Infusion-related errors expose patients to a high risk of harm. “Smart” infusion pumps that include dose-checking technology are available to help avert potentially harmful medication errors. The role of the smart pump is to “remember” the large number of rules (hospital-defined dosing limits and other clinical advisories) that are entered into the drug library and to apply those rules during pump programming to warn clinicians about potentially unsafe drug therapies.

Equally important, the role of the clinician is to use the technology consistently. Clinicians have sometimes bypassed the built-in safety features, only to realize their true value after a serious error has occurred that could have been prevented. The following scenario describes one such instance.

A 19-year-old obese woman who had recently undergone a cesarean delivery presented in the emergency department (ED) with dyspnea. Believing that the patient had a pulmonary embolism, the physician prescribed an intravenous (IV) heparin bolus dose of 5,000 units, followed by a heparin infusion at 1,000 units/hour. After administering the bolus dose, a nurse started the heparin infusion but mis-programmed the pump to run at 1,000 mL/hour, not 1,000 units/hour (20 mL/hour). By the time the error was discovered, the patient had received more than 17,000 units (a 5,000-unit loading dose and about 12,000 units from the infusion) in less than an hour since her arrival in the ED. A smart pump with dosing limits for heparin had been used.

The programming error should have been recognized before the infusion was started; however, the nurse had decided to bypass the dose-checking technology and had used the pump in its standard mode. It was fortunate that the patient did not experience adverse bleeding, because her activated partial thromboplastin times were prolonged by as much as 240 seconds initially and by as much as 148 seconds two hours later.

After further investigation, it was discovered that most nurses in the hospital, like the nurse involved in this error, were bypassing the dose-checking capability that came with the smart pumps. Although the reasons for not using the technology were not specified in the error report, studies suggest that clinicians might decide to bypass the technology because of:

- inaccurately low perceptions of risk.
- failure to make adjustments in the drug library when alerts are not credible.
- the extra work needed to use the infusion pump’s built-in features.
- time pressures and clinical emergencies.
- a culture that inadvertently supports at-risk behaviors, including technology work-arounds.

Smart pumps that turn on in a standard mode (i.e., without any dose-checking), or that default to a standard mode, can also discourage compliance because they take extra effort to switch the pump to the dose-checking mode and to access the library. Smart pumps that call for extra effort are more desirable than pumps that turn on in the standard mode because humans can always defeat technology if it is perceived to be a barrier.

We can compare smart pump technology to a seat belt. Unlike airbags, which are no longer optional safety features that can be bypassed by the user, seat belts are optional equipment and, like dose-checking technology, can be bypassed despite a policy that may require their use. Thus, it is not enough to purchase smart pumps, program the library to enable the technology, distribute the pumps, educate users, and hope that the dose-checking feature will always be used. Clinicians must be encouraged to avoid bypassing safety features and/or to report conditions that encourage work-arounds so that they can be remedied. Promoting the critical thinking necessary to evaluate pump alerts, from both a clinical and a safety perspective, would also limit overrides to situations that have been fully appraised.

Thus, a culture of safety provides a foundation for using smart pumps correctly and heeding the alerts that might arise. Additional measures that can promote compliance with technology and attention to the alerts include:

- analyzing pump logs and making necessary adjustments to the drug library.
- evaluating all overrides.
- publicizing “good catches.”
- conducting focus groups and satisfaction surveys to solicit nursing feedback.

Health care clinicians should not view the dose-checking feature of smart pumps as an option that can be turned on or off, and they should not bypass alerts that arise from the system without serious consideration. Compliance with dose-checking features should be measured, and any barriers to compliance should be identified and removed. As with other technologies, part of the planning process for smart pumps should include a readiness assessment of the organization, with particular attention directed to its culture.

For every error like the one described earlier in the scenario, many more mistakes could be prevented if smart pump technology were used. Smart pumps can save lives if they are properly designed and if they are used. In fact, failure to

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use the appropriate safety features will probably be considered suboptimal care in the near future.

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-FAIL-SAFE or via e-mail at ismpinfo@ismp.org.