When Every Cent and Second Counts

Hospitals can be crazy places--pregnant mothers cursing husbands, bleeding passengers pulled from mangled steel, the list goes on. Hospitals need to run smoothly amid the chaos; many are self-sufficient cities with unique security needs.

Submitted by SECURITY ASSESSMENTS INTERNATIONAL, AMERICAN DYMANICS and AXIS COMMUNICATIONS

Compiled by YAHAN WU

Each hospital is faced with its own set of security threats, vulnerabilities and requirements ranging from patients, staff, equipment and medicines. Many, however, are strapped for cash and have to make do with what they can when it comes to providing security. Three examples provided below show how different hospitals rose to the challenge.

Stretching a Thin Budget

High Point Regional Hospital, a general medical and surgical facility in the Piedmont Triad region of North Carolina, faced growth expanded responsibilities as its facility grew. Unfortunately, it also found itself short on security funds. Bryan Koontz, director of safety and security for the 368-bed facility, which provides care for a city of 77,000 and a service area of more than 360,000, said his first order of business was to identify assets and liabilities. "To determine where I needed to go, I had to know where I had been" said Koontz. He hired Security Assessments International (SAI) to assess the hospital's security-management program and recommend improvements.

The survey assessed security staffing, security duties and responsibilities, physical-security measures, security response, security patrol, central-station monitoring, birthing-center security, emergency-department security, pharmacy security and parking facilities. Based on survey findings, a multi-year security-management plan was implemented including changes in physical security, staffing and training.

Sterile whites to technicolor

An old black-white tube-camera system was replaced with a state-of-the-art color system to provide clearer pictures of persons, objects and events. A fiberoptic transmission system minimizes lightning problems. Perimeter cameras on top of the main hospital facilities building and on the outpatient surgery building provide unlimited surveillance of parking lots and the campus.

The perimeter system consists of seven Burle high-resolution 1/2-inch CCD color cameras equipped with 12 120-millimeter auto-iris zoom lenses. Outdoor cameras are protected with Pelco EH4700 housings equipped with fans and heaters. The cameras also feature PT570-24P pan and tilt with preset functions. Camera functions are controlled by American Dynamics 24-volt receivers configured with 72 presets that include auto-random pan capabilities. Parapet mounts have been installed on buildings to allow perimeter cameras to swing into the roof to facilitate servicing.

An American Dynamics 1650AR16-10L microprocessor-based control system has been interfaced with an infant security system. It features alarm call-up capability, integral menu-driven setup, password protection, priority lockout, salvo switching, programmable camera numbering and system partitioning. The central system also features a tour selection of onscreen display, site control and system alarm-status output. A distribution panel provides control codes to data receivers on exterior cameras, and a converter panel controls variable speed domes in the birthing center.

A Sanyo time-lapse, eight and 24-hour, industrial-grade VCR--with a time-date generator and alarm input--handles event recording. Eight Burle TC210 9-inch color monitors in the security control room monitor main perimeter cameras. A Burle TC2 15 14-inch color monitor is used in record and playback modes. The whole system is housed in a Stantron six-bay, custom-designed console that also holds the card-access system,

PC and printer. Four console bays have 18-inch writing surfaces, and two have five-foot cabinets that contain the fire-alarm panel and newly designed backup-generator control.

A CCD color camera has been installed in the shipping and receiving area at the loading dock to monitor movement of people and assets in and out of the hospital. A color CCD camera with 24-hour VCR recording capability has been installed in the pharmacy and can be monitored by pharmacy personnel and in security operations. Another CCD color camera with 24-hour VCR recording capability has been installed in the nuclear-medicine department to help personnel control access to this restricted location.

Emergency Room in High Point Regional Hospital, in the U.S.

Security in the birthing center has been enhanced by four American Dynamics color dome cameras (10X lenses) to monitor corridors and elevator access. Speed domes have been interfaced with an infant tracking system and feature variable-speed pan and tilts, housings and digital receivers with presets. The domes are monitored and controlled by security operations. The new CCTV specifications were written and designed by SFI Electronics, a systems integrator offering commercial, industrial and institutional security applications; the company also provides design and sales assistance, installation and field-branch repair service.

Caution: baby on board

For additional security in the mother-baby unit, an Accutech Infant Security System uses radio-frequency proximity technology to monitor people. Inside sensors are computer chips, lithium batteries and two small ferrite-rod antennas to communicate via radio frequencies. Wands wired around doorways or hallways leading to exits or elevators tie into control panels at the nursing station and security office. The system is set up to lock affected doors when an Accutech sensor is detected before a door is opened. Once a sensor is detected, the door remains locked until the sensor leaves the area.

The system also controls the exit of infants through an elevator. Once a sensor is detected at an elevator, the doors are closed, and the call button is deactivated. The system will not prevent the elevator from reaching the floor by staff or visitors. But if the elevator doors are opened and a sensor is in the detection field, the doors will remain open, preventing the elevator from leaving the floor. The system will also activate the appropriate alarm devices, such as an alarm tone, CCTV or remote hospital security alert. The elevator and call button will remain deactivated until a staff member goes to the alarmed elevator and resets the system with the alarm reset keypad.

The Accutech transmit-loop antenna is a run of wire discreetly placed over, under and around the area to be monitored to form a complete loop. Wiring is hidden behind a wall, or runs along door, elevator, or hallway moldings. A receive antenna is required at each monitored area. The receiving aerial is an unobtrusive device placed near the transmit loop. It receives coded identification signals from sensors, sending them to the Accutech controller. The control equipment--the heart of the system--is in an equipment room. Sensors are embedded with a common code to eliminate false alarms, and they are equipped with a unique code that identifies individuals entering monitored zones. The computer-enhanced system not only locks doors and deactivates elevators, but also identifies which infant is being removed without authorization and activates an alarm at nursing stations. The infant security system was installed by Innovative Control Systems (ICS). ICS develops and markets electronic monitoring and security systems worldwide under the name Accutech.

Total Access Makeover

Before 2002, Newton-Wellesley Hospital in Newton, Massachusetts relied on a lock-key system to secure all entrances. Employees, physicians, volunteers, students and contractors have always been required to wear photo IDs, but in the days before access control, they were forever forgetting badges. The hospital had a video surveillance system, but black-white tube cameras and analog VCRs made it difficult to achieve desired coverage. With no system in place for validating identification or monitoring door status, it was hard to know who had legitimate access to areas, whether doors that should not be were open, and where and how a space was breached.

Then, there were the keys. Every morning, a security officer had to manually unlock all exterior doors; every evening,

another officer had to lock them back up. With dozens of doors and numerous master keys, securing the exterior took anywhere from 30 minutes to an hour, depending on how well the locks were functioning and number of security requests that interrupted the process. Had there been an emergency requiring all exterior doors to be sealed, precious time would have been lost dealing with locks and keys.

Now, exterior and interior doors are linked to an access-control system in the main security office. More than 100 proximity-card readers ensure that no one enters protected areas. Forty high-speed CCTV dome cameras, recorded by three digital video recorders, keep round-the-clock watch over main entrances, exterior parking lots and interior areas. Cameras are monitored from the security office and are available by remote access from other locations.

The systems have reduced security incidents on campus by restricting access, strengthening emergency-response capabilities, and bringing the hospital into full compliance with the security requirements of the Health Insurance Portability and Accountability Act (HIPAA) and the Joint Commission for Accreditation of Healthcare Organizations (JCAHO).

Three factors were central to the project's success: close collaboration between Newton-Wellesley's security department and systems integrators Surveillance Specialties, a phased implementation strategy and consistent communication with hospital staff.

The plan is sold

A risk analysis of hospital facilities identified where and how the institution was vulnerable to intrusion. A second evaluation by an independent consultant corroborated the findings. Improvements were clearly needed.

The security department had tried but failed to get funding for new security systems many times. Although a new executive-management team was in favor of upgrading security, the hospital had a limited budget. To improve the chances of getting funding, the security director prepared a request to put access control on doors that needed it most: first, exterior doors to protect people and assets and enable immediate lockdown, if necessary; second, the maternal and child health floors--high-risk areas for any hospital; third, the medical-records area for HIPAA compliance; and, finally, the medical library to safeguard costly research materials.

Stage-by-stage strategy

Surveillance specialties won the project after submitting a detailed analysis of how access control could be implemented given hospital layout, door mechanics and wiring. National and city fire codes, as well as strict engineering standards, were also taken into account.

The C.CURE 800 access-control system and proximity-card readers from Software House were chosen for the installation. The system best met institutional needs for scalability and integration with American Dynamics CCTV systems and other security applications. Surveillance Specialties technicians had to install access panels, door contacts, card readers, request-to-exit motion detectors, motion sensors and other equipment. Using detailed CAD site drawings, the project team pinpointed where devices would go.

Next, the project was broken into segments. Technicians started with two employee entrances to give hospital staff time to become familiar with card readers before other doors were added. Technicians then moved on to the rest of the exterior, including the surgical center, emergency department, main visitor entrance, three medical office buildings and side doors. To minimize disruptions to hospital operations and achieve security goals more quickly, exterior doors were done in small groups and activated once they were finished. Medical records and the library would come next because they were small and could be done quickly, followed by maternity and pediatrics.

Technicians began to install wire on the remaining exterior doors and routing cable. Like many hospitals, Newton-Wellesley is made up of multiple buildings and wings, so cable could not always be run in a direct line. In some locations, technicians ran fiber underground, either to solve distance problems or to provide for future system expansion.

The team had to go through virtually every section of the hospital to do all the wiring. Each morning, the senior technician checked in with his designated contact to make sure that work could proceed. If patient volume was particularly high or creating dust or noise was a problem, technicians moved to other areas and returned at a better time. This way, there were no surprises or turf wars.

Maternity and beyond

After the exterior doors, medical records and library were completed, technicians moved on to the final part of Phase I: the maternal and child health floors. Card readers were installed on the two floors and public elevator access restricted. In case of emergency, a valid card read initiates a priority override function that supersedes all other elevator requests, so that nurses can get to desired floors immediately.

In addition to card readers, technicians installed 18 CCTV cameras recorded by Intellex digital video-management systems from American Dynamics. The cameras and recorders are integrated with the access-control system, as is the Hugs infant-protection system supplied by Xmark (a division of Instantel).

In Phase II, the pharmacy, materials-management area, health-information-systems area, psychiatric ward and a section of radiology were integrated with access control; nearly two dozen CCTV cameras monitoring the exterior were replaced with Sony high-resolution color cameras.

Admitting IP Surveillance

Increasingly, the British government is focusing on modernization of public-health services. A key part has been creation of an electronic patient-records system (EPRS), which will eventually eliminate need for transportation of hard-copy patient

records between surgeries, specialist clinics and hospitals.

With increased traffic of electronic patient data traveling in and out of surgeries and hospitals, there has been need for investment in robust and well-resourced network infrastructures.

These network infrastructures, which have recently been put in place in many hospitals, have led health-service IT departments to look at incorporating other applications.

Maximizing Networked Infrastructure

The Portering and Security Services Department of Stafford General Hospital was concerned about the quality of recorded images generated by its ageing analog CCTV system. At this stage, the Health Infomatics Service (HIS) was in the process of completing an upgrade of the network infrastructure of Stafford Hospital. A one-gigabit backbone had already been installed throughout the main hospital building and 11-megabit wireless links had been set up to outlying buildings throughout the hospital campus.

Understandably, HIS project managers were keen to explore maximization of this network-infrastructure investment by putting any upgraded surveillance system onto the network. HIS staff worked alongside hospital security manager Giles Perry to identify specifications required for a networked surveillance system.

Network security installer Plexnet was selected and commissioned to build a pilot, which was conducted with just four cameras--one Axis 2120, one Axis 2100 and two analog cameras attached via an Axis 2400 video server to DV Networks discover e-system. The trial proved that output could be successfully taken from both new network cameras and existing analog cameras so that investment in existing CCTV-system hardware did not need to be lost in order to upgrade. Plexnet was then given the green light to build the full system for the main hospital and two outlying hospital buildings.

With no system in place for validating identification or monitoring door status, it was hard to know who had legitimate access to areas.

The IP surveillance system

Axis network cameras are installed at the main entrances of the main building, inside the main hospital and at the Technology Park 1.2 kilometers away linked via an 11-megabit wireless link. Axis video servers take output from 14 existing analog cameras already installed in the main building, so images can be transmitted over the network.

Cameras inside the hospital and the Technology Park are sited at the reception, on entrances and exits, at the special-care baby unit, maternity wards, in the infirm-elderly unit, and at the cardiology and acute stroke unit. DV Networks discover eVersion 4 was deployed to view and store all images. The discover e-system takes images generated by all cameras and displays these in quad or single view on a PC monitor and saves them down to a hard-disk drive of a PC in the main security office. Two workstations support the system. One provides the recording to hard disk and viewing; the other provides backup storage particularly for images which may be used as evidence of a crime at some future date.

Network infrastructure at Stafford

Stafford Hospital operates a one-gigabit backbone containing two Cisco Catalyst 6500 core switches with two-gigabit connection. These core switches link to 20 Cisco Catalyst 5500 edge switches. The entire network is configured as a number of Virtual Local Area Networks (VLANs) routed via onboard multiswitch feature cards (MSFCs) operating inside core switches on supervisor boards.

Frame-rate adjustment offers control of bandwidth usage and image quality. The discover e-system enables Perry to control the variable frame rate for viewing and recording to the server. This is important because areas with high traffic--entrances--a high frame rate is crucial to ensure all people entering are captured and identifiable from images stored. Frame rate can be lowered in areas with less traffic to restrict bandwidth usage. The hospital was also able to use the discover e-system to determine number of days of recordings that could be safely stored, in this case, up to 15 days. This proved more than adequate for Stafford Hospital.

Cabling management and savings

Cabling management is a huge issue in all hospitals because of the vast infrastructure. Cabling, pipe work and ducting are needed for telephones, heating, water, electricity, air conditioning, air filtration, telecoms and computer networks. All this is housed in roof voids of hospitals between ceilings and above floors. Because all this cabling takes up a great deal of space, there is very little spare room for additional cabling.

Using coaxial cabling would have meant creating a completely new carrier system--a major job requiring teams to work overnight to minimize disruption to hospital staff and patients. The IP-surveillance solution, on the other hand, meant that the only additional cabling required was running electricity cables to new devices. Fortunately, no new power-supply points had to be created as cameras were sited within easy reach of existing power sockets.

An additional area of significant savings came with the need to put a surveillance camera into Stafford Hospital's Occupational Health Unit based 400 meters across the hospital car park. A traditional CCTV installation would have demanded laying cables under the ground in addition to the disruption that would undoubtedly have been caused. This unit, however, already had a wireless link that could be deployed for the network camera that was now installed, at virtually no extra cost. AS