

“Smart” Pumps:

Pharmacy’s Role in Establishing Purchasing Criteria and Implementing the Technology

By Stephen F. Eckel, PharmD, BCPS

THE LANDSCAPE FOR INTRAVENOUS (IV) PUMPS HAS CHANGED DRASTICALLY over the past few years, with various companies introducing “smart” pumps to the marketplace. These smart pumps have the capability to provide decision-support systems to health care professionals at the bedside. The smart pump contains institution-specific drug concentrations, dosage ranges, and preferred dosing units. For example, the institution would determine that the standard dopamine concentration is 800 mg in 500 mL, and the acceptable dosage range is 3 to 20 mcg/kg/min. In other words, the institution recommends that the drug be infused at this concentration and within these ranges only. Many of the pumps also perform calculations from a dosage unit to an infusion rate. The physician would prescribe dopamine at 15 mcg/kg/min—and provided the nurse knows the patient’s weight—once the standard concentration of the infusion was determined, the pump can calculate the correct rate in mL/hr.

This technology is being heralded as a breakthrough because it provides a safety feature that did not exist in the past for nurses administering IV medications. When a nurse programs a typical infusion pump to deliver an IV infusion, there is no double check, unless a second nurse looks at the pump settings to ensure they are correct. In most institutions, this is not a routine practice. With smart pumps, if the physician prescribes dopamine at 30 mcg/kg, and the nurse programs the pump as such, the pump will warn the nurse that this infusion rate is greater than the hospital-preferred infusion rate. Depending on the type of pump and the settings established by the institution, it will either give the nurse a choice to override the warning (soft limit) or will not allow the infusion to proceed (hard limit).

In a very different scenario, the physician could have prescribed dopamine to infuse at 10.5 mcg/kg/min—an acceptable infusion rate. While programming the pump, there is a chance that the nurse could miss the decimal point and program the pump to infuse at 105 mcg/kg/min instead. There is also the risk that the nurse could hit a wrong number or

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check at the bedside and assists the nurse with delivering an appropriate infusion. Without the use of a smart pump, the incorrect infusion has a significant chance of reaching the patient and potentially causing harm. This technology not only minimizes the chance of harm to the patient, but also improves the appropriateness of the drug therapy that reaches the patient. For these reasons, many institutions are beginning to research and adopt smart pumps for patient care use. In preparing to evaluate this technology, there are a few considerations that will make the selection and adoption easier.

Pharmacy’s Role in Pump Selection

Pharmacists are integral to the selection process. Historically, nurses have led a health care institution’s selection of IV pumps. However, with the introduction of smart pumps, pharmacists need to become integral to the decision process, if not the lead decision-makers, because the major impetus for the decision to upgrade to a smart pump is the device’s safety features. Therefore, these features need to be strongly considered, and the pharmacist is best positioned to lead the charge.

Ideally, a pharmacist who has an understanding of both clinical and operational issues should be chosen. The clinical issues are focused around working with other pharmacists, nurses, and physicians to develop a comprehensive drug library. Also, the drug library could force many operational changes within the pharmacy department. The pharmacist will need to understand the impact those decisions will have on the department and work to resolve them.

Leading the Charge

Following nursing’s review of the ease of use and administration’s understanding of the cost of implementation, the pharmacist needs to review the different safety features available. Ask the following questions of the vendor:

- What number of drugs can be placed in the drug library?
- How many drug libraries are available?
- Does the pump have the ability to issue soft and/or hard limits, which nurses can or cannot override, respectively?
- How easy is it to program and update the drug library?

After compiling this information, the pharmacist needs to rank the pumps based upon the safety features, and present his/her evaluation to the selection committee. Some hospitals choose to put all infusions into the library (including antibiotics) and others choose selective drugs for inclusions (high alert, pressors, etc). Understanding what your institution will choose for inclusion could influence the selection of the pump. The same is true regarding soft and hard limits. Do you want both soft and hard limits included for some drugs, only soft limits, or only hard limits? The advantage to hard limits is they will not allow the nurse to ever administer an infusion outside of the selected range. The downside is there

miss a number, and type 1.5 mcg/kg/min instead. In each of these scenarios, the tenfold change in the programmed infusion rate would be outside of the institution’s approved range, resulting in an alarm from the pump that alerts the nurse that the programmed infusion rate is not appropriate.

Smart Indeed

The smart pump in this scenario provides the double



Smart pumps provide valuable double checks for nurses at the point of IV administration.

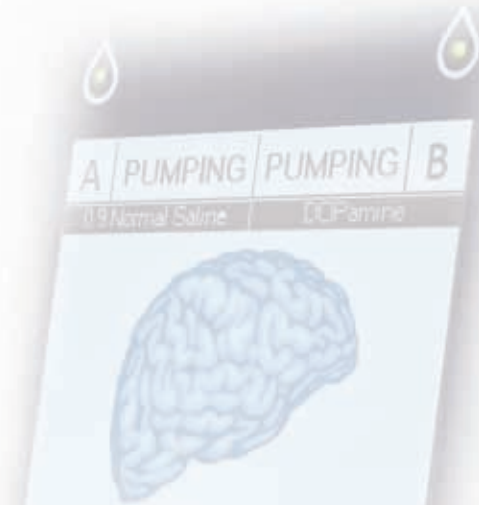


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might be times when this infusion rate is appropriate for the patient. In these scenarios, the nurse would have to give an infusion without using the drug library, avoiding all of the safety features. These situations would warrant the utilization of soft limits.

The Need for Standardized Concentrations and Dosage Units

You should also consider your institution's need for standardized concentrations, if it does not already use them. Ideally, these concentrations would extend across all patient types. For example, the concentration used for nitroprusside and phenylephrine would be the same, whether the patient is located in the medical ICU, the surgical ICU, or the operating room. This would also be true for the dosage range in the different units. One unit should not dose the drug in mcg/min while another unit uses mcg/kg/min. Unfortunately, it might not be possible to detect all ways that the drug is given until standardization in your institution is approached.

Nursing and physician input is critical during the development of standardized doses, but clinical pharmacists should lead the process, as they have the best understanding of the entire drug-use process. Using standardized concentrations minimizes the number of drug libraries needed—for example, only one for ICUs—and reduces the difficulties nurses will have caring for patients in different units. For instance, a surgical patient can be cared for in a medical ward, and the nurse only needs to select from one drug library and not multiple libraries. In turn, the potential for dosing errors is minimized.

Piloting the Pumps

If your institution is unsure of committing to a large-scale smart pump implementation, introducing a pilot could help sway the decision. Not only will it be possible to assess nursing's satisfaction with the extra protection associated with the drug library, but it is also possible to collect data on how the alerts assist with proper therapy. For example, if the data reveals that the test-unit nurses programmed at least one dose

outside of the recommended ranges per day, (but were stopped from administering that dose by the pump's alert) the technology's benefits could be easily demonstrated to hospital administration. The pumps' initial cost can be justified based upon the cost savings the hospital will realize through reduced medication-error rates.

Ease of Use

It is essential for the pharmacist to be familiar not only with the drug library, but also with the technology and processes for loading and collecting the pump information. When updating is necessary, a simple process will allow for flexibility in making changes, particularly in the following instances:

- If a programming error is detected on the pumps, an emergency update is necessary.
- Upon a change to the hospital's formulary or standardized drug concentrations, the pump's library will need to be updated.

Also consider establishing a method by which you can easily "reach" the information in all of your pumps at once. Such a method is easier than programming each pump independently.

These pumps can also store a wealth of data. Not only do the records of issued alerts serve to enhance patient care, but the pumps also generate information regarding a hospital's drug use. Even though this information should be shared with various disciplines, the lead pharmacist should be responsible for assimilating and reporting the data. With this in mind, during your product selection, consider the ease of data retrieval, the standard reports available, and the ease of building custom reports to answer certain questions.

Evaluating the Vendor's Future

Because this technology is still new, many changes will continue to occur in the marketplace. Early adopters of smart pump technology need to select a vendor that will provide them with flexibility as the market matures. The areas of the technology that will continue to develop include the use of wireless smart pumps, bar code scanning in conjunction with the pumps, and automatic programming. As such, it is essential to select a vendor that can offer pumps with these capabilities and that will allow your institution to upgrade your pumps as necessary.

Pharmacy involvement is critical in the decision to utilize smart pumps, and the selection of the devices. The guidelines outlined in this article will help you in your selection process, and can ensure the best decision is made for your institution and patients. *FR&P*

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Hospira's Plum A+ can be programmed with both hard and soft limits.



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- Alaris/Cardinal Health **Circle reader service number 97**
or visit www.cardinal.com.
- B. Braun Medical Inc. **Circle reader service number 98**
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