Hospital applications abound

GIS mapping technology strengthens emergency prep

Many people have computer navigation devices in their vehicles. These work with GPS satellites and use the same geographic information system (GIS) mapping technology that is helping hospitals enhance their disaster preparedness, safety, and security programs.

Another everyday application of GIS is obtaining driving directions online from sites such as Google™ Maps or MapQuest®.

The best part? A lot of this technology is free or cheaply available to hospitals if emergency planning leaders twist the correct arms of fellow responders in the community and tap into government resources from the U.S. Department of Homeland Security and other agencies.

Such networking can count toward Joint Commission compliance, too, as the accreditor emphasizes community outreach during the course of emergency planning under emergency management standard EM.01.01.01.

"GIS doesn't just produce pretty maps with pretty colors," says **Ric Skinner, GISP,** owner of Stoneybrook Group, LLC, a health geographics consulting firm in Sturbridge, MA. "It's … technology that enables people and functions and organizations to come together that might not have considered it before."

Sort of like baking a cake

Dalton Sawyer, MS, CHEP, director of emergency preparedness and continuity planning at University of North Carolina (UNC) Health Care in Chapel Hill, explains GIS like this: Imagine a custom map as a cake, with different data being layered on.

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For example, during the interview for this story, Sawyer and his peers were preparing for a weekend college football game and the crowd and traffic problems that go with it. The Google Map they drew included a base layer with roads, towns, buildings, and predicted traffic patterns. Sawyer distributed the custom map to emergency medical services (EMS) and police and fire departments for help in routing patients to UNC Health Care.

"It's absolutely essential to preplanning for disasters," Sawyer says. "You can't really do a good all-hazards preplan for a facility unless you use GIS."

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Imagine the potential for mapping technology when developing a hospital emergency response plan for a flood. Not only would seeing the U.S. Geological Service's floodplain maps reveal where a flood would most likely occur, but overlaying it with a highway map would reveal which normal routes for ambulances, suppliers, and employees would be shut down and which would be the best alternatives.

Looking at these visual resources makes it straightforward to develop strategies for routes affected in 10-, 100-, and 500-year floods. Ditto for tornadoes, industrial accidents, or any other disaster ranking high on your hazard vulnerability analysis. In the days and hours leading up to a hurricane's landfall, GIS would aid in planning how to keep patients moving to and from the hospital when evacuation routes are gridlocked as residents flee the area.

Visual data is one of the main benefits of GIS. It's a picture that makes decision-making faster, more obvious, and intuitive, says Skinner, who is the editor of the upcoming book *GIS in Hospital & Healthcare Emergency Management.*

"In hospitals, we feel helpless because we have no idea what's going on in the outside world and we have

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to rely on information people have told us," Sawyer says. "Most people are visually oriented. You can tell me that this street and that street are blocked, but if you show me, it gives me a better situational awareness of what's going on."

An essential first step with GIS is to plot evacuation routes from the hospital, Sawyer says. Next, figure out which streets to close if the hospital goes into lockdown. Both tasks can be accomplished with a free Google Maps account. (To learn more about common applications of mapping technology, see "Lots of ways for hospitals to use GIS" below.)

Reaching out to your neighbors

Although your hospital might not be willing to invest funds in GIS software, it's likely that multiple emergency response organizations in your area have already done so, Sawyer says. These groups might be willing to create maps on your behalf or give you time on their system to do it yourself, as Sawyer does.

He and Skinner recommend contacting the following sources first:

- **Public safety forces.** Ask your local police department to map out crime statistics. To get a more detailed picture, consult with the fire department as

Lots of ways for hospitals to use GIS

Hospitals can use the following applications of geographic information system (GIS) mapping technology:

- **Evacuating patients.** During the 2007 wildfires in San Diego County, GIS-trained epidemiologists helped 15 healthcare facilities track rapidly evolving fire paths and smoke-affected areas to assist with patient inflow and evacuations, says **Ric Skinner, GISP,** owner of The Stoneybrook Group, LLC, a health geographics consulting firm in Sturbridge, MA. The end result was efficiency: Most patients were only moved once, accompanied with three days' worth of medications, staff members from the sending facility, and medical records.
- **Life safety management.** GIS also offers applications for internal hospital emergencies, such as mapping access points for patient relocations during a fire, Skinner says.
- **Infectious disease surveillance.** GIS can map disease outbreaks such as H1N1 swine flu. Plotting which particular patients and staff members become infected can help hospitals and public health departments determine what areas in a community are hardest hit, and it may even predict who is next.
- **Family reunification.** "Experience with past disasters has shown that family members become extremely frustrated when they have to search from hospital to hospital for their loved ones," Skinner says. "No common format or system for patient tracking is available." A local hospital coalition could split the cost of a software event-tracking system that can greatly aid in mapping patient whereabouts and give family members real-time location data in the aftermath of a disaster, he says.
- **Patient location.** GIS can track patients and residents who wander from behavioral or long-term care units, or keep tabs on newborns.
- **Security planning.** Hospitals can assess security risks by analyzing neighborhood crime data plotted on maps.
- **Home care services.** GIS can make home care delivery routes more efficient, Skinner says. Home care routes can change on an almost daily basis, or even as a workday unfolds. Analyzing traffic patterns, accident data, and other points (e.g., where the driver is coming from) may enable drivers to serve more patients in less time.

Mapping all of the above can help paint a detailed picture of the types of disasters that can happen, especially when combined with weather data covering the major events likely to occur in your region.

"The first year is going to take more work to build those databases," Skinner says. "In subsequent years, it's just a matter of updating the analysis based on new data coming in. A lot of the natural events aren't going to change from year to year, in terms of probabilities and impact."

well and plot call locations over the past five years in a database and map.

- **EMS.** Ambulance companies probably have the most robust situational awareness GIS installation in your area—routing ambulances, helicopters, and the rest of the rescue fleet requires it. These programs often show bed availability at local hospitals, where police and fire units are deployed, and minute details such as traffic camera feeds.
- **Military.** Maybe there's an Army installation or National Guard base near your facility. These trained GIS pros can demonstrate their use of the mapping technology and give you pointers for finding maps on government Web sites relevant to your planning.
- **State agencies.** Your state's health department and emergency management agency likely use GIS in one form or another, Skinner says. Explore the area maps they possess and see whether the information furthers your preparedness knowledge.
- **Local and regional emergency management organizations.** Is there a regional emergency response cooperative of which your hospital is a member? Find out how it uses GIS and schedule a meeting to get up to speed. These groups—and the military folks mentioned above—also can offer intelligence about mapping terrorism targets.
- **Internal data.** Plotting addresses of sick patients and staff members, obtained from the hospital's accounting and medical records departments, can help predict potential outbreaks by yielding localized data for annual hazard vulnerability analyses.

Finding training that's affordable

Keep in mind that many state and community colleges offer courses on using GIS technology, and federal, state, and private grants may be available to help defray your formal training costs. Sawyer's GIS training came as part of his bachelor's and master's degree classes.

"You don't need to be at that technician level if you're in emergency management," Sawyer says. "You just need to know how to use it."

And although many tools (e.g., Google Maps) and resources (e.g., government data) are free, investing in commercial mapping software can greatly enhance and automate your preparedness efforts. Getting on board with GIS now will help get you ready for the near future as this technology evolves and becomes more pervasive in our daily lives.

"GIS is growing so rapidly in a lot of different areas," Skinner says. "[Soon] you're not even going to think you're using GIS. It's going to be like opening up [Microsoft®] Word to type a letter. You're going to open up an application and create a map. It's going to be that simple." ■

Illustration by David Harbaugh

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