

ESSAY

Working to Make the Hospital Smarter

Amit T. Singh, MD

Imagine in the not too distant future, you are rounding on a child who was admitted with gastroenteritis. You want to know whether he is ready for discharge, so you ask your hospital for an update:

Hospitalist, talking aloud: "Hospital computer, when was Johnny's last bowel movement?"

Overhead voice: "Patient Jonathan Smith had a bowel movement at 0538. It was yellow and seedy in appearance. He had 5 bowel movements in the last 24 hours, decreased from 10 the day prior. Would you like other vital information?"

Hospitalist: "No, thank you, hospital computer."

Although this scenario may seem straight out of an episode of *Star Trek*, is it really that far off? Everywhere we look these days, smart technology has infiltrated our lives. From Siri reminding me I am on call, or wearables that track our every biologic function, it seems you cannot make a move without generating measurable data.

But what about hospitals? Why am I still faxing discharge summaries while my friends in the tech sector make fun of me for using the word *fax*? Why have our work environments not kept pace with the rest of the world?

When I started working after my pediatric hospital medicine fellowship, the first quality improvement project assigned to me was to lead a group to improve hand hygiene on the wards. Over time, as our efforts evolved, a unique opportunity came my way. I learned that scientists at our university working in the field of artificial intelligence were interested in partnering with us.

Initially, the only way we monitored compliance was with physical audit cards done by hand, mainly by nursing staff. Consequently, we had little data on every other role. How could we recreate a fly on the wall to monitor compliance in real time, all the time, for anyone? With "computer vision" I was told.

The group was interested in placing depth sensors throughout the ward that could monitor movement and track whether the gel dispensers were being used at entry and exit of patient rooms. They could even be placed inside patient rooms to monitor whether, for example, someone washed their hands appropriately but then touched something they should not, and then interacted with the patient environment. They had previously used these sensors to track movement through subway stations in Europe and in other real-world applications but never anything in health care. Now, about 2 years after our initial meeting, we are collecting data, and I am excited about the future.

What if, in place of monitors and their wires, our patients could wear bracelets that transmitted biometric data directly to the electronic medical record (EMR)? This would save documentation time, free up staff for other activities, and allow more robust data collection (no more "missed" diapers). What if, combined with intelligent sensors analyzing patients' movements, false alarms on monitors could be silenced automatically, alleviating alarm fatigue? What if, when I walked into a patient's room, my badge was connected to a system that could let the patient

www.hospitalpediatrics.org

DOI:10.1542/hpeds.2016-0092

Copyright © 2017 by the American Academy of Pediatrics

Address correspondence to Amit T. Singh, MD, 300 Pasteur Dr, MC 5776, Stanford, CA 94305-5776. E-mail: atsingh@stanford.edu

HOSPITAL PEDIATRICS (ISSN Numbers: Print, 2154-1663; Online, 2154-1671).

FINANCIAL DISCLOSURE: The author has indicated he has no financial relationships relevant to this article to disclose.

FUNDING: No external funding.

POTENTIAL CONFLICT OF INTEREST: The author has indicated he has no potential conflicts of interest to disclose.

*Department of Pediatrics,
Division of Pediatric
Hospital Medicine,
Stanford University
School of Medicine,
Stanford, California*

know who I am, eliminating the confusion often felt by families about who their care team is? In some places, this technology is being used to provide cutting-edge care. Through a collaboration with IBM, the University of Pittsburgh has been able to create their own “smart room” that uses real-time location tracking information to bring patient information from the EMR to screens in the patient’s room.^{1,2}

As hospitalists, we are poised to be on the forefront of *appropriate* innovation. There are plenty of times when technology fails us. It is usually when the technology was designed without the end user in mind. Pairing technological advances with someone who knows the hospital inside and out (that’s us!) could unlock huge potential that our hospital administrators may not realize. Getting from our first meeting in an office to depth sensors on the ceilings of a ward was no easy task. Along the way, I learned (sometimes the hard way) how best to try to bring a new technology to the hospital. Here are some ideas that can be helpful in driving successful collaboration if you too are interested in making your hospital smarter with technology:

LITERATURE SEARCH

Reading outside your usual journals can often bring new perspectives. Checking out casual technology news outlets such as *Wired* magazine or techcrunch.com can expose you to technology companies you may never have heard of in your traditional medical reading. Moreover, there are a myriad of health care information technology (IT) outlets to explore, such as the health care section of *Information Week* or *Healthcare IT News*^{3,4} or blogs such as Chilmark Research and KevinMD,^{5,6} that can be great sources.

RIGHT PROBLEM, RIGHT SOLUTION

When the computer vision team first contacted us, they broadly wanted to work on “hand hygiene.” Finding out exactly what our problem was and what their technology could realistically do helped us determine whether it would be better than our current state. This is probably one of the most important lessons from my experience. The

world has been full of promises about new technology that will “revolutionize” how something is done. Consider the Segway⁷ or, even more recently, the rise and fall of Theranos.⁸ The time spent making sure the technology really solves a problem that exists, rather than being a solution to a problem that does not, is crucial. Moreover, in our field the proof of concept is paramount. It has to not only make sense but have proven efficacy if it is going to be adopted for improving clinical care.

TAKE THEM FOR A RIDE

Workflow integration with minimal disruption, especially in relation to brand new technology, is crucial. This has been noted in instances of large change such as a brand-new EMR rollout.^{9,10} At the beginning of our project, we invited the computer vision team to join rounds, tour the hospital, observe nursing staff workflow, and witness how many people go in and out of patient rooms. If for example, our sensors required people to change how they cleaned their hands or where they stood, it would have been impossible to move the project forward. This “field trip” is vital to making sure that a company truly understands what patient care looks like and is essential for success. No matter the technology, if it is designed without the end users’ workflow in mind, it is doomed to fail.

INVOLVE ALL STAKEHOLDERS EARLY

Research has shown that with any large implementation, finding the “special” people is crucial to success.¹¹ Your hospital’s leaders may be the first point of contact to green-light any project you propose. It is worthwhile to get their buy-in, perhaps with a short presentation and written proposal, to help push the project forward. In our case, we presented with our computer vision colleagues at a monthly chief executive meeting to answer questions and prove our case to get approval. Afterward, we focused on involving a variety of stakeholders including facility staff, engineering, occupational health and safety, nursing staff leaders, and so on. In any big project, it is also important to hold regular meetings with the stakeholders to maintain transparency

and keep momentum. It also will make any hiccups along the way easier to swallow because people are not surprised by your project and have been aware of it all along.

COMMUNICATE, COMMUNICATE, COMMUNICATE

New technology can often bring skeptics and disbelief. Addressing these problems requires developing clear and direct messaging about what you are doing to the people who will be most affected and repeating this information regularly. For example, we created multiple staff notices via e-mail and in-person discussions until everyone had a good understanding of the technology and the project. We also created a notice to hand out to patients on that unit describing the project and inviting questions. Additionally, communicating your endeavor to your colleagues is just as important. You may never know who else might be interested in collaborating with you or might have similar interests in bringing technology to the hospital setting.

I have learned now that it is our responsibility not to wait on innovation to find us but the opposite. I never thought for a second when I decided to be a hospitalist that I would have such an opportunity to bring cutting-edge technology to the hospital in such a creative way, but I was fortunate that it happened by chance and found its way to me. This experience has encouraged me to not leave things to chance but rather to start thinking outside the hospital box. What this means is thinking about how technology might be able to solve problems I encounter on a daily basis and then find out whether they exist. It means leaving the confines of the academic hospital system and seeking out companies developing technology that could be helpful and reaching out to them. What is wrong with connecting with industry if the result is better, more efficient, and safer patient care? I would not mind disclosing that at all.

However, it is necessary to reach out to your hospital’s IT leaders to discuss your ideas first. Making technology improvements is their responsibility, and many welcome the

unique view of a clinician but may not seek it out. Given our time on the “front lines,” our experience is valuable so do not be afraid to seek opportunities to share it. However, if that is daunting, asking your division chief or department chair to facilitate a meeting may be a helpful first step.

So, while I listen to the unmistakable melody of another discharge summary being transmitted via fax, I look forward to the day when I can treat my hospital like the bridge of the starship *Enterprise*. The day when I can ask aloud what happened with Johnny’s bowel movements, and Johnny’s mother or father can ask aloud who their doctor is today and what time the cafeteria closes. I just hope I can wheel around in Captain Kirk’s chair on family-centered rounds when I am too old to walk the wards.

REFERENCES

1. Cerrato P. Hospital rooms get smart. *Information Week* online. October 2011. Available at: www.informationweek.com/healthcare/clinical-information-systems/hospital-rooms-get-smart/d/d-id/1100822? Accessed June 2016
2. Pennington C. Building a smart hospital that stays smart well into the future. *UConn Today*, April 2012. Available at: <http://today.uconn.edu/2012/04/building-a-smart-hospital-that-stays-smart-well-into-the-future/>. Accessed June 2016
3. Information Week. Healthcare: Connecting the healthcare technology community. Available at: www.informationweek.com/healthcare.asp
4. Healthcare IT News. Available at: www.healthcareitnews.com/
5. Chilmark Research. Available at: www.chilmarkresearch.com/
6. KevinMD.com. Tech. Available at: www.kevinmd.com/blog/category/tech
7. Hartung A. The reason why Google Glass, Amazon Fire Phone and Segway all failed. February 12, 2015. Available at: www.forbes.com/sites/adamhartung/2015/02/12/the-reason-why-google-glass-amazon-firephone-and-segway-all-failed/#5f0eaf2461fa. Accessed November 2016
8. Carreyrou J, Siconolfi M, Weaver C. Theranos dealt sharp blow as Elizabeth Holmes is banned from operating labs. July 8, 2016. Available at: www.wsj.com/articles/u-s-regulator-bans-theranos-ceo-elizabeth-holmes-from-operating-labs-for-two-years-1467956064. Accessed November 2016
9. Washington L. Analyzing workflow for a health IT implementation: an often short-shrifted step is essential in successful IT deployments. Available at: <http://bok.ahima.org/doc?oid=77538#.WB1aAvkrl2w>. Accessed November 2016
10. Kaplan B, Harris-Salamone KD. Health IT success and failure: recommendations from literature and an AMIA workshop. *J Am Med Inform Assoc*. 2009;16(3): 291–299
11. Ash JS, Stavri PZ, Dykstra R, Fournier L. Implementing computerized physician order entry: the importance of special people. *Int J Med Inform*. 2003;69(2–3): 235–250

Working to Make the Hospital Smarter

Amit T. Singh

Hospital Pediatrics 2017;7;122

DOI: 10.1542/hpeds.2016-0092 originally published online January 3, 2017;

Updated Information & Services	including high resolution figures, can be found at: http://hosppeds.aappublications.org/content/7/2/122
References	This article cites 2 articles, 0 of which you can access for free at: http://hosppeds.aappublications.org/content/7/2/122.full#ref-list-1
Subspecialty Collections	This article, along with others on similar topics, appears in the following collection(s): Administration/Practice Management http://classic.hosppeds.aappublications.org/cgi/collection/administration:practice_management_sub Biomedical Informatics http://classic.hosppeds.aappublications.org/cgi/collection/biomedical_informatics_sub Health Information Technology http://classic.hosppeds.aappublications.org/cgi/collection/health_information_technology_sub Medical Technology and Advancement http://classic.hosppeds.aappublications.org/cgi/collection/med_tech_advancement_sub
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: https://shop.aap.org/licensing-permissions/
Reprints	Information about ordering reprints can be found online: http://classic.hosppeds.aappublications.org/content/reprints



Working to Make the Hospital Smarter

Amit T. Singh

Hospital Pediatrics 2017;7;122

DOI: 10.1542/hpeds.2016-0092 originally published online January 3, 2017;

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://hosppeds.aappublications.org/content/7/2/122>

Hospital Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 2012. Hospital Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 345 Park Avenue, Itasca, Illinois, 60143. Copyright © 2017 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 2154-1663.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

