

The Health Care Improvement Foundation
2014 Delaware Valley Patient Safety and Quality Award
Entry Form

1. Hospital Name

Hospital of University of Pennsylvania

2. Title Of Initiative

Perfect Storm of Inpatient Communication Needs: An Innovative Solution

3. Abstract (Please limit this description to 250 words)

Hospital units are dynamic environments in which health care providers must communicate and coordinate their efforts for the provision of high-quality patient care. Patient care now almost inevitably seems to involve a team approach to caring for patients which necessitates more communication. Numerous studies have shown that communication among healthcare providers influences the quality of working relationships, job satisfaction, and has profound impact on patient safety. Research conducted during a 10 year period demonstrated that ineffective team communication is the root cause for nearly 66% of all medical errors. Poor communication of information has also been found to have substantial economic consequences, primarily as a result of operational inefficiencies, unnecessary costs and decreased productivity of providers – not to mention costs associated with poor patient outcomes. While there is significant discussion of, and investment in, information technologies such as EHRs, communication systems receive much less attention and the clinical adoption of even simpler services, such as secured-messaging or smartphones, is not commonplace in many hospitals. We set out to focus on the intersection between process improvement and new technology to address the expanding complexity of clinical communication. Ultimately, we designed a solution to pilot on four hospital units utilizing Smart technology (iPhones and iTouches) with a secured-messaging application (Cureatr) for non-urgent communication among a multidisciplinary team. Our findings showed improvements in operational metrics, such as length of stay and discharge time, increased perception of improved communication between nurses and physicians, and fewer interruptions during patient care activities.

4. What were the goals of your initiative?

Direct, face to face communication is a very effective method of communication, but is often difficult in healthcare due to the size of care teams, dynamic structure, and the scope of their responsibilities. There are few studies that have attempted to directly quantify the actual size of the communication space in health settings. A recent time-motion study at our institution with medical and surgical interns showed that an intern spends an average of 20% (about 2 hours) of a typical day shift communicating with health care providers (this excludes time spent on educational activities such as rounds or conferences or direct patient care activities). The sheer scale and complexity of these interactions within the hospital puts a heavy burden on the process of communication. For this reason, our institution uses various forms of communication to connect

providers, including overhead pages, individual pagers, and mobile devices and landline phones. We came to realize that these methods not only lead to frequent interruptions in the workflow of the sender and recipient of the messages but also diminished the quality of interprofessional collaboration and was resulting in the adoption of unreliable, informal processes among providers. The consequence of such frequent interruptions is that providers have to repeatedly suspend active tasks to deal with the interruption, and then return to the previous task. Suspending tasks and then returning to them imposes a cognitive load, and may result in tasks being forgotten or left incomplete. Additionally, in order to remove silos and work as high-functioning teams, effective communication must be closed-loop, founded on a shared mental model, and exist in an environment of mutual trust. Our fragmented methods of communication did not address these needs for team-based care of patients. These barriers can lead to operational inefficiencies, unnecessary costs and decreased productivity of providers - not to mention poor patient outcomes.

We formed a multidisciplinary team comprised of nurses, physicians, discharge planning nurses, social workers, pharmacists, administrators, and user experience designers who collaborated to rapidly validate ideas on improving communication in a rigorous way. Our methodology was a disciplined, inexpensive, and rapid process of testing concepts, figuring out what works and does not, and pivoting based on what was learned. Tools that we used to rapidly validate ideas included: contextual inquiry to gain insight into providers' workflow and concerns with communication and rapid prototyping to explore possible solutions at low cost. Our goal was to better understand what the right blend of communication tools and interfaces should be based on various provider needs. Based on our focused information-gathering, we decided upon a few desired outcomes that would drive the direction of a pilot: 1) reducing time to contact the right provider, 2) reducing time to close the loop, and 3) improving staff satisfaction and collaboration. Ultimately, we designed an intervention to pilot Smart technology (iPhones and iTouches) to utilize a secured-messaging mobile application (Cureatr) for non-urgent communication between all care providers (nurses, residents, faculty physicians, pharmacists, social workers, and discharge planning nurses) on four hospital units starting May 2013.

5. What were your initiative's baseline data and the results of your initiative?

From our ethnographic work and contextual inquiry on two medical hospital units, we distilled our learnings into several key themes that influenced our prototype development and pilot intervention:

- 1) Providers spend a lot of time identifying other care team providers. This involves searching within the hospital's electronic telephone directory, calling hospital operators, asking other care providers, or walking around the unit to find the right provider.
- 2) Providers spend a lot of time trying to gather information from other care team providers ("closing the loop"). There were often multiple delays in the process of making

contact with the right care providers, obtaining complete information, and then relaying information to patients.

3) Communications are not always prioritized in terms of importance or urgency. There was little or no means for differentiating and prioritizing information on either the sender or recipient end. This caused unnecessary interruptions in workflow, and delays in acting upon the more urgent patient issues.

4) Patient-centric communication is the norm. Through our observations, it became very clear that communication (such as verbal updates during rounding) was always patient centric, meaning the stories and instructions being conveyed began with the specific patient (often stating the patient name and room number as identifiers). From a philosophical and cognitive flow perspective, it seemed to make sense for any communication about a patient to begin with the specific patient rather than specific care team provider; however this was not possible with our current communication technology.

5) Staff were frustrated with outdated communication tools. The variety of limited and archaic communication tools (overhead paging, flip-phones that only receive text information, desktop directories, and landline phones) frustrate our staff. Communication tools are also inconsistent among different staff: residents are issued flip phones; attendings use pagers; and nurses have no mobile devices. This lack of shared and consistent communication tools reinforces disciplinary silos and prevents development of shared mental models as many staff members are left “out of the loop”.

6) Providers often times use devices and applications that are not HIPAA secured as workarounds to address a few of the above barriers.

Informed by these learnings we designed an intervention to pilot Smart technology (iPhones and iTouches) to utilize a secured-messaging mobile application (Cureatr) for non-urgent communication between all care providers starting May 2013. Nurses, residents, faculty physicians, pharmacists, social workers, and discharge planning nurses were provided iPhones or iTouches on four specific hospital units: two medical teaching units, one surgical teaching unit, and one hospitalist unit. All providers on these units utilized a secured-messaging application (Cureatr) for all non-urgent communication. Examples of non-urgent communication included messages about discharges, patient questions regarding plan of care, medication order change notifications, etc. Key findings from our pilot intervention phase (May 2013 to October 2013) are summarized below:

1) Qualitative data

a. Average time saved daily by both nursing and physicians was reported to be about 60 minutes and 90 minutes, respectively. (Graph 1)

b. Based on survey responses (scale of strongly disagree (1) to strongly agree (5)), nursing

and physicians experienced improved response times (mean change 1.24, 2.35 respectively) and noticed a reduction of delays in relaying information about patient care to each other (mean change 0.96, 1.32 respectively). (Table 1)

c. Our intervention was found to be less disruptive to workflow by both nursing and physicians (mean change 2.21, 2.11 respectively).

d. Biggest improvement from using this technology to communicate was felt to be in improving efficiency of patient care activities for both nursing and physicians (39%, 47%, respectively). (Graph 2)

e. Both nursing and physicians rated the intervention a 9 (scale of 1 to 10) when recommending this new method of communicating to other care providers.

f. Calculated Net Promoter Score for Cureatr was 65. Net Promoter Score is a customer loyalty metric used in many industries, where a score of 50 is excellent and 70 is considered world class.

2) Quantitative data

a. Total messages sent were 277,785, of these:

i. 43,760 were group messages

ii. 123,712 messages were sent by nursing (44.5%)

iii. 83,629 messages were sent by physicians (30%)

iv. 6.35% of group messages were sent by discharge planning nurses and social workers

b. On a typical day, about 1,510 messages were sent and 2,093 messages received during the 6 months of the pilot

c. Nursing and physicians respectively read 66.67% and 74.71% of received messages within 10 minutes. (Graph 3)

3) Operational data

a. We saw decreased length of stay (1.3 days and 0.6 days) and improved discharge time (6 minutes and 37 minutes) on two hospital units.

b. We were able to calculate estimated annualized savings of \$1.1 million from the incremental discharges from one unit since the census remained stable.

c. Additionally, landline usage on one of the pilot hospital units decreased by one-third.

6. Describe the interventions that were instrumental in achieving the results for your initiative.

We used rapid validation which allowed for ideas on improving communication among care team providers to be implemented, tested, evaluated, and refined through

disciplined application of specific tools and methods. From this we were able to develop prototypes and choose one that could quickly and cost effectively be tested. Our pilot results highlight that a mobile communication application on smart phone technology can improve communication and workflow efficiency among care team providers. We found that frontline providers, using new technology coupled with process redesign, are better able to coordinate patient care which led to increased staff satisfaction and improved operational efficiencies in our hospital. Our intervention was able to allow for prioritization of messages to minimize interruptions in workflow and delivery of messages to the “right” providers so that “virtual” conversations on patients can take place in real-time and create a shared mental model among the care team. The findings of this pilot and rapid uptake of simple technology by our providers has given our institution an opportunity to provide staff with a communication system that allows for closed-loop communication, a shared mental model of the current state (of the care team), and mutual trust. This effort has enhanced teamwork and effectiveness on the floors among providers to provide better care to our patients. We found strong evidence that users perceive improvements with this communication intervention. Further evaluation that involves outcome measures of patient-oriented outcomes will need to be undertaken as we expand our pilot.

Engaging in a mobile health (mHealth) strategy is necessary for hospitals given the rising use of mobile medical applications to make expedited decisions with readily accessible patient information, decreased time on administrative tasks, and decreased time on non-value added activities. Ultimately, this will lead to more time spent with our patients, higher patient and provider satisfaction, improved patient outcomes, and clinician access to healthcare systems both within and outside our network.

7. How can this initiative be replicated through the region? (Please limit this description to 100 words.)

Mobile communication tools represent cost-effective interventions that can improve the quality and safety of clinical services, and deserve much greater attention than they currently receive. Tools we used to rapidly validate ideas on improving communication included: contextual inquiry, and prototyping to quickly explore possible solutions at low cost. Regional hospitals can easily adapt these methods and readily available software and hardware in their own workflows.

8. Explain how the initiative demonstrates innovation (Please limit this description to 100 words.)

Information and communication systems offer powerful means for restructuring the way care is delivered. Communication among providers currently occupies a substantial portion of a given workday and suffers from a range of inefficiencies, and yet there remains a substantial imbalance in the attention that is given to communication systems, compared to traditional information systems. We found that applications deployed on mobile devices to facilitate asynchronous, closed-loop team communication, and coordination seem to be one of the cheapest and most cost effective interventions we had available to improve the quality of care.

9. How does this initiative demonstrate collaboration with other providers within the continuum of care? (Please limit this description to 100 words.)

Medical team communications are complicated and often time-critical and new technology is unlikely to provide a comprehensive solution absent workflow changes. It is essential we understand the intersection between process improvement and new technology. Comprehensive redesign requires engaging frontline staff in these efforts, thorough analysis and equipping them with the right communication tools to provide high-quality, team-based care. We look forward to equipping our provider team members (physicians, nurses, discharge planners, etc) with access to the right devices running the right applications at the right time, to improve patient outcomes and the cost and quality of care.

10. Explain ways in which senior leadership exhibited commitment to the initiative (Please limit this description to 100 words.)

Engaging with frontline staff to not only investigate the communication problem but to also "prototype" solutions was of utmost importance to senior leadership who supported this initiative (sponsored jointly by our CMO and CMIO). Additionally, various senior leaders of our organization (CIO, CMO, CMIO, etc) regularly conducted "leadership" rounds during the pilot implementation. During these rounds, staff were asked about their experiences with the new communication tool, including what they liked and what needed improvement. This process allowed for leadership to understand how the solution being tested could be improved and also how to further improve our communication systems.

11. Appendices (i.e., tables and graphs)

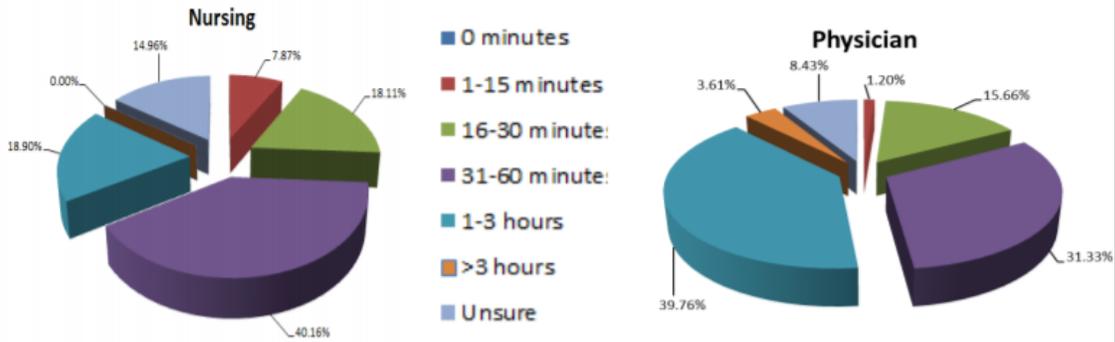
Appendix: Tables and Graphs

Table 1: Results of a pre and post survey of nursing and physicians effect on workflow after using a secured-messaging application, Cureatr, to communicate non-urgent messages

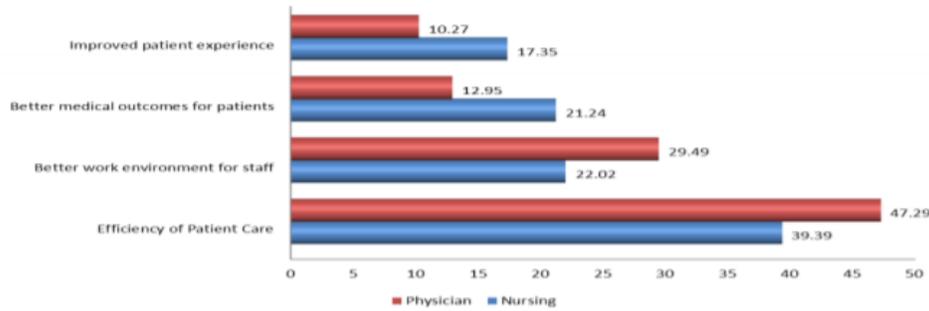
Question	PRE - Mean Response (n = 137)	POST - Mean Response (n = 137)	Change	P value
Nursing				
1. The current communication method is disruptive to my workflow	3.89	1.68	2.21	<.001
2. I do spend a lot of time away from the bedside trying to contact providers.	3.71	2.90	0.81	<.001
Question	PRE - Mean Response (n = 93)	POST - Mean Response (n = 83)	Change	P value
Physician				
1. The current communication method is disruptive to my workflow	3.83	1.72	2.11	<.001
2. I often spend time waiting for nurses to respond.	4.59	2.24	2.35	<.001

1	Strongly Disagree
2	Disagree
3	Neither Agree nor Disagree
4	Agree
5	Strongly Agree

Graph 1: Nursing and physicians daily times saved with using a secured-messaging application, Cureatr, to communicate non-urgent messages



Graph 2: Nursing and physicians reported areas of improvement with using a secured-messaging application, Cureatr, to communicate non-urgent messages



Graph 3: Nursing and Physicians statistics on time to read messages received

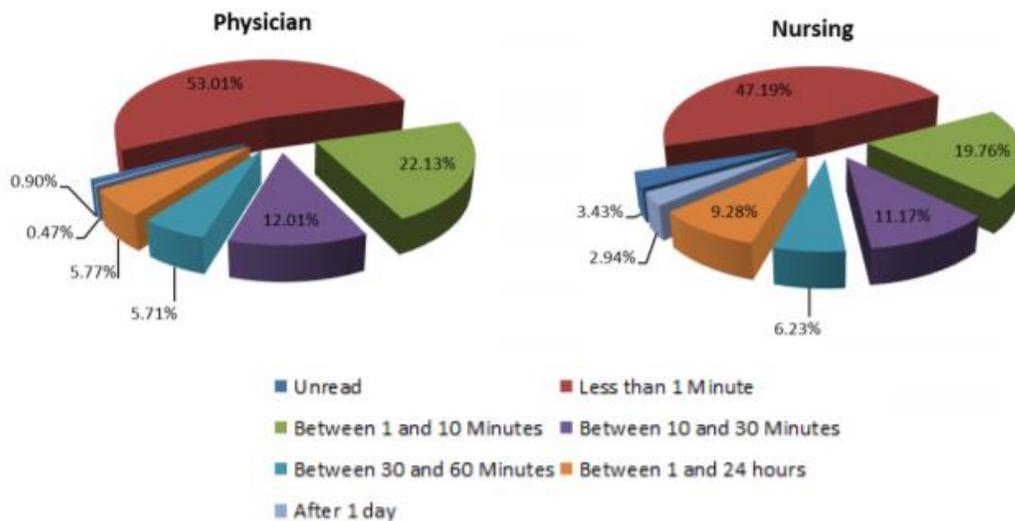


Table 2: Total messages sent matrix.

This table details messages sent within (green shading) and between roles. Any group message will be only counted once.

SENDER ROLE	RECEIVER ROLE								Grand Total
	Nurse	Resident	SW / CRC	Attending	Pharmacist	Others	Secretary	2 or More Roles	
Nurse	22,191	70,486	1,822	17,109	1,892	3,345	810	6,057	123,712
Resident	45,760	17,514	2,659	3,295	2,933	1,332	134	10,002	83,629
SW / CRC	1,887	3,934	3,391	251	40	404	63	7,660	17,630
Attending	9,373	3,727	180	1,044	576	310	53	803	16,066
Pharmacist	2,619	6,269	42	1,278	2,461	942	69	1,847	15,527
Others	5,702	1,323	509	831	383	1,125	35	5,351	15,259
Secretary	4,345	574	97	308	49	74	235	280	5,962
Grand Total	91,877	103,827	8,700	24,116	8,334	7,532	1,399	32,000	277,785