Quick, Quiet And Out Of Sight

Stanford Hospital’s pneumatic tube system is a medical care superhighway

January 6, 2010

Stanford Hospital Chief Engineer Leander Robinson at one of the pneumatic tube system's control clusters. (Photo: Business Wire)

One of the most important working parts of Stanford Hospital is practically invisible and its invention dates back more than 200 years.

Seven thousand times a day, in four miles of tubing laced efficiently behind walls from basement to rooftop, a pneumatic tube system shuttles foot-long containers carrying everything from blood to medication.

In a hospital the size of Stanford, where a quarter-mile’s distance might separate a tissue specimen from its destination lab, making good time means better medicine.

“Approximately 70 percent of the information on a patient’s chart is lab data,” says David Myrick, quality coordinator for the Hospital’s clinical labs. “We conduct about 8 million tests a year, serving thousands of patients. We are going full blast, 24-7, at the highest level of testing. The tube system is part of a complex chain of events that ultimately give doctors the essential lab results they need to make decisions about our patients.”

Stanford Hospital’s container transport system, which also serves the adjacent Lucile Packard Children’s Hospital, is one of the largest in the country. Its architecture is a sophisticated design of switching points, waiting areas, sending and receiving points.

It hosts 124 stations (every nursing unit has its own); 141 transfer units, 99 inter-zone connectors and 29 blowers. To help alert employees to the arrival of containers, the system has more than three dozen different combinations of chiming tones.

Such pneumatic tube systems date back to the early 19th century, where they drove the workings of postal services, department stores and other commercial businesses whose physical size demanded something faster than standard human pace. But those versions were designed to move paper, which could handle a hard landing.

When computers began to eliminate paper with electronically deliverable data, tube systems lost their value until engineers figured out a way to control airflow to slow down the containers for a soft landing at their destination station.

At Stanford Hospital, before 1993, a team of about 20 people had the job of transporting the multitudes of tissue, medications and documents. However, the increasing size of the Hospital, and the addition of two adjacent buildings, the Blake Wilbur Cancer Center and the Lucile Packard Children's Hospital, made the tube system option the most modern solution. "We like the human touch," says Chief of Staff Bryan Bohman, "but we don't like the human foot speed."

Depending on the diameter of a tube, cylinders can reach speeds of up to 25 feet per second, about 18 miles per hour, far faster than any human could ever manage.

It was also a question of best use of employee time, if, as often happened, a courier wasn't available when a specimen needed to get to the lab. Having a nurse leave a patient's bedside for a minutes-long run to the lab made no sense.

Reliable speed is crucial when the system carries blood products, some of which are temperature-sensitive and, by regulations, must be discarded if not properly maintained.

The tube system, says Lab Operation Services manager Gay Routh, "is vital, very vital. I don't know what we'd do without the tube system, especially when it comes to tests like those that happen in surgery. When arterial blood gases are sent from the operating room, we need to return results in a very short period of time, so physicians know if they need to change settings on a monitor. Years ago, before the tubes, we would get a phone call and we'd have to send somebody. It definitely slowed our turnaround time."

The Hospital's Chief Engineer Leander Robinson commands the system from a small basement office, where computer monitors light up every time someone puts a container in a shute, types in a numerical address and presses the 'send' button.

The screen displays a tiny icon that reflects the container's travel through various switches and transfers, but it moves so quickly it's actually hard to track its passage. Even during the heaviest flow through the system, between noon and 2 p.m., a container can cover the longest start-to-finish distance 1,500 feet in less

than three minutes.

The system has a complete set of checks and balances, sensing where containers are needed and sending them. Some departments, like the operating rooms, have dedicated lines that guarantee them a straight shot to the lab. “Blood products get first priority,” says Lee Chua, blood transfusion services manager.

The system does occasionally falter, but its operative 98.8 percent of the time, Robinson said. And no cylinder has ever gotten stuck in a tube, he said. He has software that monitors the system, charting its use station by station and watching especially those times when someone sends a cylinder “stat” the highest priority coding. It’s also a work in constant progress; the Hospital continues to evolve and locations can change. “The tube is everywhere,” Robinson says, “and the directories ever changing.”

The system “is amazing,” says Assistant Patient Care Manager Pam Ponti, who sends and receives cylinders that affect surgical care. “I don’t know exactly how it knows where to go, I’m just happy that it does.”

For more information, visit stanfordmedicine.org [1].

Sources: Business Wire, Virtual Press Office

Source URL (retrieved on *03/27/2015 - 10:11pm*):
http://www.surgicalproductsmag.com/articles/2010/01/quick-quiet-and-out-sight

Links:
[1] http://stanfordmedicine.org