INSIGHT

TAPPING INNOVATIVE SOLUTIONS & TECHNOLOGY AT JOHNS HOPKINS MEDICINE

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Facebook Helps Bring Prosthetic Hands to Johns Hopkins

In the summer of 2014, Albert Chi noticed an interesting post on Facebook: People using 3-D printers were making plastic hands with movable joints and fingers for just $50.

When fit to someone with hand differences, such as missing fingers, the prosthesis could grasp and release objects with a flex of the wrist.

After searching the Internet, Chi, a Johns Hopkins trauma surgeon, found the group responsible for the prostheses. Called e-NABLE, the organization is made up of volunteers from all over the world who use 3-D printers to make the pieces for the prosthetic hands, assemble the pieces and deliver them to people with hand differences.

Chi quickly emailed e-NABLE and arranged for a meeting with several volunteers to learn more about the technology and to possibly make and fit the hands to his patients at The Johns Hopkins Hospital. Typically, such medical prostheses cost thousands of dollars and require months of physical therapy before successful use.

Only weeks later, Chi obtained a 3-D printer, and after meeting with e-NABLE volunteers, he started making the hands himself. After entering a patient's measurements into an application that automatically generates the files for printing the hand, the pieces are printed in 10 to 15 hours. The pieces require some sanding and drilling but are then ready for assembly with screws, cords, padding, Velcro and sleeves.

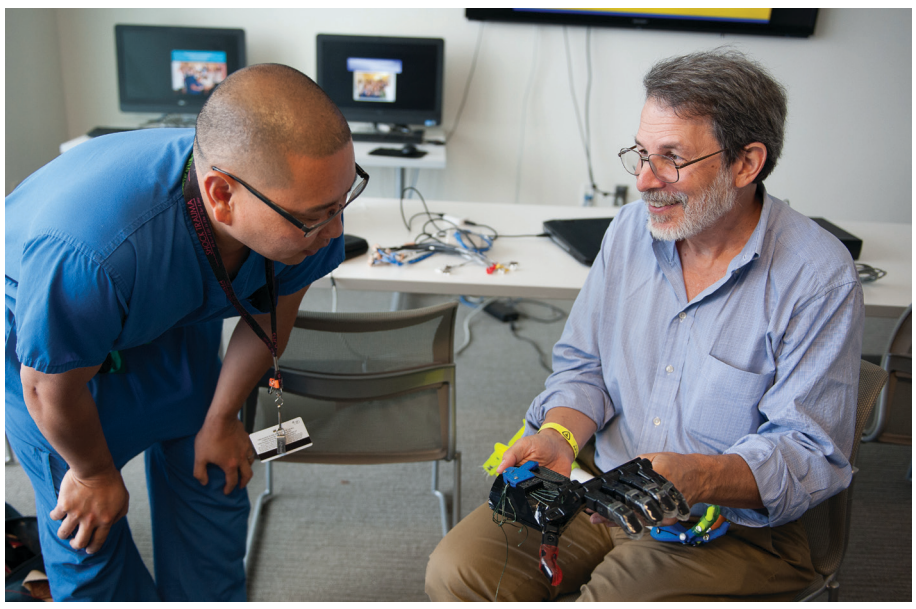
"They don't require wiring, electricity or advanced computer algorithms," says Chi. "They are powered by the natural flexing of muscles and some thin bungee cords and fishing line."

The first of Chi's patients to try a 3-D printed hand was an adult. Then, Chi worked with 5-year-old Griffin Matuszek. In just a few attempts, Matuszek was able to pick up a ball and throw it with his 3-D printed hand. After that, Matuszek ran around the room smiling and high-fiving everyone he could reach.

"Nothing beats these moments," says Chi. "Since becoming an e-NABLE volunteer, together with my lab and in relationship with the Kennedy Krieger Institute, we have printed and delivered five separate designs of hands."

A first-of-its-kind conference, Prosthetists Meet Printers, sponsored by e-NABLE and held at Johns Hopkins on Sept. 28, brought 21st-century practices, technologies and philosophies to prosthetists, printers, parents and patients. During the conference, free 3-D printed prosthetics were given to children with upper limb differences.

ILLUSTRATION BY PAIGE VICKERS



PHOTOGRAPH BY JEN OWEN - E-NABLE

Jon Schull, founder of e-NABLE, acquaints Johns Hopkins surgeon Albert Chi with a prosthetic device made by e-NABLE volunteers. To see a slideshow with more images and a video about the 3-D printed hands, visit hopkinsmedicine.org/insight.

UpToDate: Web-Based Resource for Clinical Decisions

No physician has all the answers. So, when it comes to diagnosis and treatment, Web-based tools and apps can come in handy—especially in an academic teaching hospital.

One of several diagnostic support tools provided through the Welch Medical Library website, UpToDate contains more than 10,000 peer-reviewed articles covering 20 specialties. A mobile-friendly website licensed for use by Johns Hopkins Medicine employees, it acts as an evidence-based clinical decision support resource and contains patient education sheets and a drug interactions database.

"These applications allow us to efficiently navigate the limitless volume of information in an intelligent and targeted way," says Sanjay Desai, vice chair for education for the Department of Medicine. "We feel very privileged to have access to so many expert resources for our students, trainees and faculty."

Ted James, a second-year internal medicine resident, uses UpToDate to test a diagnosis.

"When you're forming a differential diagnosis, UpToDate can be very helpful," says James, who in his spare time is developing an app to move the Osler guide for Johns Hopkins residents to an interactive digital platform. "We use our medical training to say it could be X, Y or Z. We then use UpToDate to walk us through these different scenarios, what tests to consider ordering or not ordering, and suggested courses of treatment."

In this way, UpToDate also helps reinforce Choosing Wisely, a nationwide initiative embraced by Johns Hopkins Medicine that seeks to educate physicians and patients about more than 250 tests and procedures that are often unnecessary or inappropriate.

UpToDate requires staff members to be logged in and using the Johns Hopkins desktop or Wi-Fi networks. Clinicians can use the Johns Hopkins Medicine license to access uptodate.com for free, but only while on campus.

To learn more, visit the "Popular Resources" section on the Welch Medical Library's website at welch.jhmi.edu.

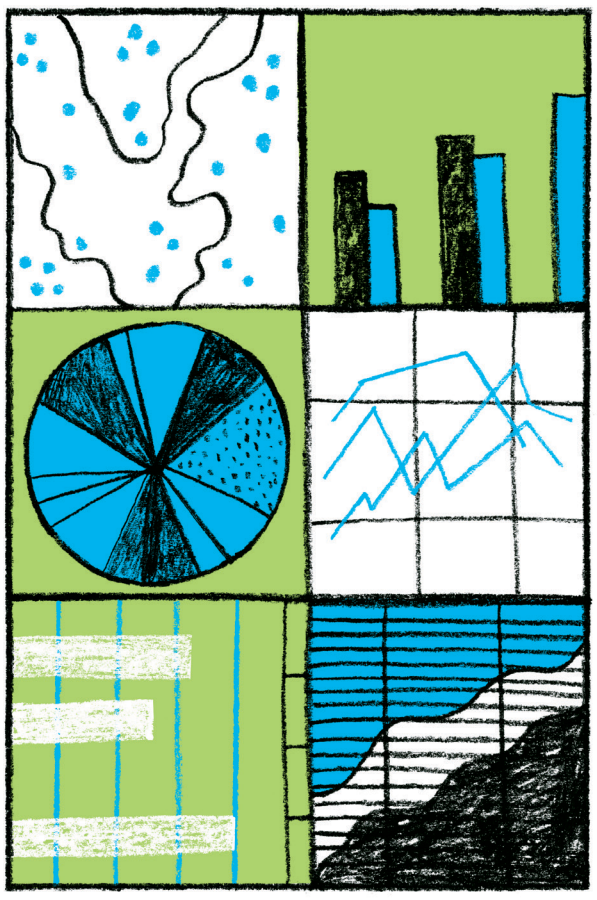


ILLUSTRATION BY PAIGE VICKERS

VISUAL REAL-TIME DASHBOARD CUTS PATIENT WAIT TIME BY 50 PERCENT

When representatives from Admitting and the Emergency and Medicine departments sat down in 2011 to share data, nobody quite understood what the others were trying to convey. Pages of data reports from one team member meant nothing to the others. Today, however, these same individuals can quickly gauge each department's situation without uttering a word.

The difference is the Patient Throughput Dashboard, a Web-based display of real-time data across the Medicine and Emergency departments. It includes patient volume in the departments and bed availability. Hetal Rupani, medicine analytics manager, says Tableau (see above article, "3 Tools for Data Visualization") was used to create at-a-glance visualizations from data streams across the department.

Now, department team members can see color-coded bar charts, line graphs and number tickers that quickly communicate the number of people waiting, the number and type of beds in use or being cleaned, and much more.

To demonstrate the tool's effectiveness, in fiscal year 2014, the time patients waited in the Emergency Department after being admitted to the hospital decreased by more than 50 percent.

In just two years, Rupani says, the dashboard has improved communication and operational efficiency, which in turn impact patient care. "We can see the whole picture so we can keep patients moving," she says. "It affects how we function and talk to each other. It's caused a real culture change in the department."

3 Programs for Data Visualization

Across the organization, departments are mining large amounts of information with the use of data visualization programs, gaining powerful insight and informing decisions that are critical to the success of the enterprise.

Here are some examples of programs in use:

1. Tableau

Hetal Rupani, Department of Medicine analytics manager, says her department uses Tableau to display patient flow throughout the hospital. The department can watch bed capacity and demand in real time. If a bottleneck or breakdown occurs, they can quickly intervene.

- Cost: Departments purchase the Tableau software individually, but the Tableau Reader is free. Departments pay an additional cost if the Tableau Server is used to publish and share data.
- Ease of Use: Intuitive, with little training, and compatible with Excel.

2. SAP BusinessObjects

Jerome Williams, a Department of Radiology and Radiological Science software/systems engineer, worked with his team to create the Patient Safety and Quality Dashboard using SAP BusinessObjects. The tool made core quality metric data, such as infections, hand hygiene and other measures, easy for Johns Hopkins Medicine frontline staff to understand and act upon.

- Cost: Based on enterprise licensing, SAP BusinessObjects is available for employees to develop, publish and view content at no incremental cost to the affiliate or department.
- Ease of Use: Requires intermediate computer programming skills.

3. D3.js

Gorkem Sevinc, a systems development manager in the Department of Radiology and Radiological Science, and colleagues Anna Roose and Katie Hazard are using D3.js—a highly customizable platform capable of dynamic interaction and animation features—to capture how The Johns Hopkins Hospital is performing compared with other hospitals. The end product will be publicly available.

- Cost: Free for download at d3js.org.
- Ease of Use: Requires advanced computer programming skills.

To discuss which platform would be best suited for your specific needs, contact Sherri Flaks, an information technology manager for Enterprise Business Solutions, at sflaks@jhu.edu.

Software-Based Citation Managers

Are you tediously typing each one of your citations for your research paper or journal article?

Hopefully not, because there are several software-based citation managers available for students and researchers to create, compile and use citations with just a few clicks.

Victoria Riese, a clinical informationist at Welch Medical Library, recommends two solutions available to Johns Hopkins users when they log in at my.jhu.edu: **RefWorks** and **EndNote**.

Riese recommends starting with RefWorks, which is free to users through the library's subscription. "Once you get comfortable using that, you can purchase EndNote if you want something more sophisticated," she says.

Both programs export and save citations from online databases. Then, the programs can convert the citations to almost any style formatting—AMA, MLA or styles specific to particular journals.

"One main difference between the two," says Riese, "is that EndNote allows you to attach files like PDFs to your citations and lets you record notes or highlights in the files. This makes EndNote more of a one-stop shop for citations and research."

RefWorks and the latest version of EndNote both allow users to access their citations from anywhere they have online access and let users share citations with other users.

Riese says students and researchers are also using free tools like Zotero and Mendeley. Each has an option to install a button on your Web browser to add sources such as wikis and websites to your citation list quickly, and both are accessible through apps that can be used with a mobile device.

Even if users aren't using citations managers to create reference lists, Riese says the programs can serve as a helpful resource to keep articles all in one place.

"Nobody likes being that person who remembers an article from five years ago but can't find it now," she says.

Are you using any particular application to organize your research? If so, let us know by commenting on this article at hopkinsmedicine.org/insight.

If you have questions about these applications, contact your Welch Medical Library informationist at welch.jhmi.edu/welchone/Informationist-Program.

Mobile Mapping Applications Help Visitors Find Their Way Indoors

There are smartphone and mobile apps to find parking, navigate traffic, map bus routes and even determine walking paths.

The time has come for maps and directions to offer this same robust experience inside locations, from airports and college campuses to health care and resort facilities.

Technologies that help us find our way indoors are a relatively nascent development. At The Johns Hopkins Hospital, when we opened two new clinical towers in 2012, we created a cross-platform mobile and desktop interactive floor map that highlights important hospital locations and includes features that patients and their families may find useful when navigating the hallways. The floor map continues to receive thousands of views each month by staff and visitors alike. Many of our colleagues at leading health care organizations are creating similar mapping systems.

Growth in indoor mapping isn't limited to health care. Industry leader Google recently launched indoor mapping for Android phones. Apple's newly released iPhone 6 also has a new technology that will hopefully help developers build apps with a greater degree of indoor mapping accuracy. A major hurdle, however, is the need for indoor point-to-point directions, and this requires the construction of robust databases.

Showing users their real-time tracking, the "blue dot," is simply not enough.

However, a new technology may come to the rescue.

Called beacons, these small electronic transmitters are the size of a doorbell and are designed with the retail customer in mind. Placed on a storefront, beacons broadcast signals that can trigger messages on your phone, such as a coupon for a free coffee that appears as you pass your local coffee shop. While this may sound somewhat intrusive, it's easy to imagine the potential for this technology as applied to hospitals and health care facilities, where patients trying to locate appointments could receive push messages to guide them on their way.