



INSIDER WHITEPAPER



Credit: Aethon

Hospital Robots Make the Rounds

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MATERIALS ROBOTS AND PHARMACY PRODUCTION ROBOTS REACH EARLY MASS ADOPTION

A growing number of medical facilities and centralized internal pharmacies see efficiency gains as robots perform delivery and packaging tasks.

By Phil Britt

Today's hospitals are more like indoor cities – with food, laundry, mail, medical supplies and other materials moving among buildings several times per day. To become more efficient, hospitals are increasingly relying on robots to handle materials, enabling humans to focus on more-critical aspects of health care.

In this report, we'll look at the tasks that robots are doing within the hospital and pharmacy space, and the companies that make them.

WORKING BEHIND THE SCENES

In a hospital setting, materials-handling robots can provide basic movement of items such as food, linens, equipment, lab specimens, and non-narcotic medical supplies. Depending on the facility, the robots operate in dedicated spaces or move at least some of the time in the same hallways used by health providers and patients.

In the pharmacy space, robots are used to ensure sterility and correct dosages of medicines.

COMPANIES PROVIDING HOSPITAL DELIVERY ROBOTS

Robots first started entering hospitals less than 15 years ago, as administrators looked for efficient ways to make internal deliveries as their campuses grew.

Companies providing materials-handling robots in health care facilities include Aethon, JBT Corp., Panasonic, Swisslog and Vecna. Other materials-handling robots used in other collaborative environments could likely enter health care facilities if providers chose to compete in the market.

Aethon's TUG robots make an estimated 5 million deliveries annually in health care facilities, said Tony Melanson, Aethon's vice president of marketing.

Other companies, like ARxIUM, Omnicell and Stäubli cater to materials handling for pharmaceuticals, including pharmaceutical supply systems in medical facilities.

In hospital environments, the Aethon TUG robots transport scheduled and on-demand items between ancillary, support and patient care units, using

private wireless networks. The TUG units announce their arrival upon reaching their destination, notifying hospital personnel to load or unload the robot.

“The TUG robots offer a highly competent autonomous technology,” said Melanson. “They help improve workplace safety and hospital staff satisfaction. Hospital nursing staffs are overwhelmed.”

As medical facilities expand, the additional distance materials must travel make robots more practical than human labor, Melanson said.

Aethon has deployed nearly 500 robots to medical facilities worldwide. Considering the large number of medical facilities worldwide, Melanson said he sees a tremendous growth opportunity.

EL CAMINO HOSPITAL EXPANSION SUPPORTS ROBOT DEPLOYMENT

El Camino Hospital in Mountain View, Calif., has deployed robots for delivery tasks for nearly 10 years. The robots move independently around the hospital, even taking elevators if necessary.

The hospital campus includes 301 beds located in three buildings, the latest built in 2009. The new building grew the campus from 1,100 square feet per patient to about 2,300 square feet per patient, said Ken King, the hospital’s chief administrative services officer.

Prior to the expansion, the hospital relied on dumbwaiters, trash and linen chutes, and other passive systems to move materials without human intervention. But these old methods became inefficient to serve the needs of the expanded facilities, King said.

Hospital officials calculated it would require at least another 12.6 full-time



At El Camino Hospital in Mountain View, Calif., robots have performed delivery tasks for almost 10 years.

equivalent employees to move items now handled by Aethon TUG robots, King said.

Because the robots weren't proven in a hospital environment, King says he entered the project with cautious optimism. To protect itself, the hospital signed a five-year lease for the robots, but included an opt-out clause for a significant portion of the robots after the first year.

The project went so well that the hospital purchased an additional robot plus the original 19 robots, which are all still in use today, King said.

In the first year, the robots removed 10,200 trash carts; saved lab technicians more than 4,700 trips; and spent more than 12,700 hours making deliveries. About one-third of that time was spent pulling carts weighing more than 400 pounds. Robots also made nearly 12,000 deliveries to and from the hospital's internal pharmacy, traveling an estimated 13,300 miles.

The robots saved the hospital 40% compared to using humans for the same tasks, King said. He said savings increases every time the costs for humans – either in higher salaries or higher benefits costs – goes up.

“That’s a significant savings,” King said. “Health care is challenged with high costs, we need to do anything that we can to lower them. Using the robots enables us to deploy our workforce more closely to the bedside.”

“A more efficient logistics process enhances clinical outcomes,” King added. “Our TUG robots are increasing our on-time deliveries and accuracy, and don’t mind doing the dirty work that many employees found distasteful, such as picking up soiled linens or hazardous waste materials,” King said.

El Camino officials estimate the Aethon TUG robots now handle some 80% of the material deliveries within the facility, saving an estimated \$650,000 per year in wages and benefits.

While El Camino’s robots traverse areas that patients and doctors use, King said safety has never been an issue. “One of the benefits is that we can program the robots to move from point to point, on the elevators and through the hallways,” King said. “I can jump in front of one of the robots and it will stop immediately. We’ve never had an accident with one of them.”



Aethon's TUG Robots can help move materials within hospital environments. Robots like this are being used at the El Camino Hospital in Mountain View, Calif.

El Camino Hospital plans to add two new hospitals to its Mountain View campus by the end of 2019. By the time the new facility opens, King said he wants to have more robots and extend their tasks, such as having them bring trash all the way to trash compactors.

Though the hospital has not decided whether to increase the robot fleet as part of the hospital's expansion, King said he expects more materials-handling robots to be added. "They are a normal part of daily life," King says.



Materials-handling robots at The Ohio State University Wexner Medical Center work in areas apart from human workers.

ROBOTS SUPPLANT OLD TECHNOLOGY

At The Ohio State University Wexner Medical Center, materials-handling robots are essential in providing desired care to patients, officials said.

As the center expanded, its old overhead rail system that was used for materials transport wasn't going to be sufficient to support the increasing number of towers (each of which features a specialty hospital) said Dean Russ, manager of the automated transport system for the medical center.

Four years before El Camino Hospital was experimenting with its first robot fleet, Wexner started with materials handling robots from FMC Technologies (that division was later spun off and is now JBT Technologies).

The medical center started with 46 robots. In 2014, they added another 20 robots and refurbished the original fleet.

Unlike the TUG robots at El Camino hospital, the materials-handling robots (from JBT) at Wexner run in dedicated areas, without co-existing with humans. JBT is known for its materials handling robots in the food industry, including The Coca-Cola Company bottling plant in Atlanta.

At Wexner, the JBT units move items from the receiving dock to designated receiving locations in the center's different hospitals, each with its own tower



Materials-handling robots at The Ohio State University Wexner Medical Center work in areas apart from human workers.

and dedicated elevator. All lateral movement is done at the loading dock, the robot goes up and down its dedicated elevators.

Workers load flatbed carts with various supplies for receiving locations, then use a touchscreen to program the JBT robot with its various stops. At each stop, a worker removes the material(s) from the robot, scans the barcodes for each item taken, then sends the robot on its way, either to the next designated stop or back to the loading dock.

“There was good success with the initial implementation,” said Russ, adding that using humans for the same work is cost prohibitive in terms of wages and benefits. Since the robots don’t incur injuries, there are no worker compensation claims, Russ said.

The medical center expected to break even on its robot investment in 10 years, but reached that goal in half that time, which allowed the 2014 expansion.

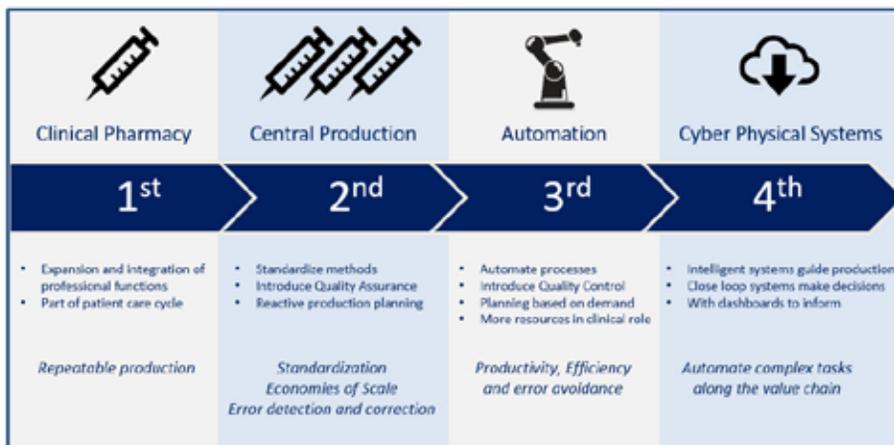
As the medical center expands further, Russ said he expects to expand the use of the robots, and is looking at Wi-Fi communications options, although hospital infrastructures have challenges in maintaining wireless signals.

ROBOTS AT INTERNAL PHARMACIES

Another location for materials-handling robots within medical centers is the internal pharmacy, where robots are preparing and delivering medications.

“The trend is toward higher volume operations,” says Thom Doherty, executive vice president in charge of strategy, for ARxIUM, a company that provides automation solutions for pharmacies. Robotic automation can handle the demand and speed it would take too many humans to perform, Doherty said.

To help ensure quality and consistency, more hospitals are handling the production of medicines and IV bags themselves rather than involving third parties, Doherty added.



ARxIUM's Pharmacy 4.0 process shows the different iterations of pharmacy production tasks.

To address this trend, ARxIUM developed its [ARxIUM Pharmacy 4.0 offering](#), focusing on system operability, information transparency, technical assistance and decentralized decision-making. Benefits include improved medication safety, quality, and output.

As internal pharmacies evolve and consolidate, they display more characteristics of a manufacturing hub, becoming a larger part of the supply chain in preparing and delivering medications. Internal pharmacies, particularly those serving large medical facilities, are becoming more important by implementing technologies commonly seen in the manufacturing industry to address demand.

The company's [RIVA system](#) is an example of pharmacy technology that includes Pharmacy 4.0 attributes. The fully automated IV compounding system's latest features provide enhanced workflow and analytic and data warehousing capabilities. ARxIUM also recently integrated its high-volume medication system, OptiFill-PPS, with the company's pharmacy software, RxWorks, to provide connected workflow and inventory management capabilities for central pharmacies and processing facilities.

RIVA, which uses a [Stericlean robotic arm from Stäubli](#), is a self-contained robotic cell, protecting outside contaminants. The automated process ensures accuracy and consistency for all prepared drugs and filled IV bags.



The Stericlean robotic arm can help pharmacies perform drug-filling and IV-filling tasks with more accuracy and consistency.

The first Stericlean robot was introduced 10 years ago; today the company offers many robots to meet the needs of sterile environments, including pharmaceutical and cleanroom applications.

“We’ve seen a real increase in demand for robotics inside automated pharmacy systems,” says Olivier Cremoux, robotics business development manager, North America, for Stäubli. The primary uses for these systems are medicine compounding and boxing, Cremoux said.

One of the latest additions of a pharmaceutical materials handling system is Omnicell’s XR2 Automated Central Pharmacy System, which Mercyhealth added to its central pharmacy operations in Rockford, Ill., in late March.

“Having the ability to streamline our pharmacists efforts with the XR2 allows them to refocus their time to serving our patients,” said Don Janczak, system director of pharmacy at Mercyhealth upon the announcement of the planned Omnicell implementation. “At Mercyhealth, hospital automation is something that we believe in, and our goal is to have a comprehensive inventory network that gives us more control with less labor. XR2’s barcode utilization integrates into our nurses’ scanning protocols, which helps reduce the risk of medication errors.”

AT THE INFLECTION POINT

Looking to the future, medical facilities and internal pharmacies expect to grow their use of materials-handling robots, especially for tasks that can be automated.

“The technology is still relatively new,” said Aethon’s Tony Melanson. “We’re at the inflection point right now.”

He added that increased attention for autonomous cars and robots in other industries provide more acceptance for materials-handling robots in the medical industry, moving the space to the early mass adoption stage.