

# FAST

Karolinska University Hospital - Huddinge is as large as Stockholm's Old Town. It used to demand the equivalent labor of fifty personnel members when it came to dropping off and picking up samples, documents and medication. A new pneumatic tube system – five miles of tubes – will provide 118 000 hours of patient care.

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TRANSLATION Swisslog Healthcare



*„We save about 1.5 hours per shift. This is time we can now use to focus on our job, taking care of our patients.”*

Emma Olander, a nurse within the emergency surgical unit KAVA at Karolinska Huddinge, wraps a test tube in a plastic bag. Then, she puts the plastic bag in a ten-centimeter thick plastic cylindrical carrier, unlocks the door of the pneumatic tube station using her ID-badge and places the carrier inside. With a soft swish the carrier is sent on its way. She can now go back to her patients. It only takes a couple of minutes. In seconds, the sample arrives at the lab. Just a few weeks ago, Emma had to trudge away with the test tube herself, a round trip walk of over 500 yards. It was in March that Locum completed the installation of the new fully automated, computercontrolled pneumatic tube system. The investment for Karolinska Huddinge amounted to a total of seventy million Swedish crowns [approximately 10.5 million USD], but saves a massive amount of time. Previously, twenty-five percent of the nursing staff in the wards had to bring the test samples on foot and this on an average of four to eight times per shift, which is equivalent to between two and four working hours. This was the case for various staff categories, most often assistant nurses but also operating room staff could be forced to leave an emergency situation. The tube system also means that ward personnel no longer have to go off on solo walks during on-call hours, which leads

to increased security and allows them to be with patients during a time when the lowest number of staff is on duty. Now it takes less than five minutes to prepare and send off a sample. This makes a huge difference. Now we can send and receive items in an eyewink. It hardly demands any time or attention, says Emma Olander. And it wasn't hard to learn. Not at all. Everyone who uses the tube system first took a short training course. It only took five minutes.

Approximately ninety percent of all small items sent by pneumatic tubes go to the lab. The hospital complex covers an area the size of a city section such as Stockholm's Old Town. Before, a walk to the lab or blood bank could be more than half a mile back and forth - and it also meant waiting for the elevators and so on, which meant that the total transit time could take a whole half-hour. A total of 400 hours per day were devoted to these transports on foot, which is the equivalent of fifty employees. That's not all, personnel with delivery duties often went around their ward asking if any of their colleagues also had items to deliver at the same time. It turned out that just the touring and inquiring came to involve a job interruption of up to seven minutes. In all, even more than 400 hours was wasted. Thanks to the pneumatic tubes, even the longest transport just takes a maximum of five minutes.

Even though KAVA is located only a few hundred yards from the lab, the time saved is worthwhile. "We save about 1.5 hours per shift. This is time we can now use to focus on our job, taking care of our patients", says the head of department Kitti Szöke. The lab daily handles about 3000 samples and test results which can now be sent both speedily and securely thanks to the tube system. It also offers a number of other advantages. The influx of samples has become smoother. This gives the lab a more balanced workload and allows it to work faster and more effectively. Samples usually consist of biological matter, so faster transport provides fresher samples and thus more accurate results. Patient privacy is better protected since the risk of exposing private information is reduced. The ten percent of the items that aren't sent to or from the lab are primarily blood bags

from the blood center and medication. The system is even set up to send pre-dosed antibiotic syringes and patient dosages from the hospital pharmacy. "Sometimes we run out of a medication here in KAVA. Now, we can easily call another department and ask them to send over a little. In just a couple of minutes, a carrier arrives to our station here. Just a small detail like this means a lot", says Kitti Szöke. The system consists of 98 standard stations, which are spread out among the wards. The Blood Center has a specially designed station with separate portals for blood to the wards and separate bins for carriers with samples. At the chem. lab, there is an automatic carrier opener, a machine that has been integrated into the pneumatic tube system which automatically opens the carrier, unloads the samples, sorts them by emergency and routine, closes the carrier and sends it back into the tube system. The carrier opener has the capacity to handle 180 carriers per hour. Anita O'Flaherty, local planner at Karolinska, gives us a tour. She points up at the ceiling in the corridor and the conduits where the pneumatic tubes run exposed along the ceilings. A pair of tubes, called the highways, quickly transport the carriers between the four junction points (transfer stations) to all corners of the hospital.



In this clinically sterile, un-manned special station, the carriers are automatically diverted to new tubes to continue on to their destination. In the bin with transparent sides, a carrier quickly transfers in the correct direction.

Everything is controlled by advanced software. The only human operations needed concern the sending out and receiving of the carriers. Every carrier has a tiny chip which uniquely identifies it. When a carrier is dispatched, its ID is registered in the computer and the system knows where it is going. Then the software takes care of the rest.



Stefan Larsson of Dalkia, responsible for the hospital's technical infrastructure, is very satisfied with the pneumatic tube system. »Technically, it is the most advanced«, he says.

Behind a locked door to what used to be a workshop, is one of the transfer stations. Eight tubes run adjacent to each other. Here the carriers are slowed down through an elbow branch. Each carrier is equipped with a chip that is read. The system then knows the carrier's destination. It is placed carefully in a small transfer unit, a transporter which directs it to the correct tube where it is then dispatched to the correct ward - or to another transfer station for a new diversion in another area of the hospital. Around the room, are a number of powerful fans that generate the air currents which move the carriers through the tubes. The fans are fitted with high-efficiency HEPA-filters which clean the air in the tubes so that it is as particle-free as possible when it flows into the various wards. The noise level is high; ear protection is needed for staff in there. These stations, the system's junction points, are visited from time to time by technical services staff who look in to see that everything is functioning, especially the fans. Occasionally, settings are finetuned, including adjusting the carriers' speed so that is as effective as possible. Air pressure in the pipes must be changed sometimes so as to protect the biological specimens in transport. This is also why it is important that the samples be packed correctly in protective plastic sleeves before they are placed in the carriers. Junction points also take care of the empty carriers and distribute them to the wards with the greatest demand. Need for empty carriers registers automatically in the software when the wards dispatch a loaded carrier, and within a minute or two,

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a new empty carrier comes back. All in all, about 4 000 employees use the pneumatic tube system. Each of them has some degree of authority for the sending and receiving of various types of items due to special regulations regarding pharmaceuticals. Every user has been assigned his/her authorities by his/her supervisor. The system knows exactly who sent and who received a carrier and when it occurred, which guarantees very high security, explains Anita O'Flaherty.

Currently, between 1 500 and 2 000 items are transported every day through the tube system. Samples, medications and the like are prioritized. However, in time, the hospital hopes to find a logistical solution to, for example, allow internal mail to be sent via this system. It involves finding the times with the least traffic. The software also ensures that, after a thousand trips through the system, a carrier is sent to a service center where it is cleaned and inspected so that it is intact and functioning properly. The decision to integrate the tube system in Karolinska University Hospital in Huddinge took place in June 2009. Locum started the installation in January 2010, the first stages were completed a year later, when the system was first tested. The entire construction was completed in March this year. During the construction, we naturally looked closely at the pneumatic tube system that was installed at Karolinska University Hospital in Solna a few years ago. This construction was the first of its kind in Sweden, among the very first in the world. Huddinge had thus benefitted from Solna's experience, says Anita O'Flaherty. Now Danderyd's Hospital is next in line for the pneumatic tube system. There the investment is greater, 84 million Swedish kronor [12.7 million USD]. Construction is planned to begin in January 2013.



#### A SYSTEM THAT IS EASY TO USE

Since the tube system is automatic and computer controlled, it is very easy to send and receive items:

- 1) The item is packed in a plastic bag to protect it from potential shocks.
- 2) The user unlocks the tube station using the ID badge worn on his/her clothing, and enters the destination address.
- 3) When the door opens, the carrier is placed inside.
- 4) The carrier's ID is read and registered in the system. Now the system knows who sent what, where and when.
- 5) When a station receives an item, blinking lights indicate if it is a normal or a security item.
- 6) Only those with proper authority can open the door using his/her ID badge. The identity of the receiver is registered.
- 7) If a department has received more carriers than they need, staff can send them back into the system without entering an address. The system automatically distributes them to departments that don't have enough carriers.

#### PART OF THE STRATEGY

The pneumatic tube system is one of four development projects within Karolinska University Hospital. The ultimate aim of the project is to give more patients better care.

*"Who does what?"* develops the organization so that every staff category can focus on their "real" duties. For example, avoid devoting half of their shift going for long walks with samples to the lab.

*"Future wards and clinics"* develop the facilities for more effective use.

*"Future logistics"* is where the new pneumatic tube system is included along with new automatic transport trucks and central suction for waste and dirty linen.

*"Future IT"* develops all the information handling from the logbook system to such events as when a particular room needs cleaning.