Avoid Medication Errors Caused by System Downtime:
Automating Your Pharmacy Information System Back-Up

by Leslie Pires, PharmD
Michael Muller, PharmD

PATIENT SAFETY IS THE FOCUS OF EVERY PHARMACY DEPARTMENT AND hospital organization, and is built into our daily, computerized pharmacy processes. But when those computerized processes are unavailable, our patient safety responsibilities become a heavier burden. No matter how efficient your manual back-up system is or how talented, dedicated, and meticulous your pharmacy staff may be, errors can occur during downtime. That is a liability in any hospital pharmacy, but in a level III neonatal intensive care unit (NICU) pharmacy, downtime without an automated computer back-up can leave you especially exposed to risk.

The vulnerable population of a NICU needs clinical care, whether the pharmacy system is up or down, and unlike adult patients, these fragile babies require individualized doses of pharmaceuticals based on their weight, which can change daily. Women & Infants Hospital in Providence, Rhode Island, has one of largest NICUs in the United States, and we dispense between 300 and 500 individualized doses a day. To provide the level of care that our patients require 24 hours a day, an automated computer back-up system is essential. The safety of our patients depends on it.

Why we needed a back-up system

In 2004, Care New England, of which Women & Infants Hospital is a part, initiated a system-wide implementation of a new pharmacy information system (PIS) as the first step in the deployment of a clinical information system. However, because the new PIS had no automated back-up system for inevitable system downtimes (both scheduled and unscheduled), a back-up solution was needed before the NICU pharmacy could implement the new system.

We needed a back-up that functioned at least as well as the off-the-shelf system we had modified to work with our old pharmacy information system. That system, bought sometime in the ’90s, was clearly outdated, even clumsy, but it got the job done. Though it wasn’t automated, it did calculations of doses and volumes, produced individual and batched labels, kept profiles, and provided passive dose range checking. With it, we could calculate doses accurately. We ran it on the network, kept a back-up on a standalone hard drive, and kept another copy on disks. It was an elementary system that had served us adequately, but it was incompatible with the new system.

We needed a back-up tool that would minimize risk and save time. Our busy pharmacy required a system and workable processes to ensure that:

- Our tiny patients’ medication needs were met during downtimes
- New orders for existing patients could be captured
- Changes to orders could be made
- Labels could be printed

Our back-up system had to be both linked to the pharmacy system and independent of it—linked so that it would have completely up-to-date information, and independent so that it would run when everything else was down.

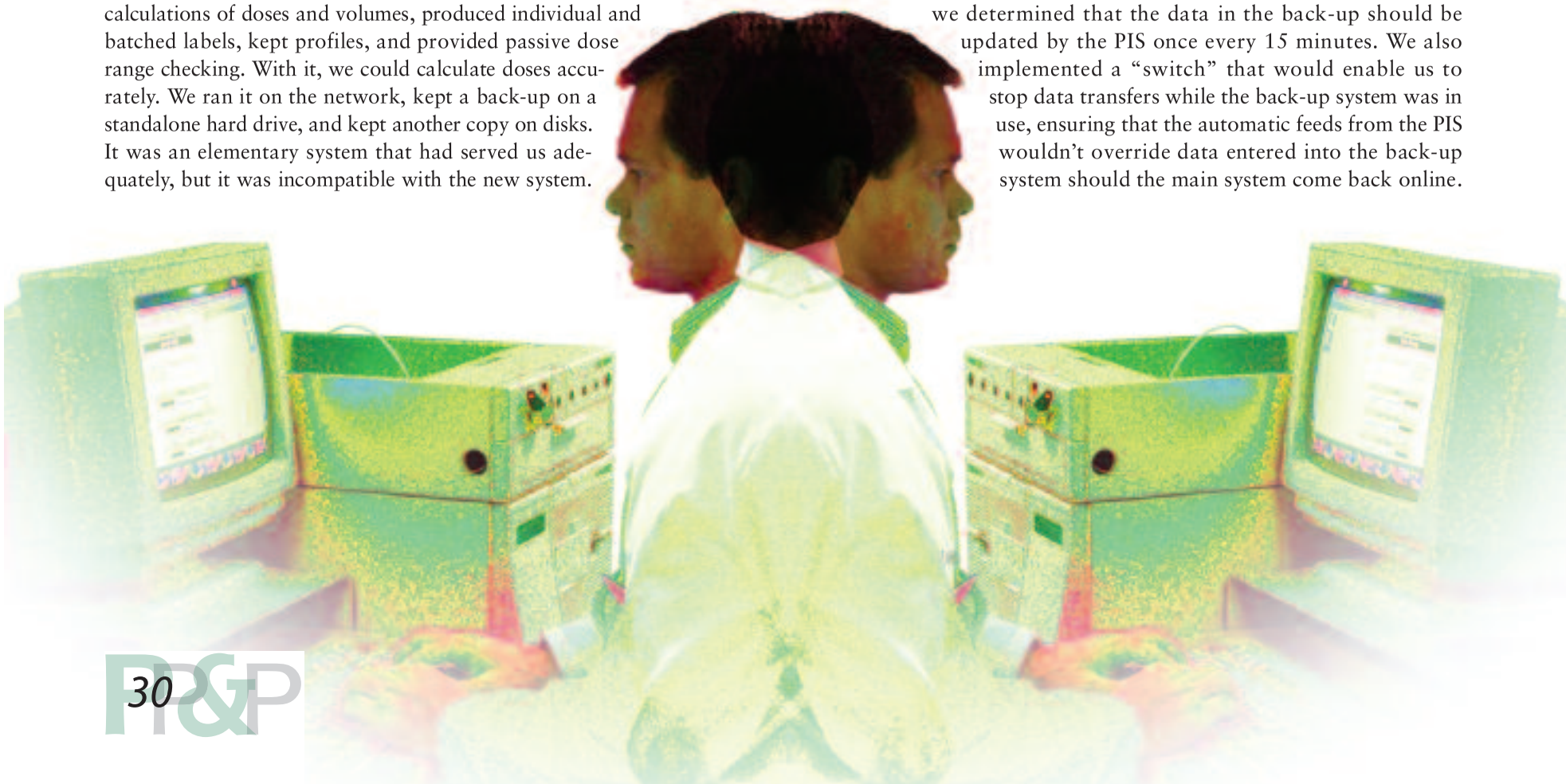
The system’s features also help us manage particularly long periods of downtime.

Building a back-up solution

We first turned to the clinical information system vendor for a solution. But because the vendor’s solution was essentially a stand-alone of the main system, it was far too complex and costly a solution. Instead, Care New England hired Superior Consultant Company to work with Women & Infants Hospital’s NICU pharmacy to build a stand-alone, back-up pharmacy system, based on existing technology and requiring minimum hardware and software expenditures.

After defining our basic requirements, we outlined the design of the system and we explored our existing technology. At that time, Care New England already used SQL server and was rolling out Microsoft Office, with Access as part of the standard load. Superior recommended using Access as a stable and reliable platform for the back-up tool and for the system’s security database.

Once the details of the design had been determined, it took one month to build, refine, and test the back-up system. During that time, we determined that the data in the back-up should be updated by the PIS once every 15 minutes. We also implemented a “switch” that would enable us to stop data transfers while the back-up system was in use, ensuring that the automatic feeds from the PIS wouldn’t override data entered into the back-up system should the main system come back online.



After extensive staff education and unit and integrated testing, the system was delivered and installed within a week.

How the back-up system works

The back-up tool resides on a stand-alone workstation in the pharmacy, and remains operational if the hospital network goes down unexpectedly and during scheduled system downtimes (in our case, for four hours once a month).

The system:

- Extracts patient and pharmacy-order data from the main HIS/PIS through a data transformation services (DTS) package.
- Allows the modification of existing patient profiles and pharmacy orders.
- Allows the addition of new patient profiles and pharmacy orders.
- Generates pharmacy labels for a single order or for batch processing.
- Generates reconciliation reports when the PIS resumes operation.
- Automatically downloads updates to system tables on the next scheduled extract.

The system uses two Access databases: one for the application and the other for security. Our role-based security system allows for flexibility in assigning user functionality and privileges.

When an eight-hour, unexpected network downtime kicked the system into gear, the pharmacy functioned at full speed.

While the main system is operational, the Access database is refreshed every 15 minutes with information from the PIS through a data transformation services (DTS) package. The system extracts patient demographics and pharmacy orders, and all relevant reference tables (dose/volume modifiers, sex codes, frequencies, formulary, etc.).

When the back-up system is needed, we disable the DTS package and the Access database is ready for use. The user logs into the back-up application, and sees a user-friendly switchboard. Once logged in, we can view, update, or add patients.

The patient list is searchable by name, patient number, or FIN (financial number). The patient profiles list demographics, weight, nursing unit, bed, allergies, prescribed medicine, and other information. If the patient's information has been extracted from the main system, only certain fields (those in white) can be modified, while others (those in gray) are locked and cannot be changed, an added safety measure for pertinent data.

In the back-up system, we can modify or add a drug order for a listed patient. A red asterisk signals required information and a drop-down menu lists the drugs in the formulary. New drug products can be added to the formulary by simply entering the drug name and concentration. Active dose range checking is provided by weight or fixed dose on a per dose basis. Once the order is confirmed, it will appear in the patient profile. We can print a label for the drug on a dedicated label printer at the workstation.

To add a new patient, we open a blank patient profile, enter, and then confirm the required information. Red asterisks indicate required fields. The new patient will then appear on the patient list. While the main system is still down, all of the fields in that new patient's profile can be changed and appear in white.

The back-up system generates a variety of reports, one of the most useful being the reconciliation report. This report shows all the changes that have been entered while the system or network was down, whether the changes are the addition of new patients, modifications to existing patient profiles, or the addition of new drug products. Only the changed data shows up in the reconciliation report.

The system's features also help us manage particularly long periods of downtime. It is able to batch print labels, with the appropriate number of labels for each drug order for a 24-hour period.

After the network or main pharmacy system returns to operation, the changes made during the downtime must be manually entered into the PIS. At the suggestion of our IT department, we opted not to build real-time interfaces to the main hospital pharmacy system, so as not to compromise the PIS. Data flows in only one direction: from the main system to the back-up. Furthermore, the back-up system does not provide billing or identify drug/drug or drug/lab interactions, which pharmacists must check for manually.

Getting the job done

Women & Infants Hospital's pharmacy back-up system scored its first success within days of its deployment. When an eight-hour, unexpected network downtime kicked the system into gear, the pharmacy functioned at full speed.

Since the system was installed in April 2004, we have experienced three major, extended downtimes, in addition to our monthly scheduled downtimes. In all cases, the system works remarkably well.

The development of our pharmacy back-up system was a success for some very specific reasons. First, we were very clear about the requirements of the system and worked with Superior Consultant Company's team to delineate those requirements. Second, we were creative in leveraging the technology already available in the organization. Third, the pharmacists and Superior's consultants worked as a team throughout the process. The result was a solution that was designed, built, tested, and deployed in two months, and one that enables us to seamlessly provide our tiny patients with quality care. P&P

Leslie Pires is the director of pharmacy at Women & Infants Hospital in Providence, Rhode Island. She received her PharmD from the University of Rhode Island. Dr. Pires is a past president of the Rhode Island Society of Health-System Pharmacists, which named her Pharmacist of the Year.

Michael Muller, the NICU clinical pharmacy specialist at Women & Infants Hospital, received his PharmD from the University of Rhode Island. He is an adjunct clinical assistant professor of pharmacy practice at the University of Rhode Island, College of Pharmacy and the School of Pharmacy at Northeastern University's Bouvé College of Health Sciences.

Where to find it:

Superior Consulting .....Circle reader service #60
or visit www.superiorconsultant.com