



# What Does Pharmacy Automation Mean for Packaging?

Hallie Forcinio

**The American Pharmaceutical Association predicts that the number of prescriptions filled annually will grow from approximately 3 billion currently to more than 4 billion in 2005.**

**A**s the number of prescriptions filled by automated pharmacies grows, packaging must evolve to meet new demands. Chances are we'll see greater standardization of packaging, and drug makers will be asked to supply product in larger bulk quantities. Other possibilities include the development of protective secondary packaging to safeguard products from irradiation or other treatment processes put in place to prevent bioterrorism through the mail.

Merck-Medco's second-generation automated facility in Willingboro, New Jersey, demonstrates the packaging changes pharmacy automation may bring. At 280,000 ft<sup>2</sup>, the new location is even larger than the pharmacy benefit manager's first automated pharmacy established five years ago in Nevada.

Capable of filling more than 800,000 prescriptions per week, the Willingboro facility features automation technology from 10 countries and uses

three methods to stage more than 1000 drugs for dispensing. Approximately 75% of the pharmacy's prescriptions are handled by the automated dispensing of solid dosage forms from bulk supplies of 10,000 or 20,000 tablets or capsules. These solid dosage forms are received in pallet-load quantities and are removed from their original shipping containers — typically 30-, 60-, or 90-count bottles — and placed in intermediate replenishment containers. As dispensing-cell supplies are depleted, pharmacy technicians replenish dedicated dispensing channels, and one of the facility's 71 registered pharmacists verifies that the proper drug has been placed in the correct channel. Merck-Medco hopes eventually to eliminate the unpackaging-intermediate replenishment step and receive solid dosage forms in larger bulk quantities than is common today. "Ideally, more drug makers will begin

packaging their products in larger, 1000- to 10,000-[pill] quantities," predicts Mike Frank, general manager of the Willingboro facility.

The other 25% of the prescriptions received at the facility are accommodated by automated or manual dispensing of cartoned product. Dosage forms other than tablets and capsules generally arrive in cartons and are staged on the dispensing floor for automatic picking by a robot arm or are arranged on flow racks for manual dispensing by a registered pharmacist. Most of the drugs dispensed manually require refrigeration and special protective packaging, hence the manual operation.

Doctors or patients in Merck-Medco member plans send their prescriptions by mail, fax, phone, or Web site, and 99% of the prescriptions are filled within 24 hours of receipt. Before a prescription is released to be filled, an automated drug utilization review flags any issues such as potential drug interactions. Flagged prescriptions are referred to a registered pharmacist for investigation and resolution.

Nearly all of the prescriptions for solid dosage forms are filled from 1 of 1900 dedicated dispensing channels into 110- or 165-cm<sup>3</sup> bottles. The company has standardized the two sizes and fills more than a tractor trailer-load of the round containers each day. The two sizes of injection-molded, white, high-density polyethylene bottles vary slightly in height but feature a common neck finish so the same 45-mm, tamper-evident, white, polypropylene closure can be used on either container. A knurled surface makes the cap easier to grip, and a removable insert allows patients to switch it from a push-and-turn, child-resistant (CR) style to a non-CR twist-off.

Once the drug utilization review is complete, the pharmacy's central control system downloads patient information for each prescription to a high-speed print-apply labeler. After the customized label is printed and applied, containers are loaded into a 24-bottle transporter, or carrier, for the trip to one of five dispensing lanes. By reading bar codes on the carrier and bottles, bar code scanners direct the carrier to the proper dispensing

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After filling and capping, a robot arm plucks each prescription bottle from its carrier and sets it on a conveyor for the trip to the consolidation point, where it is swept into a mailing bag along with personalized patient instructions and billing information.



At Merck-Medco's automated pharmacy in Willingboro, New Jersey, bottle movement, filling, capping, and labeling are governed by a central computer system and bar coded components.

ing point, and the computer tells the dispenser the quantity of tablets or capsules to be released. "The central computer not only tracks the actual location of the carrier, but also the location of each bottle in the carrier," explains Frank.

Carriers of filled bottles move to a four-headed capper, which applies closures to four containers at a time. After an automated torque check ensures that caps are neither too tight nor too loose, the carrier proceeds to the consolidation area. At this point, a robot picks up one bottle at a time

from the carrier and sets it on a conveyor where a rotating mechanical arm sweeps it into a 10-mil-thick, high-density, polyethylene bag. At the same time, a shipping label is printed and applied to the bag. Literature and billing information, customized for the prescription and patient, are printed on demand in an area on the second floor and delivered by a pinch-belt assembly to the consolidation point. Linear bar codes ensure that bottles and cartons, printed materials, mailer bags, and prescriptions match. Mailers can accommodate as many as four bottles plus literature. Once all the components are present, bags are heat sealed and dropped onto a conveyor for the trip to the mail manifesting area.

To protect patient privacy, shipping labels include only return and recipient addresses, and bags are opaque white and unprinted except for register marks to ensure the heat sealer indexes the material properly. Bags rather than boxes were chosen as the shipping containers because "bags are lighter and save money on postage costs," explains Frank. In addition, he says, bags proved "more practical with the automated process."

At the mail manifest station, more than

90% of the packages are prepared for transit by means of the US Postal Service. The remainder are sent by United Parcel Service or Federal Express. The shipment method is determined by the client's pharmacy benefit plan or a request for expedited delivery.

With the majority of its prescriptions delivered by the US Postal Service, Merck-Medco is monitoring proposals to protect the mail from bioterrorist activity stemming from last fall's illnesses and deaths caused by anthrax exposure from adulterated mail. "We support any means that protect patient safety," says Ann Smith, a Merck-Medco spokesperson. However, she adds, "We believe it's unwise to use current technology to irradiate mail containing prescription drugs. Not enough research has been done to determine what effect it

might have on medication." Preliminary testing indicates such exposure could have negative consequences. Possible solutions include adoption of radiation-resistant secondary packaging for mailed prescriptions or an alternate means of distribution. "There are a lot of unanswered questions in this area," she says. Meanwhile, the company is participating in a federal postal task force to address issues related to bioterrorism.

### Six Sigma quality

Electronic checks and balances supported by more than 200,000 development hours, 2 million lines of computer code, 41,000 control points, and 70,000 staff hours of testing enable the Merck-Medco prescription fulfillment process to operate at a Six Sigma level. Six Sigma, which means virtually error free, ensures delivery of the right quantity of the right medication to the right patient. If the system suspects a problem with one of the 6700 bottles that travel through the pharmacy's two miles of conveyors each hour, the order is set aside and sent to quality assurance (QA) for inspection. However, the fail-safe features of the system make QA checks a relatively rare occurrence. Fewer than 0.8% of the prescriptions handled at the



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Willingboro facility are flagged for QA review.

"We do no end-of-line inspection or sampling," reports Frank. "Quality is built into the process." In fact, Merck-Medco's Nevada facility has filled more than 100 million prescriptions without an error.

### Automation future

According to the American Pharmaceuti-

cal Association, the number of prescriptions filled annually will grow from approximately 3 billion currently to more than 4 billion in 2005. With this kind of growth, it seems likely we'll see more automated pharmacies. The benefits for both patient and drug maker are compelling. First, automation provides a level of quality even the best manual pharmacies can't achieve in an equivalent time frame. Sec-

ond, the convenience of home delivery can't be beat, especially for house-bound patients. Third, mail delivery can cut copay costs because maintenance supplies can be delivered in 90-day instead of 30-day quantities. Finally, high-volume ordering by the pharmacy can translate into lower costs per dose and passed-along savings.

Volume orders also benefit drug manufacturers because of potentially lower shipping costs and reduced quantities of transport packaging. For example, a significant savings in packaging costs and weight charges can be realized by switching from 12 90-count bottles to one container holding approximately 2000 tablets or capsules.

The number of automated pharmacies also is likely to grow because automation enables fewer pharmacists to fill more prescriptions and at the same time provides more time for patient care because less time is spent counting pills and generating paperwork. With the demand for pharmacists currently exceeding the supply, the investment in automation increasingly will be seen as the way to fill more prescriptions without adding personnel. To complete the picture, packaging equipment and materials already are evolving to meet the demands of automated dispensing. **PT**

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