



A report by  
Hospira  
Worldwide, Inc.

## Hospira LifeCare PCA<sup>®</sup> Pain Management System



### Abstract

Patient-controlled analgesia (PCA) has been a welcome advancement in the therapy of acute postoperative pain. Unfortunately, as with all infusion pump technologies, medication errors resulting in patient harm have been reported during PCA use. The advent of "intelligent" IV infusion pump technology, with medication management and barcode capabilities, has the potential to substantially reduce operator errors and thus help enhance patient safety.

### History of Patient-Controlled Analgesia

A landmark advance in the control of acute postoperative pain occurred in the 1980s, with the advent of intravenous (IV) patient-controlled analgesia (PCA). For the first time, the actual patient experiencing pain was empowered to control his/her own treatment for pain relief. Limits were programmed into the dosing apparatus to help prevent drug misadventures. No longer were patients required to receive analgesics by intramuscular injection (which may itself be

painful), often long after the caregiver (nurse or other healthcare personnel) had been summoned for assistance. Nor were the patients required to wait for the clinician to go through a lengthy process of obtaining and preparing the medication for delivery, thus delaying patient access to pain relief.

At the heart of PCA is a sophisticated IV infusion pump that is activated by the patient to deliver a pre-programmed dose of analgesic at the press of a button. For safety reasons, there is a pre-programmed time interval (lockout period) between doses in which the pump cannot be activated by the patient.

### PCA Errors

Considering the powerful, high-risk medications (primarily opioids) delivered during PCA therapy;

LifeCare PCA<sup>®</sup>



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errors occurring during use can be life-threatening. Over a recent five-year period (1998 - 2003), over 5000 PCA errors were reported to the USP medication error reporting databases (MEDMARX, MER). Eight percent of these (over 400) were associated with patient harm. In common with other voluntary adverse event reporting systems, these figures are likely an underestimation of the extent of the problem. Potential hazards that have been reported during use of PCA therapy are detailed in Table 1. Many of these potential hazards are caregiver-based and thus amenable to education and improvements in infusion device design. In response, some manufacturers (such as Hospira) of PCA infusion pumps have designed and introduced easy-to-use "intelligent" pumps utilizing customized drug libraries and integral barcode technology to help reduce caregiver error.

### LifeCare PCA<sup>®</sup> with Hospira MedNet<sup>®</sup> Software

Hospira Worldwide Inc. has been the industry leader in PCA medication delivery systems since the 1980s when it introduced the first PCA infusion pump. Today, Hospira offers a complete portfolio of infusion and safety software systems that allow the client to standardize medication management across a common platform.

Hospira's LifeCare PCA<sup>®</sup> Infusion System with Hospira MedNet<sup>®</sup> Software has the potential to reduce medication errors and enhance workflow and best practices. Barcode drug identification for both commercially-available prefilled drugs and those compounded in the pharmacy help ensure that the drug administered and its concentration

is properly identified, and the correct medication program parameters for that drug and concentration (also called a rule set) are utilized. Wireless capability allows real-time infusion monitoring and integration to barcode point of care (BPOC) systems for "5-rights" verification (right drug, right dose, right patient, right time, and right route). Higher drug concentrations and dosing limits allow for more flexible dosing, even for the drug-tolerant patient. Confirmation screens and stored protocols (stored programs such as standing orders) are displayed on intuitive, easy-to-understand programming screens while a clear, easy-to-read numeric keypad allows direct numeric input. The extensive use of human factors research from the inception of design makes the LifeCare PCA<sup>®</sup> easy to use. Multiple configurable alarm sounds allow the clinician to differentiate the infusion system from other devices, thus helping facilitate a timely response.

Dosing limits are configurable for 1, 4, 6, or 12 hour intervals. Expanded stored protocols allow for greater customization of standing orders (5 per clinical care area or 90 in total). The enhanced event log facilitates tracking of device overrides and alerts. Continuous quality improvement (CQI) reports can provide actionable information to enhance caregiver performance and improve patient safety. Client continuing education with Internet-based e-learning promotes standardization in implementation and consistency in learning. Hospira e-learning provides immediate 24-7 access to device-specific learning resources and allows the client to track individual training completion and competency. E-learning provides flexibility in terms of when and where training is scheduled and/or completed.



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### Hospira MedNet<sup>®</sup> Software

This is the high-performance safety software interfacing with the Plum A+<sup>®</sup>, Hospira's general infusion device, and the LifeCare PCA<sup>®</sup> Infusion System. Both the Plum A+<sup>®</sup> and the LifeCare PCA<sup>®</sup> infusion systems utilize the same software platform and are available in several system packages, in wired or wireless configurations.

Hospira MedNet<sup>®</sup> Software allows the use of facility-manufactured vials using pharmacy-generated barcodes to confirm the correct medication and concentration.

Drug libraries, for as many as 18 clinical care areas (CCAs) with up to 25 drugs per CCA, are customized to meet the needs of virtually any client. These libraries provide hard and soft dosing limits for each medication along with a capacity of 90 stored protocols (maximum of 5 per CCA) to facilitate customized standing orders. Nurses can manually override soft dose limits when a dose is clinically appropriate for the patient and the situation. When soft limits are overridden, a symbol (⬇️⬆️) is displayed on the final screen to indicate that the medication is running above or below the recommended dose range. Medication identification and final programming confirmation screens help reduce the potential for programming errors. The standard Hospira MedNet<sup>®</sup> data report templates collate and display data to permit at-a-glance understanding of infusion data, including medications infused (by CCA, by medication, etc.), alarms/events, asset utilization, and other variables. These data can, in turn, help to manage resources, work more efficiently, pinpoint areas needing improvement, and help to reduce adverse drug events and, hence, potential liability costs.

In the future, Hospira plans to provide enhanced capabilities for connecting infusion software to monitoring devices and other clinical information systems to allow enhanced tracking of patient care and outcomes.

### Hospira's Commitment



Hospira is committed to "Advancing Wellness™ ...through the right people and right products." "Advancing" focuses on the progressive, positive, and purposeful approach we take as we look to the future. "Wellness" demonstrates a broad commitment to healthcare, supported by our extensive product line which helps improve the well being of patients worldwide. "Wellness" also refers to the overall well being of our customers.

Hospira is committed to helping reduce medication errors and enhance patient safety through the development and distribution of Medication Management systems with barcode capabilities. These are designed to help caregivers confirm the "five rights" of medication delivery safety with the goal of helping to minimize medication errors.



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Table 1. Taxonomy of PCA Hazards



Use of wrong drug or drug concentration

Accidental misprogramming at the caregiver-pump interface

False triggering (various reasons)

Triggering in error by the proxy (i.e., family member, nurse)

Hardware or software failure/malfunction

Drug accumulation, siphoning, or retrograde flow due to dead space or catheter blockage

Poorly-written orders or duplicate analgesic orders

Anaphylaxis

Extraordinary drug sensitivity

Reprogramming with criminal or "mercy" intent