while the needle is attached to the pen.

Dispensing and administration errors. Although there might be fewer mix-ups with insulin pens than with insulin vials, both devices are subject to similar risks because of their look-alike packaging by various manufacturers’ lines of insulin products and similarities in product names. For example, the ISMP has received reports of dispensing mix-ups...
between the Novo Nordisk’s Novolog Mix 70/30 (70% insulin aspart protamine suspension, 30% insulin aspart) FlexPen and the Novolog (human insulin aspart) FlexPen.

Similar mixups have happened during administration. Mistaking a large dose of short-acting insulin for long-acting insulin can be fatal. A new color-differentiation system used by at least one manufacturer seems promising.

**Safe Practice Recommendations:** Potential problems with insulin pens are not insurmountable. The key to using these devices safely involves anticipating and reducing potential risks beforehand and close monitoring during the first few months of implementation when unanticipated failures and work-arounds are most likely to occur.

**FMEA.** Practitioners, including prescribers, pharmacists, nurses, and diabetes educators, should conduct a failure mode and effects analysis (FMEA) and implement identified risk-reduction strategies to prevent critical failures before using any insulin pen in the hospital.

**Formulary control.** If possible, the variety of pens in the institution should be limited to promote staff education and ongoing competency in using the devices.

**Education.** Training is crucial for all practitioners before they use insulin pen devices. Instructional videos on how to use many of the pens are accessible online and should be readily available to pharmacists and nurses from their organization’s Intranet. Staff members should receive clear instructions about how to proceed if they encounter problems, and real-time support should be accessible at all times. One hospital pharmacist reported that after the initial phase of education, one-on-one troubleshooting was the key to successful use of the pens when problems were encountered.

**Guidelines.** Written guidelines should be developed for each type of pen that is used in the hospital. Specific information should address safety, including how to handle pens for patients in isolation, prohibitions regarding sharing pens or using them as multiple-dose vials, how to apply pharmacy labels to pens without obscuring important information, and other relevant procedures.

Technical information about how to give the injection should be provided, including an emphasis on needlestick precautions, keeping the needle under the skin for about 6 seconds after injection, and removing the needle immediately after injection to prevent entry of air or contaminants into the cartridge. Patient education materials should also be provided.

As mentioned in this column last year, the ISMP plans to continue to work to establish safe practice guidelines that can be used in both hospitals and at home to maximize safety for patients when pen technology is used to deliver medications.

**REFERENCES**


The reports described in this column were received through the ISMP Medication Errors Reporting Program (MERP). Errors, close calls, or hazardous conditions may be reported on the ISMP Web site (www.ismp.org) or communicated directly to ISMP by calling 1-800-FAILSAFE or via e-mail at ismpinfo@ismp.org.