MEDICATION ERRORS

Pen Injector Technology Is Not without ‘Impending’ Risks

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Although the U.S. has historically lagged behind Europe and Japan in the use of pen injectors for delivering medication, the availability of drugs packaged in these devices has been increasing in our nation. An interest in the ability to administer subcutaneous (SQ) medications in the home, particularly among older patients with chronic diseases such as diabetes, has propelled the use of this delivery method. Intended primarily to facilitate accurate self-administration of SQ drugs, pen injectors are now found in hospitals and other settings for use by health care practitioners who administer pharmaceuticals to patients.

As with any new technology, the Institute for Safe Medication Practices (ISMP) has received numerous reports of medication errors that have occurred with the use of these devices both at home and in health care facilities. Following are a few examples.

**USING THE PEN LIKE A VIAL**

In response to the rising costs of drugs, some health care practitioners have replaced insulin vials on nursing units with insulin pen injectors (or just the pen cartridges), from which they routinely withdraw the patient’s prescribed dose using an insulin syringe and needle. In some cases, the pens or cartridges are used as multiple-dose vials for an individual patient, and each dose is removed with a sterile needle and syringe. In other cases, the clinician uses the pens or cartridges as floor stock “vials” from which they obtain insulin doses for several patients; in this instance, they use a new sterile needle and insulin syringe for each puncture into the cartridge membrane.

The manufacturers of pen injectors do not recommend withdrawing medication from the pen, except in an emergency, for example, when a pen does not work properly. In this instance, the pen should be discarded even if insulin remains in the device. Similar to withdrawing medication from a vial, these practices may also result in unlabeled syringes of insulin.

The presence of large pockets of air has been observed in cartridges of insulin pen injectors after some of the drug is aspirated with a needle. If the pen injector or cartridge is not discarded and if the air is not eliminated before a subsequent dose is delivered, the patient may receive less than the desired dose of insulin as well as an injection of air subcutaneously.

**DISPENSING ERRORS**

Insulin products with look-alike, sound-alike names have contributed to numerous errors in which the wrong injectors have been dispensed, resulting in poor glycemic control. In one instance, a 70/30 Novolog Mix (70% insulin aspart protamine suspension, 30% insulin aspart [rDNA]) Flexpen was used instead of a Novolog FlexPen (human insulin aspart [rDNA]). The patient experienced unexpected fluctuations in blood glucose levels until the error was noticed.

Clinicians have also confused adult and junior strengths of epinephrine with the EpiPen Auto-Injector (Dey), leading to dispensing errors and unfavorable responses to this emergency drug.

**CONFUSING THE VOLUME WITH THE DOSE**

Health care practitioners and patients have confused the dose of medication with the volume to be administered from pen injectors. With the apomorphine HCl pen injector (Apokyn, Tercica/the Ipsen Group), which is used to treat symptoms of Parkinson’s disease, the design of the device may also contribute to an error because it is marked in milliliters (mL). The drug is actually administered in milligrams (mg), but the label instructs physicians to prescribe the drug in mL to avoid confusion. Patients and practitioners could mistakenly administer 1 mL (10 mg/mL), instead of 0.1 mL, if the dose was prescribed as 1 mg, for example.

**TREATING THE AVAILABLE DOSE AS A SINGLE DOSE**

Patients and clinicians have administered the entire dose contained in a multiple-dose pen injector because they thought that the injector was a single-use device. In one instance, a nurse administered the full contents of a pen containing 750 mcg of teriparatide (rDNA) (Forteo, Eli Lilly) to a hospitalized patient with osteoporosis. Unbeknownst to the nurse, the pen contained enough medication for 28 daily doses (typically 20 mcg/day). In this situation, the pen should be discarded even if it still contains medication.

The manufacturer clearly lists the full contents of the pen (750 mcg/3 mL) on the carton label and on the pen injector; however, the notation that the pen contains a 28-day supply is much smaller and may be overlooked. Thus, the patient thought that she was giving herself 750 mcg each day, which she prepared by turning the pen dial one time until it clicked. She therefore told her nurse and physician that she had taken this dose at home; subsequently, this dose was prescribed. In fact, the patient had been receiving 20 mcg with each daily dose at home. Because the pen had been dispensed accidentally without a needle, the nurse had drawn its entire contents into a syringe and administered it to the patient during the hospital stay.

**INADEQUATE PATIENT EDUCATION**

Instructions given to patients before they are discharged from the office visit or hospital might not correspond to how the medication will be given at home and might not even pertain to the specific pen injector that will be used in the home.

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cover the cost of a pen injector, and the shelf life of coupons and samples to help patients obtain these devices is often short-lived. Thus, patients who receive guidelines about using the device but who cannot afford to purchase the medication in this fashion are not prepared to draw doses from a vial.

Many patients do not tip and roll their insulin suspension pen injectors adequately to ensure proper mixing. Lack of proper technique may result in large clumps of aggregated insulin flowing from the device during the first injection. This error can lead to hypoglycemic symptoms with use of new cartridges, followed by subtherapeutic doses.

ADDITIONAL CONCERNS

Injector pens are fairly thin. If pens are dispensed for each inpatient, space for applying the label may be limited on the pen. Labels that include the patient’s name, room location, and identification number may obscure important information.

After the first injection, if patients find that a multiple-dose pen injector contains less medication than is necessary for a single dose, they must rearm the device or use a new device to inject the remaining amount. Trying to recall how much drug has been given can lead to inaccuracies and may result in dosing errors.

The wide variety of designs for these devices makes it difficult for health care practitioners, including nurses, to learn how to use them properly.

We at ISMP encourage our readers to contribute to our pool of knowledge about pen injectors. We would like to hear from clinicians and patients about any problems experienced with these devices. We are also interested to learn about any safety guidelines that our readers have implemented. A report can be sent to ISMP via e-mail at the address below, and we might share the information in a future article.

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.