

The Health Care Improvement Foundation  
2016 Delaware Valley Patient Safety and Quality Award  
Entry Form

**1. Hospital Name**

University of Pennsylvania Health System

**2. Title Of Initiative**

"Clinical Data App": Upgrading from Outdated Paper to Real-Time, Interdisciplinary Mobile Handoffs

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

The acute care of patients involves a multitude moving parts – from teams of physicians, nurses, and interdisciplinary providers, to an assortment of tests, medications, and clinical information systems. Physician teams often use paper "signout documents" or "handoffs" not only for transitions in care, but also to organize these parts to work together. These documents however, are outdated soon after being printed. Moreover, valuable information written on these printouts seldom gets communicated promptly to other providers, if at all. To improve the quality of transitions, interdisciplinary care, and clinician efficiency, our organization created "Clinical Data App": a responsive web application with real-time clinical data and an interactive, editable mobile handoff. Designed through close collaboration between physicians and developers, "Clinical Data App" gathers information from over 10 different systems into one clinically intuitive display. Our real-time, shared, and easily accessible handoff interface provides a timely view of the patient's problems and the team's plan for each. Viewable by all providers - including not just clinicians but also nurses, respiratory technicians, phlebotomists, social workers, clinical nutritionists, and others - "Clinical Data App" is transforming clinicians' daily workflow and interdisciplinary team interaction. As we move beyond our initial implementation to system and workflow optimizations, we aim to leverage our system to improve the quality of transitions of care and ultimately, improve patient safety.

**4. What were the goals of your initiative?**

1. Provide clinicians with electronic tools that intuitively display clinical data and enable smart utilization through discrete handoff elements.
2. Use mobile tools to facilitate clinicians spending more time at the patient bedside
3. Improve the quality of transitions in care and the communication between health providers at these critical moments.
4. Improve coordination of healthcare teams and disciplines in a patient-centered manner.

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

"Clinical Data App" was developed and launched in 2 phases: Version 1 (V1) in August 2014, provided real-time access to objective data (Figure 1a, 1b), and Version 2 (V2), implemented January through July 2016, adds an iterative, collaborative plan of care (Figure 1c) used in handoffs and to create progress note assessment and plans.

"Clinical Data App" enables timely access to intuitively displayed data and handoff elements. Initial time motion observations revealed that accessing data in "Clinical Data App" V1 on mobile devices was 22 times faster than logging into the inpatient EHR on a hospital computer. During rounds, teams using "Clinical Data App" accessed data 50% more often, yet spent 25% less time logging into devices. In addition to reducing login time to access clinical data, usage statistics showed that V1 decreased the number of desktop EHR logins daily by 25%. This frees up much-needed workstations for more in-depth documentation needs, again improving efficiency and workflow.

In a March 2015 survey of 386 V1 users, 87% reported being able to make more timely clinical decisions and 95% said they would recommend the application to a colleague. Providers reported using it during rounds (77%), while pre-rounding (58%), at the patient bedside (48%), while off-campus (44%), while on call (37%), and during handoff (21%). Users of V2 have also reported that it has improved their clinical workflow. In a December 2016 survey after an initial pilot of V2, general medicine residents described the following benefits of using "Clinical Data App": "good mobile interface [makes] it easy and practical to access patient data not at a desktop" and the "ease of access to data/vitals when updating [the handoff]," among other comments.

During the initial stages of "Clinical Data App"'s V2 implementation in early 2016, we compared provider perceptions of V2 and the previous handoff tool. The general medicine services at one of our organization's hospitals are naturally divided into 2 groups with identical structures and nearly equal numbers of patients; 1 group continued to use the previous established handoff tool (with which they had 0.5 - 2.5 years of experience) while the other group transitioned to V2. After 1 to 8 weeks, 51 physicians responded to 16 Likert-type scale statements (Figure 2). The percent responding positively ("Agree/Strongly Agree") and negatively ("Disagree/Strongly Disagree") were compared via a Chi-squared test, with statistical significance in favor of "Clinical Data App" V2 found for 3 statements: "The current written handoff system is safe for patients" ( $p = 0.022$ ), "I am satisfied with the current handoff system" ( $p = 0.012$ ), and "I would recommend the current handoff system to colleagues" ( $p = 0.011$ ). The residents also reported near-significant improvement in workflow efficiency with V2 in responding positively to the following statement: "I am able to efficiently manage my patient care responsibilities." Responses among early (weeks 1-4) and late V2 users (weeks 5-8) were compared to each other in the same fashion, with no statistically significant differences found between the 2 groups. Of note, these findings show users positively rating a new system as compared to a previous system with which they had much more experience. Moreover, many bug fixes, interface optimizations, and feature improvements or additions were implemented in the months since this survey was conducted.

To assess perceptions on use of "Clinical Data App" V2 at the bedside, 152 patients cared for by the aforementioned general medicine teams were asked in person to respond to Likert-type scale statements about provider communication and perspectives on healthcare IT. Notably, 72% replied positively to: "My care providers should use mobile devices to access and manage my health information."

Almost two years after the launch of V1 and 6.5 months into V2, there are approximately 145 medical and surgical services using V2 across 4 of our organization's hospitals. Over 3,200 unique patient records are viewed weekly between >24,000 sessions (Figure 3b) amongst >3200 unique users (Figure 3a): 40% physicians & advanced practitioners (including 7% attendings), 45% nurses and 13% other clinical users (pharmacists, therapists etc). Interestingly, "Clinical Data App" V2 is being used or piloted by many services that previously did not create any written handoffs, including respiratory therapy, phlebotomy, social work, and clinical nutrition.

## **6. Appendices (i.e., tables and graphs)**

DelawareValleyQSAward\_ClinicalDataApp\_SupportingFigures.pdf

## **7. Describe the interventions that were instrumental in achieving the results for your initiative.**

"Clinical Data App" is a home-grown, responsive web application designed by front-line clinicians, residents, medical students, interdisciplinary providers, and developers. Device and operating system agnostic, "Clinical Data App" is accessible from anywhere - hospital computers, workstations on wheels, smartphones, tablets, or personal laptops - as long as the device is connected to the hospital's secure network via WiFi or VPN. It can be viewed from within our inpatient EHR as well as separately in a computer or mobile device browser window. Utilizing HL-7 messages, direct database queries, and web services/APIs, "Clinical Data App" pulls information from our organization's many different information systems: ADT (demographics, visit information), Cerner (lab data), Radiant (imaging), Navicare (patient location), Epic (provider and encounter data), Sunrise clinical manager (care team, vital signs, allergies, and medications with administration record), and others. Accessing all this critically important data previously required going to multiple different programs. Now it is available at any time, through an intuitive display optimized for smartphones.

Beyond the data review capabilities of V1, V2 adds handoff functionality that is arguably more transformative, moving away from free text boxes to discrete, collapsible data elements organized in a way that facilitate rounding, critical thinking, and list management. Key features include the ability to archive information, tag items as anticipatory guidance, and view qualitative content arranged by problem or by task. V2 also provides extensive functionality for list-based management of patient and team tasks.

Although originally designed for front-line provider use in the inpatient setting, "Clinical Data App" has become widely adopted by our home care clinicians and interest in other "off-label" uses continues to rise. Previously, the handoff document was primarily used by the primary medical team and advanced practitioners; with V2, many other user groups have begun to refer to the handoff more routinely to stay informed about the patient's care plan and what needs to be done during the admission (Figure 3, 4). While we have yet to implement nursing-specific handoff functionality in "Clinical Data App," geriatrics and wound care nursing consult groups at our institution have started using "Clinical Data App" V2's consult functionalities to communicate findings and plans with the team in real time. We are also exploring interest in using "Clinical Data App" as a platform for other interdisciplinary functions. Some examples include verification of diet orders in real-time by food services during meal delivery; communication between clinical documentation personnel and the clinical teams regarding necessary documentation additions or changes; and use by phlebotomists to identify which labs need to be drawn, communicate with teams regarding labs that were not drawn, and communication with other phlebotomists regarding patient lab draw preferences. Looking beyond the inpatient setting, our advanced lung disease and liver transplant teams have begun to use "Clinical Data App"'s discharge planning section for multi-disciplinary coordination to facilitate safer and more timely discharges. Finally, our Home Care services have been using "Clinical Data App" extensively for accessing patient data during home visits.

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

"Clinical Data App" is a home-grown tool built as a responsive web application that can import and show data from any back-end clinical information system. Using a system's existing or custom web services and APIs, "Clinical Data App" can be "hooked up" to most other systems with some initial setup. The intuitive display was designed to complement the clinical workflow of all clinicians and would be applicable widely.

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

Our program offers seamless real-time, mobile data review and handoff updating capabilities more advanced than those offered by leading EHR vendors. Moreover, its back-end EHR integration makes it superior to most stand-alone mobile handoff solutions. Finally, "ClinicalDataApp" is innovative in that it provides a single workspace where different teams of clinicians and interdisciplinary providers can collect and share information about a patient's plan of care. The shared handoff management promoted by this design has led to new workflows and collaborations we believe will result in higher quality, more patient-centric clinical interactions, eliminating the silos of information pervasive in clinical settings.

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

Our system's design, implementation, and improvement processes have involved the close collaboration of clinicians, housestaff, medical students, nurses, therapists, social workers, developers, and administrators. "ClinicalDataApp" is a system for, and by, providers from all service lines, as reflected in Figures 3-4. Moreover, as mentioned above, many clinical disciplines that previously did not create written handoffs are now using or developing pilots to use "ClinicalDataApp" for their own intra-team handoffs as well as communication with the primary team. Rather than "separate" sections for different disciplines, "ClinicalDataApp" has one interface for all users, again increasing information sharing and improving communication.

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

"Clinical Data App" evolved from the original idea of our health system's Chief Medical Information Officer (CMIO) to create paperless handoffs. This initiative has support from our CMIO, Information Services, and Innovation Offices. As such, it has now been implemented across almost all inpatient services at our main hospitals.