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Remote Solutions

A Web-based telemedicine consultation system is closing the gap between rural hospital labs and national expertise.

By Kerri Penno

Clinical laboratory scientists and public health officials say a computerized emergency response consultation system for public health laboratories developed in Nebraska is proving valuable for other states and has the potential to impact public and private health systems worldwide.

A Virtual Network

The Secure Telecommunications Application Terminal Package (STATPack) system is a secure, HIPAA-compliant, Web-based network system that supports telecommunication connectivity between clinical health laboratories. In the current model, the STATPack links remote "spoke" laboratories to a main "hub" facilityinitially, linking rural labs in Nebraska to the Nebraska Public Health Laboratory (NPHL).

STATPack incorporates secure, dedicated, Web-based technology with a camera attached to a microscope and a remote-controlled digital Web cam connected to a computer, according to Ann Fruhling, PhD, assistant professor of information systems and quantitative analysis, Omaha Peter Kiewit Institute College of Information Science & Technology, University of Nebraska, Omaha.

Once linked, the laboratory personnel in the spoke lab can send digital images of suspicious culture samples to the hub laboratory for identification, eliminating the risks and time delay of shipping the sample by courier.

"STATPack allows spoke clinical hospital and reference laboratories to have electronic connectivity to their hub health laboratories, thus allowing for consultation regarding clinical isolates," Dr. Fruhling said. "Consultation can occur in real time, thus helping the clinical scientist at the spoke location to be instructed on the next steps." The STATPack can provide expert consultation within 15 minutes, an unattainable timeframe when shipping is involved.

STATPack is useful in hospital laboratory systems where much of the expertise is located in a hub lab but where triage -occurs is in smaller hospital and clinic labs, Dr. Fruhling noted. "This is where decisions regarding specimen processing take place in remote or spoke labs." While the STATPack has been used by dermatologists or non-experts in clinics to transmit pictures to a regional expert, it is most useful in microbiology laboratories, she explained.

When a suspicious microbiology organism is encountered at a remote microbiology laboratory, the telemedicine system uses a digital camera to capture macroscopic images of culture plates or a microscope -interface to capture microscopic images using conventional light techniques or fluoroscopic imaging, explained Steven Hinrichs, MD, director of the NPHL at the University of Nebraska Medical Center (UNMC).

The STATPack currently has five major uses:

1.Consultation—clinical laboratory scientists in remote labs can send magnified images of organisms to clinical laboratory scientists and other experts at the hub laboratory for interpretation of the culture growth, i.e. identification and -advice on processing the sample and a differential diagnosis.

2.Education—photos of rare isolates or emerging threats can be sent to all the labs in the network to teach laboratorians what to look for.

3.Uniformity—standards of care and diagnosis can be aligned in the different labs in the network by sharing samples and diagnosis, and establishing uniform parameters.

4.Documentation—interesting or rare cases can be documented in the system for future deployment for educational and training purposes.

5.Emergency notification—alerts can be sent from the hub laboratory out to all the spokes, instantaneously alerting them to any outbreaks or emerging threats.

Thus far, the NPHL has deployed 20 STATPack systems throughout Nebraska. The Oklahoma State Department of Health and the Kansas Department of Health and Environment are also placing STATPacks throughout their states.

Proven Worth

At St. Mary's Regional Medical Center in Enid, OK, the STATPack proved its value within the first week it was deployed. St. Mary's lab personnel found a malaria parasite on a patient but were unsure which of four malaria—causing organisms they were viewing—a critical factor in determining the proper treatment. Using the STATPack system, the St. Mary's lab staff sent an image to the hub parisitologist expert and received an answer in minutes, saving the several hours it may have taken to hand-deliver the sample to the state facility, Dr. Fruhling told *ADVANCE*. The STATPack has also been used for bacteria consultation on potential Bacillus anthracis samples, an unusual fungal colony, Stachbotrys, suspicious Gram-negative bacillus cocci, suspect Neisseria, tiny Gram-negative rods including Francisella tularensis, and large Gram-positive cocci.

"For some of these laboratories, it is difficult, if not impossible, for them to describe to us what they see in a culture sample," Dr. Hinrichs said. "Prior to STATPack, their only option was to physically send us the sample, which could take several hours or even a full day to receive. STATPack allows us to actually see the sample immediately and assist with the diagnosis in a matter of minutes. It's a valuable system to have in place."

The STATPack system also increases the availability of subject matter specialists. The NPHL Biosecurity and Special Pathogens section at UNMC has a team of microbiologists trained in the diagnostic testing of special pathogens or agents included in the CDC's list of potential bioterrorism agents. Using the CDC's Sentinel Laboratory "Recognize, Rule-out or Refer" testing algorithm, coupled with the digital images and text, subject matter specialists can consult with the sending laboratory to determine what actions should be taken. "For other consultation uses that may involve 'normal' bacterial pathogens, fungus, parasitic smears, etc., because we are fully integrated into the UNMC, we can call upon various subject matter specialists to give their professional opinion," Dr. Hinrichs pointed out.

The NPHL specialists are always available, through a beeper system, 24/7. For example, if the state laboratory microbiologist is not at the hub laboratory, she can securely log on to the STATPack system through the Internet wherever she is and provide her expertise.

This recently took place in Oklahoma during an outbreak of five malaria cases, Dr. Fruhling reported. Their parasitologist was on the road and within a short period of time, he was able to log on remotely to view the laboratory microscopic images and provide immediate consultation.

Tech Support

The biggest hurdles to implementing STATPack in rural facilities are the technological capabilities of the facility and knowledge of the staff. In Nebraska, remote healthcare and public health institutions may not have access to high speed networks. However, they have the option to be connected through the Nebraska Statewide Telehealth Network. The STATPack system provides a means to integrate with this service.

As for training personnel, the STATPack support group coordinates all network requirements with the local IT network administrator, travels to the spoke laboratory to install hardware and software, and provides on-site training for all laboratorians. "Our goal is to provide first-class service and make the installation of the STATPack as easy as possible for the location where we are placing them," Dr. Fruhling stressed. "We realize that often laboratories have limited resources and we try to ease that burden. Basically, if the laboratory has access to the Internetpreferably high speedthen the STATPack system can easily be deployed."

The team also provides technical support as needed. The software is user-friendly, and allows users to choose from a menu of options that let them remotely control a Web camera to view specimens, see different slides and magnifications, call up previous samples through an image library, and send messages instantaneously with the touch of a button—whether a network-wide alert that reaches all spoke laboratories, or real-time chat with an expert at the hub facility.

"In the laboratory setting, if a remote client has the proper microscope, there would be no limitations on the different types of laboratory applications that the STATPack system could be used for," Dr. Fruhling said, including consultation on wet-mount

preparations, cytology slides, blood smears, urinalysis, Gram stains, acridine orange, fluorescent antibody staining and more.

A Global Vision

In the future, the STATPack could be implemented in a multitude of healthcare settings, from public health labs to veterinary labs, water labs, emergency response mobile units, rural health clinics, emergency departments, military hospitals or small village health centers in third-world countries. The technology would benefit any laboratory where long-distance consulting could be useful, Dr. Fruhling pointed out.

While the system currently connects rural hospital labs to public health laboratories, the STATPack could be used in a similar fashion by any laboratory organization that has a network—including military laboratories; the USDA, FDA, EPA and NAHLN; national commercial reference lab-oratories; and pathologist outreach programs.

The CDC has also recognized the STATPack's potential. "We think STATPack is a great public health tool that has potential applications nationwide and globally," said J. Rex Astles, PhD, senior health scientist in the CDC's Laboratory Systems Development Branch in Atlanta. "In China, for example, not many people are trained in public health issues," Dr. Astles explained. "The country geographically is so big, STATPack would be a real boon for someone in a public health agency in Beijing to be able to look at a culture sample that's under a microscope in a laboratory clear across the country. We think it might have a great application there, and we are very enthusiastic about the possibilities."

By expanding the system and incorporating new technology, the possibilities -become "basically unlimited," Dr. Hinrichs opined. Increased archival storage space allows STATPack linked facilities to share images for site-specific training needs. Adding wireless capabilities gives first -responders the ability to send digital photos from the field to a waiting trauma team. "Currently, we are only scratching the surface of the capability of STATPack and we're very glad that's the case," he said. "We are now examining ways to use the system to fill in any gaps we have in dispensing health information and awareness. In terms of building relations and communications among our health labs, STATPack can have a major impact."

The team embodies the "think globally, act locally" mentality. "We envision the STATPack system being used around the globe," Dr. Fruhling stated. "STATPack has no boundaries." The system universally provides leading medical facilities the -opportunity to provide laboratory expertise to healthcare facilities around the world, and in their own backyard.

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Table: STATPack

Secure

Telecommunications

Application

Terminal

package

STATPack Origins

STATPack is a collaborative effort between the faculty and students at the University of Nebraska at Omaha College of Information Science & Technology; the University of Nebraska Medical Center (UNMC), Omaha; and the Nebraska Public Health Laboratory (NPHL), Omaha.

The project was funded by a Nebraska Research Initiative, the Health Resources and Services Administration and the CDC, through the Association of Public Health Laboratories.

Once the collaborators developed a stable prototype, they field tested it in laboratories across Nebraska. The prototype proved to be useful for laboratory testing, training and consultation. The team further enhanced the system that was eventually deployed at 35 laboratories in Nebraska, Oklahoma and Kansas. Forty systems will be in the field by the end of summer, 2007.

ADVANCE spoke with three of the key figures involved in bringing the STATPack to fruition:

Ann Fruhling, PhD, assistant professor of information systems and quantitative analysis, Omaha Peter Kiewit Institute College of Information Science & Technology, University of Nebraska, Omaha, was interested in improving healthcare delivery to rural communities using information technology.

Steven H. Hinrichs, MD, director of University of Nebraska Center for Biosecurity; director of NPHL; and associate professor pathology/microbiology, UNMC, saw a need for electronic lab reporting and an automated system to connect Public Health Laboratories to sentinel labs.

Anthony R. Sambol, MA, SV(ASCP), MT(ASCP), CBSP, coordinator, Special Pathogens/Biosecurity Preparedness Laboratory, Omaha; assistant director, NPHL, UNMC, brought an interest in bioterrorism preparedness and laboratory education to the team.

This team is working with the Mid America Alliance to negotiate the deployment of STATPack systems throughout the Midwest. Laboratorians across the U.S. and in Canada have also expressed an interest in the product.

Today, the team is currently gathering information to gauge interest in the STATPack system to see if it will support commercial development by a private company. To express your interest in and learn more about the STATPack and how it could be used in your facility, visit the STATPack Web site at www.statpack.org or contact Dr. Fruhling at afruhling@statpack.org.