Penn Highlands Elk and Iatric Systems Collaborate to Streamline 700 Hospital Workflows to Improve Patient Care

By: Mary Ann Schwabenbauer, CIO, Penn Highlands Healthcare
    Derrick Goode, Clinical Informatics, Penn Highlands Healthcare
    Frank Fortner, President, Iatric Systems, Inc.

Executive Summary

Clinicians need the right information quickly to make effective decisions about patient care. But in many healthcare organizations, the way they get this information hasn’t changed in decades. Hospital staffs still rely on printed reports and highlighters, getting eyestrain sifting through multiple reports that may be hours or days out of date. Depending on the situation, clinical and administrative staff needs specific types of information, and they need to see it in specific ways. But all too often, that information is buried in a lot of extraneous details or it’s out of date, out of sequence or filed elsewhere. The result is not only rampant inefficiency, but also delays that negatively impact patient care as well as increased potential for errors.

Collaboration between Penn Highlands Elk and Iatric Systems tackles these challenges head on. Static paper reports have been replaced by Visual SmartBoards that provide a real-time view of critical information, customized for different clinical and administrative workflows. The result has been a seismic shift in the way Penn Highlands Elk provides information to the people who need it and the way those individuals can interact with that information. More than 700 “SmartBoards” have streamlined workflows in virtually every hospital department — improving patient care, patient safety, staff efficiency, and quality measures. For Iatric Systems, the collaboration has resulted in the emergence of a flexible platform that has brought benefits to hundreds of other U.S. hospitals. The collaboration between the two partners is ongoing, with each partner providing expertise and resources that complement the other. The focus on the improvement of patient care and quality measures is the first step in moving from a fee-for-service organization to an organization that focuses on the quality of patient care.
Introduction

Penn Highlands Elk, (formerly Elk Regional Health Center) is a small, rural hospital in North Central Pennsylvania. Early in the last decade, the hospital was facing a problem that almost every hospital has experienced: clinicians have to make fast, effective decisions, but were stymied by the need to look up records in multiple systems and sift through static, outdated reports trying to assemble the information required. The hospital knew that its mission of excellence in healthcare depended on finding a better way to bring clinicians the information they need, presented the way they need it.

While Penn Highlands Elk has a small IT staff, they are passionate about using information technology to solve problems that had previously seemed intractable. In Iatric Systems, they have a technology vendor and service provider that works closely with their staff to develop innovative solutions to address a variety of challenges, many of which also applied to other hospitals. This collaborative partnership has enabled Iatric Systems to develop, test, and demonstrate several products over the years in a hospital environment, using feedback from Elk staff to help improve the product and make it ready for the marketplace.

One of these products is Iatric Systems Visual SmartBoard™, a data visualization and interactive workflow management tool that pulls information from clinical and administrative systems and presents real-time, color-coded views of meaningful data — much like an airport flight information board on steroids. SmartBoards can be customized to meet a wide variety of needs, including Meaningful Use compliance tracking, infection control, sepsis, 30-day readmission, pharmacy dashboard, diabetes management, influenza management, dietary view, patient fall risk and many others. Many of these capabilities would be initially created for Elk, and adapted for use by other hospitals.

The Collaboration Begins

In early 2006, Elk approached Iatric Systems for help on two projects aimed at improving workflow efficiency by reducing reliance on paper. The first was in pharmacy, where a nurse or physician would have to fax a written order to the Pharmacy, which would have to retrieve the order from the fax machine (often with dozens of other orders) and enter it into the hospital's Healthcare Information System (HIS) before filling the prescription. The second project was in Cardiology, where EKGs were on paper and therefore, difficult to access and view promptly.

At the time, Visual SmartBoard was in its infancy, but could still provide the basis for a solution. Iatric Systems developed a paperless Pharmacy system that employed a rudimentary SmartBoard for managing medication orders in the pharmacy, using scanned images of medication orders rather than faxes, allowing orders to be filled in a fraction of the previous time. A similar approach was created in Cardiology, where a SmartBoard provided access to scanned images of EKGs, making them immediately available for clinical review.
In hindsight, these early solutions may seem quaint, but for Elk and Iatric Systems, they provided an epiphany. By bringing together relevant information on a screen that was updated in real time, it was no longer necessary to rely on reports that became obsolete the moment they were printed. This ability to see critical information at a glance was a major breakthrough.

As the two partners developed these early SmartBoards, ideas began percolating far beyond the scope of the original project. Penn Highlands Elk IT staff began to see areas throughout the hospital where Smartboards could help save time or improve patient safety. Both parties brainstormed to determine what shape the solution should take and what improvements were needed. They envisioned a system that could show the information needed to solve a particular problem at a glance, using graphic elements to highlight critical values. It would bring together data from multiple systems (admissions data with lab data, medication data with dietary, etc.) that previously had to be viewed separately. It would support multiple venues — large overhead screens, desktop workstations, and mobile devices — to fit the needs of the user. Most important of all, it would need to be a flexible platform to create SmartBoards that could streamline operations throughout the hospital.

The Collaboration Today

Since those early days, Visual SmartBoard technology has greatly evolved, building on the basic concept with many new capabilities. These include use of graphic elements such as fly-over, hovers and right clicks to perform specified actions or drill down to detailed information, the ability to document from a SmartBoard directly into the HIS, and the ability to filter and process data from different sources before displaying the results. Integration with an Event Notification System (ENS) can send automated alerts when criteria are met, or thresholds are crossed. Many of these improvements emerged from brainstorming between Penn Highlands Elk and Iatric Systems about how to present information in the most useful, transparent way. Additional integration and enhancements continue to this day.

Penn Highlights Elk now uses more than 700 different SmartBoards that meet an immense variety of needs throughout the hospital, and they continue rolling out new SmartBoards to support additional workflows and user requirements. As the boards have become pervasive, they have brought about a new mindset whenever hospital staff encounter a problem or need information. Their first question now is: “Can we use a SmartBoard for that?”

New SmartBoards are built using a collaborative approach that benefits both Elk and Iatric Systems. Penn Highlands Elk comes up with ideas for SmartBoards based on needs that they have. Iatric Systems then applies specialized expertise to help bring the new SmartBoard to life. Over the years, the division of work has shifted so that today, Elk staff can do much of the work themselves. With a vast library of existing SmartBoards, there is usually code that can be re-purposed. IT staff have also built up a quite extensive body of knowledge to make the new board work as desired. However,
they may still encounter an issue or requirement that is above their technical level — whether programming, specialized algorithms, or proper use of a graphic element. Iatric Systems provides a resource on standby when Elk runs into challenges and specialized knowledge is not available internally.

Elk then tests the prototype SmartBoard and refines it as needed (sometimes with Iatric Systems help) before going live. In many cases, Iatric Systems builds on this foundation and packages it for other hospitals so they can also take advantage of the new solution. Paperless Pharmacy, Sepsis, and 30-day Readmits are some of the Visual SmartBoards developed at PHH that have become models for solutions now used in many other hospitals.

**Two SmartBoard Examples — Sepsis and Readmission Risks**

Every SmartBoard is created to solve a problem or meet an unmet need. Two of the most important at Penn Highlands Elk are SmartBoards used for detecting early signs of sepsis and readmission risks. These are quality measures that most hospitals have to report, and will become even more important in the future as hospitals move from fee-for-service to value-based care.

**Detecting Early Signs for Sepsis**

With help from Iatric Systems, PHH created a SmartBoard to detect early signs of sepsis as part of the CMS Inpatient Quality Reporting (IQR) program. The SmartBoard helps improve hospital quality scores and, more importantly patient outcomes, since early detection of sepsis can be a lifesaver. Identifying sepsis requires examining multiple clinical measures, which can be difficult when the information is buried in multiple reports that could be many hours old. If a physician isn’t able to put all the pieces together or doesn’t have access to all the information in a timely manner, he or she can be blindsided.

PHH was aware that it had no way to monitor actively for sepsis, but it could be done using a VSB SmartBoard. They defined a set of criteria that a patient would have to meet to indicate they were heading toward sepsis (pulse greater than 100, systolic blood pressure less than 90, temperature greater than 101 or less than 96, glucose greater than 150 in a non-diabetic, and others). The SmartBoard monitors for these different criteria, updating every ten minutes as the data refreshes. If the patient meets three of the criteria, an automatic alert is sent to the nurse monitoring the patient, who can then notify the physician. The SmartBoard also weighs the different criteria to create a Sepsis score of 1 to 6 for the patient. There’s no longer any need to interpret all the individual data points because the program code is doing the work automatically, and alerting staff when the patient meets the defined criteria.
Hospitalists at Penn Highlands Elk have reported that the sepsis SmartBoard has caused them to think differently about certain patients, leading to interventions such as starting the patient on a different course of antibiotics or ordering some different lab work. These interventions have changed the course for some patients who may otherwise have been headed to a full sepsis, with potentially fatal consequences.
Managing Readmission Risk

As a critical access hospital, Penn Highlands Elk is using a Readmission Risk SmartBoard to share daily patient information with a multidisciplinary team to discuss the patient’s risk of readmission and possible treatments to lower the patient’s risk. Associated with each patient in the SmartBoard are algorithms that show the readmit risk and fall risk score.

Readmission Risk SmartBoard

Iatric Systems has expanded this application to specifically track 30-day readmission required by the Centers for Medicare and Medicaid Services (CMS). A Visual SmartBoard tracks inpatient admissions and detects patients who are readmitted within 30 days of the previous discharge. If the readmission is for a similar condition as the previous admission, this triggers an automated alert to the Director of Nursing and Case Management. A case manager can then notify physicians who are caring for the patient, deal with any insurance issues and coordinate a review to determine what, if anything, needs to be done differently.

Penn Highlands Elk also developed a SmartBoard to track inpatient admissions and length of stay. The board will look for a couple of items:

- Patients who are in the hospital for 48-hour observation, but not formally admitted as an inpatient. If a patient is in an observation status, the SmartBoard tracks the number of hours. When it reaches 40 hours, the SmartBoard notifies the case manager so they can alert the physician and advise that there are eight hours to go before a decision is needed about whether to admit that patient, or if the patient should be discharged.
- The board also shows if the inpatient stay is greater than 3 days and notifies the case manager daily.
- It also compares last inpatient admission date and if less than 30 days since last admission, will send out a notification.
Transforming Patient Care Hospital-wide

SmartBoards are used throughout Penn Highlands Elk, in all departments except Maintenance and Biomedicine (as of July 2015). The ability to pull relevant data from multiple systems and build customized screens showing critical information not only improves patient care and staff efficiency, but it also makes life easier for the people who depend on them. The SmartBoards are used in hundreds of different workflows at Penn Highlands Elk, of which the following are a few examples.

The First Step Towards Value-Based Healthcare

Improving Patient Care and the Overall Patient Experience

Departments

Scheduling
Pre-registration
Registration
Discharge

01 02 03 05 04

Nursing • Radiology • Infection Control • Cardiology
Lab • PT/OT • Pharmacy • Respiratory Therapy • Quality
Dietary • Long Term Care • MIS • Medical Records
<table>
<thead>
<tr>
<th>SmartBoard Application</th>
<th>Improving Efficiencies and Patient Care</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scheduling</strong></td>
<td>Provides a detailed list of scheduled patients for departments such as wound care to be aware of the patient population they serve and be prepared for the daily services scheduled.</td>
</tr>
<tr>
<td><strong>Pre-registration</strong></td>
<td>Streamlines patient flow and optimizes staff efficiencies by capturing accurate patient information. Colors indicate which patients have been pre-registered and which patients remain, allowing the staff to be aware of their outstanding work.</td>
</tr>
<tr>
<td><strong>Registration</strong></td>
<td>Provides a daily, real-time list of patients to be registered. Any changes in the schedule are indicated on the SmartBoard. The list provides information regarding co-payments to be collected and other data critical for the staff to be aware of during the registration process to reduce errors.</td>
</tr>
<tr>
<td><strong>Departments</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Nursing</strong></td>
<td>SmartBoards assist with clinical decision-making and make patient care and monitoring much easier than manually reviewing paper reports and using a highlighter. The ability to document directly into the EHR within a SmartBoard improves efficiency because the information is visible immediately to all staff.</td>
</tr>
<tr>
<td><strong>Radiology</strong></td>
<td>A communication tool for transporters, telling them when and where to pick up patients for their Radiology appointment. These SmartBoards increase patient satisfaction by assuring patients arrive on time for scheduled procedures.</td>
</tr>
<tr>
<td><strong>Infection Control</strong></td>
<td>During the registration process, clinical notifications are gathered during registration. For example, during the recent Ebola crisis, patients were asked during registration if they had any relevant symptoms or may have been exposed. The SmartBoard then alerts appropriate staff members when patients may potentially be a candidate for Ebola.</td>
</tr>
<tr>
<td><strong>Cardiology</strong></td>
<td>As EKGs are ordered, they are displayed on the SmartBoard, with colors and alerts that indicate STAT EKGs for easy escalation. Once the EKG is complete, the SmartBoard monitors whether the report is in draft form or signed. Cardiology staff can use the SmartBoard to print the EKG or send it to an offsite physician.</td>
</tr>
<tr>
<td><strong>Lab</strong></td>
<td>Improve patient care by monitoring lab results and patient medications, and alerting staff to any inpatient or ER STAT orders. By seeing the peaks and troughs, and interactions between different medications, pharmacists can adjust medications appropriately.</td>
</tr>
<tr>
<td><strong>Physical Therapy and Occupational Therapy</strong></td>
<td>A SmartBoard tracks the number of visits a patient is allowed by their insurance company, and how many they have already had (both within the hospital and from an outside facility). The patient experience is increased because there are no delays in receiving treatment due to late insurance responses.</td>
</tr>
</tbody>
</table>
Pharmacy  A number of SmartBoards are used to enable the hospital’s paperless pharmacy initiative, helping pharmacy staff track and manage orders in progress, including orders awaiting lab results and/or physician clarification. Medication orders can be immediately processed so they are ready for pickup when patients come to the pharmacy.

Respiratory Therapy  SmartBoards show patients on respiratory medication, next med due, attending physician and similar information. They’re also used for managing STAT orders for respiratory therapy or respiratory medication, with automatic alerts to RT staff.

Quality Department  With the new focus on valued-based care, the quality care managers rely on the SmartBoards to track CHF, AMI, and SCIP to diagnose patients and alert the care team when critical protocol for that diagnosis is necessary. With the new IQR requirement for sepsis, a SmartBoard was created in conjunction with the Iatric Systems team that uses algorithms to monitor clues for patients that are possible, probable, or positive for sepsis. The results of the Sepsis SmartBoard were swift and the physicians can change the course of care for the patient thus preventing a sepsis crisis.

Dietary  SmartBoards monitor lab work, portions, BMI, and weight for diabetic patients, so dieticians can adjust diets for those patients based on what information the SmartBoards are presenting. Color and bolded text alerts the team to make dietary changes sooner.

Long Term Care  Pinecrest Manor, Elk’s long-term care facility uses SmartBoards to improve their Minimum Data Set (MDS) quality scores. They provide a Braden scale for patients developing breakdowns in their skin that may indicate a decubitus ulcer (bedsore). Clinicians can click to access lab work and nursing documentation helps determine if patients might need intervention. Other SmartBoards help monitor a variety of items including wounds, fall risk and immunization/vaccination.

MIS Department  SmartBoards manage the fax system, pulling information from the fax server and show failed faxes for further investigation. Administrators can manage physician privileges, and serves as an online Rolodex for supervisors, pulling phone numbers and other contact information from the hospital’s payroll system.

Medical Records  SmartBoards are used heavily to speed up coding and reduce AR. The staff that needs coding or a diagnosis added to documentation use SmartBoards to communicate between the Billing department and the department providing the medical service.

Discharge  Monitor discharged patients detecting a readmission within the CMS 30-day window. If the readmission is for a similar condition as the previous admission, this triggers an automated alert to the Director of Nursing and Case Management. A case manager can then notify physicians who are caring for the patient, deal with any insurance issues and coordinate a review to determine what, if anything, needs to be done differently.
Conclusion — the Collaboration Continues

The collaboration between Penn Highlands Elk and Iatric Systems is now more than a decade old, providing a continuous source of new ideas and innovation with benefits to both partners. Penn Highlands Elk has a workflow productivity tool that caregivers, administrators, IT staff as well as patients throughout the hospital have embraced. It may be a small, rural hospital with a small IT staff, but Penn Highlands Elk has a platform for sharing and using healthcare information that rivals much larger hospitals. To make it work, they call on Iatric Systems for technical expertise as well as broad healthcare experience, and knowledge of what works (and what doesn’t) at other hospitals. For its part, Iatric Systems has access to a hospital environment where new efficiency and safety solutions come to life, which can then be quickly adapted for other hospitals and brought to market.

The collaboration is continuing and expanding as both partners make strategic technology decisions. Many new and valuable SmartBoards are on the way, improving patient care and productivity at Penn Highlands Elk and in the wider hospital community beyond.