



# Developing a Complete and User-Friendly Drug Library

## A First Step to Smart Pump Success

**S**mart pumps have had a proven impact on patient safety and provide an additional tool for reducing errors associated with IV medications. One of the key aspects of a smart pump implementation is the creation of the drug library, which provides the data that drives system alerts to users. Key data components for each drug in the library include: drug name; concentration; and minimum and maximum infusion, and minimum and maximum bolus infusion rates per specified time, all using appropriate dosing for drug specified, i.e. mg/kg/hr, mcg/kg/hr, mg/hr, ml/hr, etc. Pharmacy's involvement and leadership in the development of the library is necessary in order to ensure its completeness and ease of use.

### Vendor-Supplied Drug Libraries

Many smart pump vendors offer sample drug libraries, which are often be a compilation of other facilities' libraries and may or may not meet your facility's needs. With this in mind, work with your vendor to ensure the sample library will work in your environment. Clinical advisory settings from other facilities can be helpful in determining when reminders should be offered at the point of care, i.e. an alert to use a central line for concentrated amiodarone infusions. Your pharmacy-nursing or other appropriate committee should review the sample library and involve a subcommittee with representation from intensive care, general care, adult and pediatric care, oncology, and anesthesia in the review. Furthermore, review by the medication use, P&T, or other appropriate committee can provide medical staff oversight of the project. Other key staff members, such as medication safety pharmacists or nurses and risk-management or quality personnel, if available, should review the library from their various perspectives.

After a complete review of the sample library, you may find some degree of customization necessary to meet your facility's needs. Matching the drug library to your facility's existing prescribing, dispensing, and administration conventions will build more user intuitiveness into nursing's process at the bedside, resulting in a lower learning curve as the pumps are rolled out. That said, variability in IV medication practices between individual nursing units, patient types, and patient care services contributes to a lack of consistency in practices and should be addressed prior to a smart pump implementation.<sup>1</sup>

### Formulary Review and Medication-Use Evaluation

The initial step of drug library creation starts with a formulary review and medication use evaluation. Assess medication use in the areas where the pumps will be deployed and then stratify the drugs used by various categories, i.e. high-alert versus non-high-alert drugs, continuous infusion versus intermittent infusion, and so on. Also compile internal data on medication errors, and examine the drugs involved and common ordering protocols for those drugs. This is the start of a con-

tinual quality improvement (CQI) process, detailed below, through which medication error and dosing protocol data is used to update and augment the drug library on an ongoing basis.

The decision to have separate libraries for various areas generally revolves around patient acuity, available monitoring, established policies and procedures, and the clinical judgment of the library authors. From a patient safety standpoint, the use of drugs requiring intensive monitoring would not be permitted in care areas where this type of monitoring is not available, thereby driving the need for multiple libraries. Decisions concerning the use of concentrated infusions and limitations for high-alert medications outside of the ICU need to be made. For instance, dopamine in a standard concentration of 400 mg/250 mL may be considered suitable for the ICU library at a maximum rate of 20 mcg/kg/min, but may only be considered safe up to a maximum rate of 10 mcg/kg/min on a step-down unit, based on nurse-patient ratios and available physiologic monitoring. Using prefixes such as "ICU" and "GC" (for general care) before drug names could designate drug library settings to improve ease of use and patient safety. In this vein, different settings for a cardiovascular ICU versus a burn ICU may be of further benefit. Furthermore, weight-based dosing for pediatric medications may be required to ensure the effectiveness and safety of your drug library.

As smart pump technology becomes more integrated with other hospital systems, it will be necessary to incorporate lab data and data from physiologic monitoring in your drug libraries. In this vein, some hospitals have already begun integrating SpO<sub>2</sub> and end tidal CO<sub>2</sub> monitoring data with their intelligent PCA pumps.<sup>2</sup>

### Standardized Concentrations

As part of a smart pump implementation project, standardized concentrations have been known to enhance patient safety.<sup>3</sup> Because current Joint Commission standards mandate the adoption of standardized concentrations for IV medications, many facilities have already begun addressing this important area of drug library development and have successfully standardized concentrations by settling on normal and concentrated formats to accommodate patients who need reduced fluid intake. Vasoactive drugs and thrombolytics used for cardiac surgery patients (norepinephrine, phenylephrine, epinephrine, and TPA) are generally good places to start standardizing, should you treat this patient population at your facility.

Agreement between nursing and pharmacy is vital for those emergent situations when immediate-use infusions are prepared at the bedside and followed by pharmacy-prepared infusions. Ideally, the concentration of both preparations should be the same.

### Drug References

The use of tertiary, secondary, and primary drug references is necessary when devel-



Photo courtesy of Cardinal Health

For your override rate, set an initial goal of 15-20%, with <5% as your ultimate goal.

oping an evidence-based drug library. Pharmacists need to extrapolate maximum dose information provided by the drug reference to a maximum infusion rate per specified time period, in order to set up the library. For example, one common reference states a maximum recommended infusion rate for vancomycin of 60 minutes, with no reference to the dose infused. This would need to be converted to mg/hr in the drug library for use on the pump.

#### Data Presentation

Because drug name confusion is frequently identified as a root cause of medication errors,<sup>4</sup> you must also consider how data will be presented in the library. The use of enhanced lettering, such as standardized tall-man lettering, is recommended for differentiating look-alike, sound-alike drug names and has been shown to improve user identification of the correct drug name.<sup>5,6</sup> In addition, special symbols can be used to differentiate drugs used for different indications within the same patient type. For example, you can place a percent (%) symbol at the beginning of all anesthesia-specific drug names to separate them from other drug listings used throughout the hospital.

#### Continuous Quality Improvement

An assessment of drug library overrides and resulting patient outcomes should be carried out frequently in the early stages of your smart pump implementation process, and changes should be made to the library as needed to mitigate harm and improve patient safety.


With wireless networking functionality, this data exchange can be performed as often as daily, and data review and routine reporting to the medication-use committee can be more easily incorporated into your facility's quality metrics than would be possible with a less automated data download process. Although national benchmarks are not currently available, a 15% to 20% override rate should be considered an initial goal, with the ultimate goal of a rate less than 5%.

The continued use of internal data, published evidence, and resulting practice change assessments should trigger a repeat of the drug library development process to insure clinical applicability and adherence to existing practice patterns. The frequency of this process will depend on the individual institution and the resources available for this review. However, rigorous and well thought-out drug library development processes – both initial and ongoing – are necessary for any facility seeking to improve patient safety through the use of smart pump technology. ■

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#### References:

1. Bates DW, Vanderveen T, Seger DL, Yamaga, CC, Rothschild J. (2005). Variability in intravenous medication practices: implications for medication safety. *Joint Commission J on Quality and Patient Safety*. 2005;31(4): 203-210.
2. Overdyk FJ, Carter R, Maddox RR, Callura J, Herrin AE, Henriquez C. Continuous oximetry/capnometry monitoring reveals frequent desaturation and bradypnea during patient-controlled analgesia. *Anesth Analg*. 2007;105:412-418.
3. Maddox RR, Williams CK, Oglesby H, et al. Clinical experience with patient controlled analgesia using continuous respiratory monitoring and a smart infusion system. *AJHP*. 2006;63:157-64
4. Larsen GY, Parker HB, Cash J, O'Connell M, Grant MC. Standard drug concentrations and smart pump technology reduce continuous medication infusion errors in pediatric patients. *Pediatrics*. 2005;116:e21-e25.
5. Santell JP, Cousins DD. Medication errors related to product names. *Joint Commission J on Quality and Patient Safety*. 2005;31:649-653.
6. Filik R, Purdy K, Gale A, Gerrett D. Drug name confusion: evaluating the effectiveness of capital (tall man) letters using eye movement data. *Soc Sci Med*. 2004;59:2597-2601.
7. Institute for Safe Medication Practices. List of product names and recommended revisions for the use of tall-man letters. Available at: <http://www.ismp.org/Newsletters/acutecare/articles/20010901.asp>. Accessed March 17, 2008.



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