Best Practices: The Impact of Mobile Point-of-Care Decision Support on Sepsis Treatment and Outcomes at Huntsville Hospital

Sponsored by: Wolters Kluwer Health

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IN THIS WHITE PAPER

This White Paper discusses findings from an IDC Health Insights case study conducted on behalf of Wolters Kluwer Health (WKH) to assess the impact of its POC Advisor clinical decision support product on sepsis identification and treatment at Huntsville Hospital. The POC Advisor product has been in use at Huntsville Hospital on two floors since March 2014 and has made a strong initial impact on the hospital's ability to identify and treat sepsis cases according to evidence-based medicine guidelines. Key findings from the case study include:

- Improvements in the hospital's ability to identify and treat sepsis cases early

- Significant reduction in mortality and readmission rates for sepsis patients on the two floors involved since the introduction of the tool

- Gains in clinical staff collaboration and job satisfaction, as the tool prompts more collaboration on implementation of evidence-based medicine and allows staff to be more confident in decision making

- Strong codevelopment relationships with HIT suppliers, allowing hospitals and their IT staffs to collaborate on product development and IT-based innovation in care and drive process improvements

METHODOLOGY

This White Paper was sponsored by WKH and discusses the implementation of its newly introduced POC Advisor product for use in sepsis care at Huntsville Hospital. Huntsville Hospital is a collaborator in WKH's innovation lab where teams from the hospital provide guidance that aids in the development of the POC Advisor tool for sepsis identification and treatment. During the course of the primary research for this paper, several interviews were held with WKH as well as with representatives from Huntsville Hospital, including CIO Rick Corn, Quality Director Joycelyn Craighead, Dr. Jason Smith, Nursing Director Lee Hardison, and several nurses from the team on the two floors involved in the pilot. IDC also examined the raw data from the project that was collected from the source systems attached to the project to validate the conclusions. The research for this document also included working with WKH to gather and aggregate data from the POC Advisor system and the hospital's EHR to quantify the results of the solution.

SITUATION OVERVIEW

Sepsis is a serious problem in U.S. hospitals, and studies indicate that the condition contributes to as many as half of all hospital deaths (http://www.medpagetoday.com/MeetingCoverage/ATS/45862#). In addition, the incidence of sepsis is on the rise with reports showing that rates of postsurgical sepsis in the United States tripled between 2000 and 2008. Sepsis is also costly. It's estimated that U.S. hospitals spent $20 billion treating sepsis in 2011, and some estimate that it may account for 24% of hospital charges (http://www.nigms.nih.gov/education/pages/factsheet_sepsis.aspx). Sepsis identification and high-quality early treatment, according to established guidelines, are among the most important ways a hospital can decrease mortality and spending on sepsis. In addition, as accountable care enters the market and preventable readmission penalties grow, it's becoming even clearer that quality and financial incentives are aligned — hospitals and patients will both benefit from aggressive approaches to sepsis identification and treatment. Covered in this case study, Huntsville Hospital chose to use an approach to improving its sepsis identification and treatment that included training, change management, and advanced clinical decision support.

Clinical Decision Support

The term *clinical decision support* (CDS) can mean a number of different things to providers and IT suppliers. Clinical decision support systems in use in the United States, today, typically provide rule-based basic decision support such as that required by meaningful use or for support of alerting for drug-drug interactions and inappropriate dosing to prevent medication errors during electronic orders. Decision support also may extend to include rules that address best practice-based processes in hospitals and provide alerts to help standardize treatment processes and improve care quality in a "one size fits all" manner. In existing implementations, rule-based basic CDS helps hospitals decrease medication and clinical errors when used in conjunction with CPOE. However, with the implementation of electronic ordering, productivity has seen a decline as the electronic process may take longer for physicians who are unaccustomed to the applications replacing paper-based ordering. Excessive and noncontext-sensitive alerting from basic decision support systems used in ordering can also contribute to productivity slowdown. Velocity of care is a critical concern for treatment of sepsis, demonstrating a need for more advanced decision support approaches.

Advanced Decision Support

The future path for clinical decision support is that of advanced or second-generation decision support, a more customized patient-specific endeavor using real-time analytics alongside best practice-based guidelines and a patient's medical record to provide intelligence relevant to clinical decision making. In this sense, CDS is still in an early stage of adoption in the U.S. healthcare provider market as systems have yet to mature. In spite of some provider organizations having installed CDS systems and most using basic decision support, only a few hospitals use advanced decision support actively in their work environment.

Advanced decision support adds the following functions to those of basic decision support:

- **Continuous surveillance.** Advanced decision support requires real-time interaction with data, and engines autonomously conduct continuous surveillance of data as it is created to return results and alerts to providers in real time at the point of care.

- **Diagnostic recommendations.** Advanced CDS systems and expert systems may provide assistance with the differential diagnosis process and recommend specific tests and procedures that may assist the physician with diagnosis or improve the velocity of care.

- **Proactive preventive recommendations.** Advanced analytics-based CDS may be used to alert providers of developing escalations in patients' conditions and trends in vital signs such as those indicative of sepsis or other crises that are difficult for clinicians to recognize early on but for which early detection is vital to improve outcomes for patients.

- **Automatic ordering recommendations.** CDS systems may work with order sets in CPOE systems to recommend order sets in addition to individual orders when appropriate. Basic rule-based systems offer generalized ordering recommendations and order sets; more advanced decision support systems are sensitive to situational complexity and tailor ordering recommendations accordingly.

- **Other assisting messages.** The possibilities for CDS will continue to grow with use and acceptance by providers. With CDS infrastructure in place to deliver messages at the point of care, hospitals and health systems can customize their CDS approaches to reflect specific organizational priorities and influence practice patterns like treatment protocols.

Mobile collaborative implementations of advanced decision support, like the approach used by Huntsville Hospital, could potentially enhance productivity for physicians and other care team members further. Providers are increasingly using and trusting CDS tools to support their daily work and improve treatment quality and work efficiency. Advanced decision support can be used to help assist in the application of evidence-based medicine and reduce variations in care with real-time decision support, resulting in better outcomes for patients.
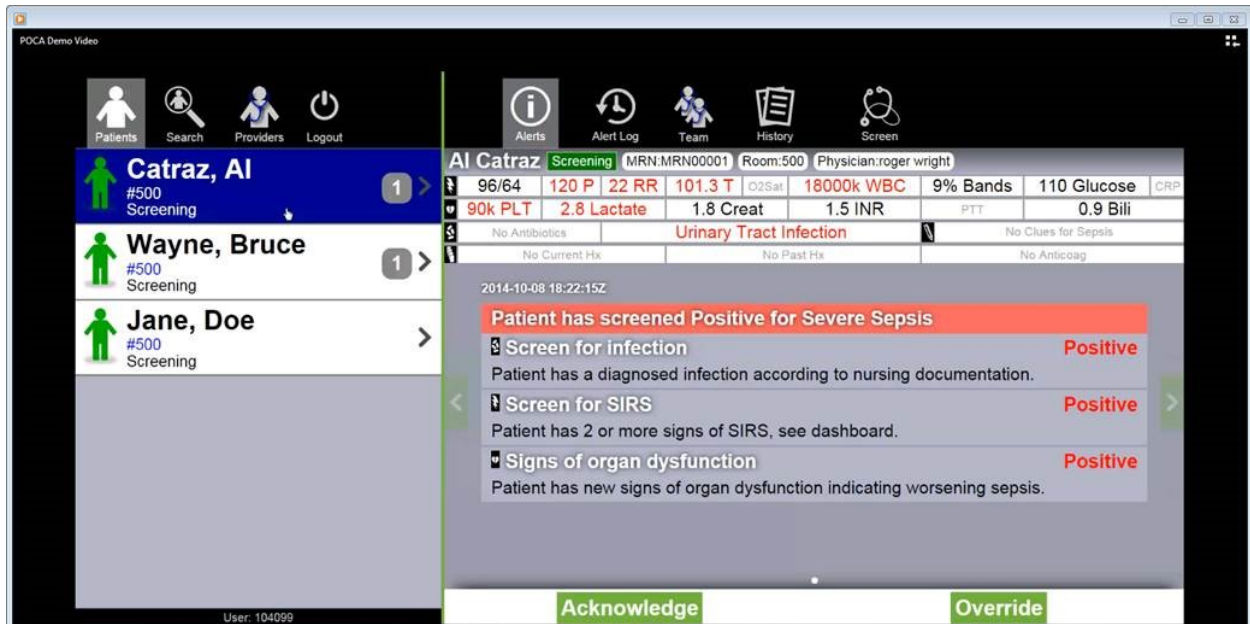
Solution Description: POC Advisor

POC Advisor – the platform that, along with its sepsis module, was put into use in the Huntsville Hospital pilot – is a product offering of WKH. WKH has been a leader in decision support content for hospitals for many years and also offers the well-known UpToDate, Lexicomp, Medi-Span, Health Language, and ProVation Medical solutions, in addition to other clinical solutions. WKH is also the publisher of Lippincott Williams & Wilkins medical textbooks and Stedman's Medical Dictionary. The sepsis module is available now and is one of the several planned condition-specific clinical modules for the POC Advisor platform, which may include modified early warning score (MEWS), pneumonia, heart failure, diabetes, central line-associated bloodstream infection (CLABSI), and catheter-associated urinary tract infection (CAUTI).

The POC Advisor platform is an analytics and rules engine that manages security and runs reporting and analytics. The platform relies on content from the UpToDate, Lexicomp, Medi-Span, Health Language, and ProVation Medical offerings from WKH as well as information from the end user's own systems, including the EHR and administrative systems. The surveillance engine in the platform, relying heavily on real-time HL7 messages, gathers information from the EHR, including comorbidities, medications, vital signs, nursing notes, lab results, and other data that may reflect on a patient's propensity to develop sepsis. This technology comes from Sentri7, another product within WKH. The alerting engine uses hundreds of rules to conduct continuous surveillance and create closed-loop decision support, accessible in real time at the point of care. The alerts are delivered to clinicians via a device at the point of care – at Huntsville Hospital, a mobile device was used, but the solution can also run on laptops and tablets. The mobile workflow for alerting is integrated with data from the EHR. The staff acknowledges alerts on the mobile device or overrides them with an explanation and then documents any new orders or data directly in the EHR. Figure 1 shows a screenshot of a sepsis notification alert on a mobile device. Clinicians can clearly see all the data driving the alert as well as the patient's comorbidities and sepsis status. The clinician must acknowledge or override the alert, and notification alerts are followed up with treatment advice alerts as shown in Figure 2.
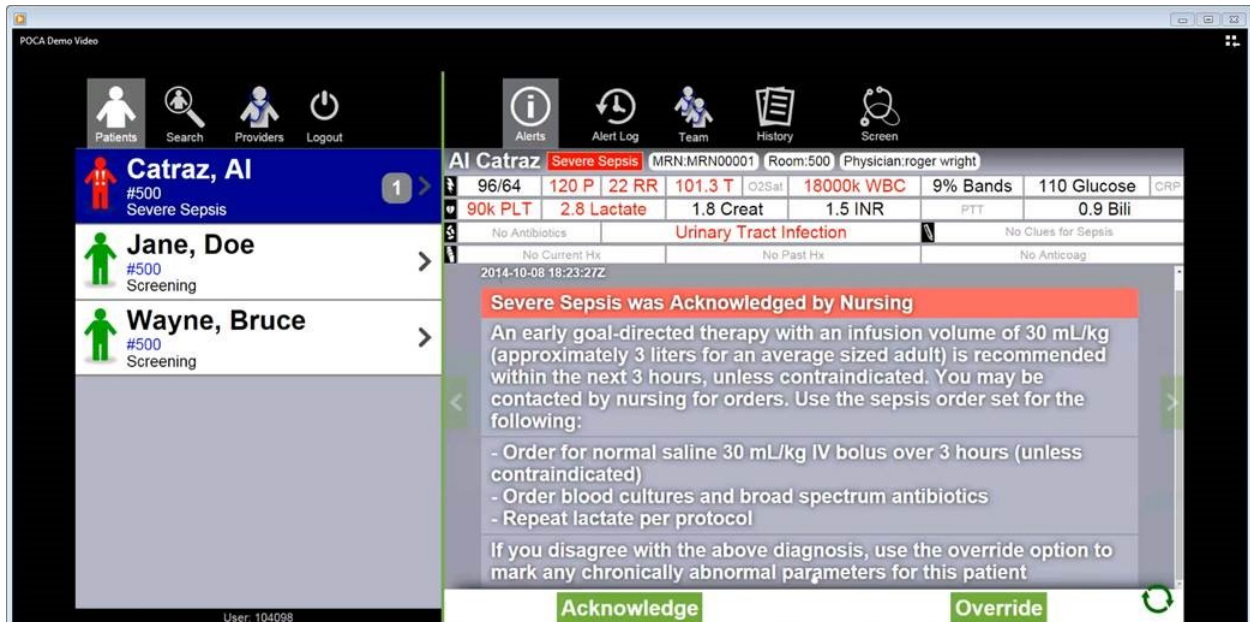
FIGURE 1

POC Advisor: Sepsis Notification Alert

Source: Wolters Kluwer Health, 2015

FIGURE 2

POC Advisor: Sepsis Treatment Advice Follow-Up Alert

Source: Wolters Kluwer Health, 2015

Analytics that run on the POC Advisor platform look at both actual data and reference information and determine the most important issues and considerations to bring to the attention of the clinician at the point of care. The intention of the analytics is to provide prescriptive guidance to care teams to help facilitate the early identification and treatment of sepsis. Sensitivity and specificity are important to any clinical alerting tool with this type of advanced functionality, and careful attention was paid to this issue within POC Advisor. High-quality alerts with a low level of false positives are key to the success of any decision support product.

The Importance of Point-of-Care Decision Support

Today, one of the key issues facing analytics deployments in U.S. hospitals is not the information and report from analytics but the clinician's ability to review the information and incorporate analytics findings into point-of-care decision making. A retrospective report on sepsis mortality may be informative, but point-of-care decision support tools that leverage analytics are essential to making the information actionable. Real-time information relevant to care decisions that is accurate and highly specific is much more likely to effect change in the clinical environment than retrospective analytics and reporting. Information provided at the point of care needs to meet high standards, if it is to be used. Physicians want high-sensitivity and high-specificity information that adds to their ability to make decisions without slowing them down with issues like alert fatigue. In addition, when physicians are dealing with a condition like sepsis for which treatment guidelines are evolving, point-of-care decision support is critical to bringing new guidelines and techniques to the bedside quickly.

POC Advisor at Huntsville Hospital

The decision to pilot POC Advisor at Huntsville Hospital was made quickly — the hospital was aware it had issues surrounding sepsis identification and treatment. Quality committees within the hospital had looked at sepsis incidence and the specific DRGs associated with mortality in the hospital prior to making the decision and knew that numbers were high. A physician champion joined the project early. At the initial meeting with WKH, members from the quality, clinical, and IT teams were present and early buy-in from all of these stakeholders made the decision go quite smoothly. A steering committee was formed that included representatives from quality, nursing, physicians, administration, and IT to help guide the project and ensure that decisions about content and approach were made collaboratively.

Quality Director Joycelyn Craighead explained that when the opportunity came up and the team saw the tool, "They knew they wanted to leverage technology to help with a solution that would be staff led and give frontline staff the ability to change processes and affect outcomes instead of management, leadership, or quality imparting what they should be doing." According to Craighead, the staff-led quality improvement initiative, driven by the sepsis process changes and the POC Advisor tool, represents the largest quality improvement project to date at the hospital. CIO Rick Corn led the IT efforts to build the vital interfaces that provide data for the POC Advisor engine. Although the integration challenges were formidable, the potential benefits of the tool were clearly strong, and Corn's team welcomed the opportunity to become more involved in clinical tools that would make a difference for patients and work on the collaboration with WKH.

Dr. Jason Smith was also convinced quickly and stated, "I was sold from the initial introduction on the opportunity to use the software to get everyone on an evidence-based protocol." Smith is a pulmonary critical care physician and director of the hospital's ICU as well as the physician champion of the hospital's campaign to stop sepsis. Although physicians were not yet widely using the tool at the time that this case study was written, a beta test has begun. Smith and other physicians on the team have been critical as clinical advisors for the project and plan to use mobile devices for sepsis alerting.

The Project Plan and Current State of the Implementation

Huntsville Hospital made the decision to work with WKH on POC Advisor in mid-2013, and the project got started quickly in September 2013. Initially, the focus was on nursing, specifically on change management. The areas of the hospital selected for the pilot were three units on two floors in the hospital's medical service line. These two floors were identified as good opportunities for the pilot due to the strong buy-in from nursing and quality leadership and a high number of sepsis patients with potential for early identification to improve outcomes. The team worked with outside consultants from The Altos Group to map processes and began to put paper-based protocols into use to work out issues with the process reengineering before bringing the electronic tools into use in April 2014.

Nursing Director Lee Hardison stated, "We have really been able to identify sepsis in earlier stages to treat and send patients home who would otherwise have stayed longer and gotten sicker."

From a quality standpoint, change management was a critical part of the implementation process. Change management work was conducted on paper in 4Q13 before the electronic tools were implemented. By 2014, electronic and paper tools were in use together. During this time, the nursing team focused on capturing data, examining alerts, and working to reduce false alerts. The team found it necessary to add some additional data capture during admissions to help screen for sepsis. Training was also important. To help the team learn not to make assumptions in the rapidly evolving science of sepsis management, the entire staff was retrained on the current best practice-based guidelines in sepsis identification and management. According to Craighead, "Reeducation and relearning sepsis care was important for the entire staff to avoid assumptions based on years of experience and improve performance." Staffing and scheduling also presented a challenge – crossover in the scheduling of different staff units created some training and process issues between areas of the hospital where the tools were in use and areas of the hospital where the tools were not in use. However, overall, the project has been a success. Nursing Director Lee Hardison stated, "We have really been able to identify sepsis in earlier stages to treat and send patients home who would otherwise have stayed longer and gotten sicker." There were also some unanticipated benefits that came from the collaborative environment created by the tools. Hardison said, "Nurses are collaborating more and developing critical thinking skills that you can't teach."

The IT environment at Huntsville was complex and the integration and data aggregation associated with the sepsis project presented a challenge. After initially attempting decision support using the limited basic capabilities embedded in its EHR, Huntsville decided that it needed advanced decision support from a third-party application to get the results the team wanted and decided to work with WKH due to the company's experience in developing strong clinical content. Like most hospital IT departments, staffing is lean at Huntsville, and prioritizing the project and its components that would have the most impact was key to success. Corn stated that when he took the project to the IT staff, there was extensive discussion about how to squeeze in the necessary components of the project, but he also said, "The IT staff was excited to participate in the project as it provided a rare opportunity for IT to have a direct impact on patient care." Huntsville already had an interface engine in use and was able to leverage this existing technology investment to pass essential elements like lab values to the POC Advisor alerting engine. However, getting data out of the hospital's EHR proved to be more difficult. IT teams needed to get creative to create triggers that sent data to the alerting engine when nurses updated information or vital signs or entered notes. HL7 was leveraged heavily as the team built an internal rules engine with triggers to initiate HL7 messages when events needed by the alerting engine occurred. Corn emphasized that although the integration is a work in progress, the WKH team has helped the hospital prioritize data of greatest value to the alerting algorithms, and the high-priority integrations have been completed; however, other data elements that are less vital have yet to be completed. The project went live on mobile devices at the end of 1Q14, and the team has been working since that time to fine-tune the performance and usability of devices and software and incorporate more data into the algorithms. The clear success of the early pilot implementations provides strong motivation for the IT team and other stakeholders to continue their work.

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Putting evidence-based protocols in place and ensuring they are followed or as Smith stated, "enforcing the law," is the goal of this closed-loop decision support approach. The teams did encounter some resistance to the new protocols for sepsis that were introduced with the project, and the clinical leadership emphasized that it was important to pick the right floors for the pilot to prove the value. The POC Advisor tool is designed to ensure that protocols are enforced. "It creates a yes/no protocol that has to be addressed and can't be turned off, so steps are recognized and tracked," said Smith, pointing out what he found most innovative about the tool. The sepsis module was carefully fine-tuned during the collaboration between WKH and Huntsville Hospital to reduce false positive alerts and make this possible. Increasing the sensitivity and specificity of the alerts was critical for physician buy-in during the collaboration. Most hospitals know alert fatigue well. When too many false positive alerts are created, physicians turn off or ignore all the alerts to remain productive, and benefits of the technology are lost. Sensitivity and specificity calculations were made from comparing the volume of alerts generated by POC Advisor with confirmed sepsis and severe sepsis as established in the medical record at Huntsville. As the POC Advisor app was fine-tuned, both sensitivity and specificity rose above 94%. Data on the sensitivity and specificity of alerts is shown in Figure 3. Sensitivity refers to the accuracy of alerting – the percentage of sepsis cases that were truly positive, identified and alerted, and not missed. Specificity is the percentage of true negatives, so the high specificity shown in Figure 3 means that the product rarely identifies a sepsis case in error.

FIGURE 3

Sensitivity and Specificity of Alerts: April–June 2014

	April	May	June
Sensitivity, Sepsis	98%	99%	97%
Sensitivity, Severe Sepsis	97%	94%	97%
Specificity, Sepsis	96%	99%	96%
Specificity, Severe Sepsis	96%	99%	96%

Source: Wolters Kluwer Health, 2015

The protocols are enforced with the alerts; clinicians are required to document a rationale in cases where protocols are not followed and exceptions are made, assisting leaders in getting to the goal of making sure the protocols are followed whenever possible and allowing for continuous improvement and education based on analysis of the reasons for exceptions.

Nursing and clinical mobility was also a goal of the project. Although the process management tools and sepsis protocols started on paper, they have since been piloted on iPod touch devices and will eventually be rolled out into production on iPhones. The iPods went into use in the POC Advisor pilot in early 2014. The hospital's goal is clinical mobility and to get to a point where clinicians carry a single device to do everything in place of pagers, telephones, tablets, and laptops. The iPod is being used as a mobile tool for the sepsis alerting system, but it is a stepping-stone to a larger mobility strategy for the hospital.
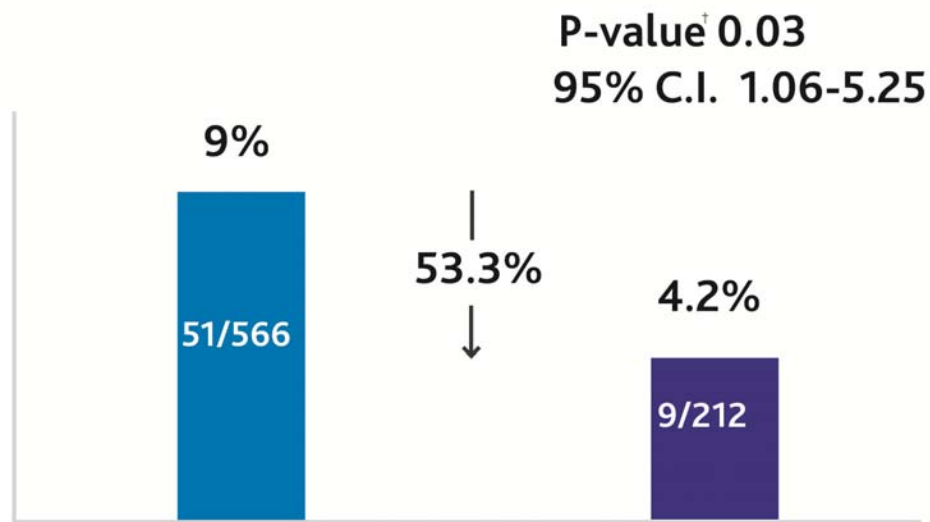
Impact: The Results

To objectively evaluate the results from the pilot, the hospital compared sepsis outcome measures from the pilot with those from a pre-implementation control period from January 2011 to October 2013. The protocolization period – the time when the change management work began, before electronic tools were implemented – is from November 2013 to March 2014. The period from April 2014 to December 2014 is the time frame for which data on performance of POC Advisor and its mobile tools is available. The sepsis outcome measures that were examined included mortality, length of stay (LOS), and 30-day readmission rates, and data from the two pilot floors as well as the rest of the hospital.

Mortality

Across the hospital (all units, including the POC Advisor pilot units), numbers of sepsis cases grew in 2014 compared with 2013, as did mortality, but a significant reduction in mortality was seen on the units using the new tools. Mortality rates were determined from an in-depth chart review, as documented during the case study period. The percentage of sepsis deaths dropped from 9% to 4.2%, a 53.3% reduction on the pilot units' pre-implementation to post-implementation. This data is shown in Figure 4.

FIGURE 4

Sepsis Mortality: Pre- and Post-Implementation

Notes:
1. Data analyzed represents a subset of cases that could be influenced by POC Advisor, meaning comfort care cases and those who went to the ICU first were excluded.
2. "Pre" period = Jan 2011 - Oct 2013; "Post" period = Mar 2014 – Dec 2014.
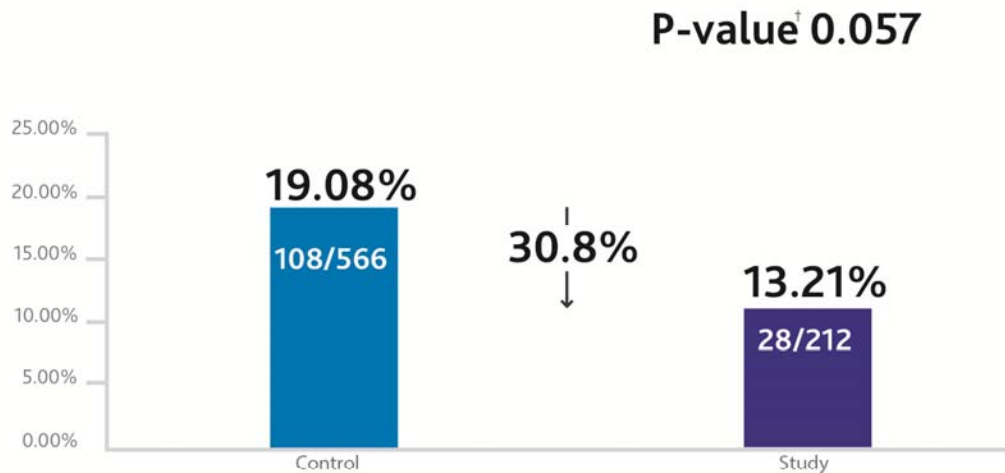
† P-value calculated using Fisher Exact Test.

Source: Wolters Kluwer Health and Huntsville Hospital, February 2015

Readmission Rate

As we enter the third year of Medicare's readmission reduction program, penalties for hospitals with excessive rates of readmissions mean a loss of as much as 3% of the Medicare payment for treatment. This makes reducing preventable readmissions critical for hospitals to address. In this case study, readmission rates were calculated based on same site admissions data from Huntsville Hospital. At Huntsville, the units with the sepsis screening technology saw a reduction of the 30-day readmission rate from 19.08% pre-implementation to 13.21% post-implementation, a drop of 30.8%. The data on readmission rates is shown in Figure 5.

FIGURE 5

30-Day Readmission: Pre- and Post-Implementation

Notes:
1. Data analyzed represents a subset of cases that could be influenced by POC Advisor, meaning comfort care cases and those who went to the ICU first were excluded.
2. "Pre" period = Jan 2011 - Oct 2013; "Post" period = Mar 2014 – Dec 2014.

† P-value calculated using Fisher Exact Test.

Source: Wolters Kluwer Health and Huntsville Hospital, February 2015

Key Findings at Huntsville Hospital

The findings from interventions in the form of change management and process reengineering as well as mobile tools to offer advanced clinical support at Huntsville Hospital are significant. Within the span of a single year, the hospital has managed to reduce mortality and readmission rates significantly on the units where the interventions were piloted. While the effects of sepsis on the hospital as a whole have not changed significantly, it is clear that this can be accomplished by adding the sepsis training and decision support tools to additional units and floors as well as by using the tools in the emergency room to identify

patients who are admitted with signs of sepsis even earlier. In summary, the case study highlighted the positive outcomes of advanced decision support interventions for sepsis identification and treatment:

- **Impact on care quality and mortality.** The introduction of evidence-based protocols for sepsis treatment, leveraging the POC Advisor tool to ensure protocols are followed, led to a significant improvement in the early identification of sepsis and a measurable decrease in mortality on the units involved.

- **Staff satisfaction and collaboration.** The use of mobile tools created an evidence-based resource that empowered staff and encouraged collaboration. The learning and critical thinking culture created by the tools is invaluable, and the staff members we spoke with all indicated that it has affected their approach to not only sepsis but also other concerns in the hospital. The effects were particularly strong among the nursing team and in the relationship between the IT and clinical teams.

- **Unexpected benefits.** Entering into the project, the team at the hospital expected an impact on the sepsis mortality and readmission rates, but it did not expect benefits to the culture and collaborative environment. In addition, the introduction of mobile devices furthers the mobility strategy of the hospital as more staff members are trained and increasingly accustomed to using the devices in clinical situations, paving the way for future technology rollouts.

Considerations for Implementing Decision Support

Clinical mobility and clinical decision support, advanced and basic, have clear benefits to hospitals that wish to use technology to improve clinical performance and productivity; however, like any change, implementing these technologies has risks. These risks should be carefully considered by hospitals and health systems considering implementation of advanced decision support and mobile devices. They include:

- **Process change.** Process reengineering within a hospital environment needs to be carefully considered, examined, and monitored with appropriate training to facilitate the move to the new process. Hospitals should address process changes by considering the impact on patients and staff, outcomes, and productivity as well as the risk of any potential process failures that may occur when planning a change.

- **Potential productivity and communication issues with electronic systems.** The introduction of electronic systems changes the way staff members work within the hospital but doesn't replace collaboration and communication. Hospitals should select solutions and approaches that improve communication and collaboration to use technology successfully.

- **Mobile security.** While mobile devices can be a great tool to enhance the productivity of clinical staff, they also require special attention to data protection and privacy. Mobile device management and network security processes and procedures need to be in place to make sure devices are in compliance with regulatory requirements, including HIPAA, and cannot be compromised. Additionally, provisions need to be in place to prevent data breaches from lost or stolen devices.

- **Downtime and availability risks.** Hospitals implementing electronic systems, whether to replace paper-based processes or other electronic systems, need to consider the risk of downtime and low availability. Systems should be planned with appropriate failover and business continuity approaches, including backup and disaster recovery. Training is also needed to ensure that IT staff and end users are familiar with the procedure for moving to a backup site and/or process in the event that service is interrupted.

FUTURE OUTLOOK

At Huntsville Hospital, the intervention resulting from the engagements with The Altos Group on change management and WKH on POC Advisor has been a critical step for the hospital to improve its quality and mortality rates for treatment of sepsis on the two floors in which the processes have been put into use. According to Craighead, "The project has been a catalyst for improving knowledge within staff related to sepsis and empowering critical thinking that makes a difference for patients." Huntsville plans to extend the use of POC Advisor to the other units of the hospital, including the emergency department, and expects to see additional improvement.

IDC Health Insights believes that in the coming years, advanced clinical decision support investment will continue in hospitals that have strong IT environments, infrastructure, and EMR installations. Investment in clinical decision support and the underlying analytics that drive decision support engines will be driven by the following factors:

According to Quality Director Joycelyn Craighead, "The project has been a catalyst for improving knowledge within staff related to sepsis and empowering critical thinking that makes a difference for patients."

- CDS helps improve provider productivity, particularly when providers are making data-based decisions and trying to incorporate data into the process of care. Point-of-care decision support is particularly important to provider productivity.

- CDS can improve care quality through ordering assistance, reminders, and alerts. Basic decision support can work to significantly reduce medication and medical errors in hospitals as well as ambulatory care. More advanced decision support tools can add to the benefits of basic tools in reducing medication and medical errors.

- CDS can be used in training and teaching interns and other clinical trainees. Traditional ways of imparting clinical knowledge through hands-on practice can be augmented by the use of the clinical data stored in the decision support systems. Decision support may help reduce common errors made in training situations and when new providers enter clinical practice. Decision support can also help experienced providers incorporate new evidence-based guidelines into their work.

- CDS can be used to support clinical and medical innovation, driving new technologies into practice more quickly and potentially improving clinical outcomes.

- CDS can help organizations leverage their investments in big data and analytics technology by incorporating it into advanced systems.

As technology and mobility are increasingly incorporated, the more sophisticated decision support capabilities will make the technology more likely to be widely accepted and utilized by providers. Critical steps include establishing clinical data warehouses, deploying data mining, and investing in cloud computing resources to provide the needed resources and infrastructure for second-generation CDS systems that offer high-specificity and high-sensitivity results. Gradually, advanced decision support systems will grow to integrate more data from multiple sources, and their effect on decision making will be to make features more precise and valuable.

ESSENTIAL GUIDANCE

Hospitals that seek to augment their decision support environment with mobile point-of-care advanced decision support tools can get started by taking the following steps:

- **Assess the existing environment.** Understand the data sources and capabilities embedded in existing systems, and make sure those systems are being exploited to their full potential. Determine weak areas and plan investment in third-party advanced decision support analytics and tools to meet the goals in these areas.

- **Determine high-value targets.** Advanced decision support represents a big investment in disruption and process change, training, and retraining as well as technology, but it can also have significant reward. Identify places in the care delivery value chain that represent weaknesses and high-value targets to get started on advanced decision support projects.

- **Get staff buy-in and establish governance for projects.** Leadership, which was key to success at Huntsville Hospital, must come from all areas of the team – IT, physicians, nursing, and quality must collaborate to be successful. Involve team members early, make sure they understand the issue and reason for the change, and move forward as a team.

- **Define the project.** The initial project should be small and carefully defined for results in areas with opportunity, willing clinical staff participants, and available data. Choose a pilot hospital, floor, or area that represents a fertile ground for initial results.

- **Don't strive for perfection.** Consider the risk and reward value equation in all phases. Change is hard and can introduce risk in the clinical environment. Choose approaches and targets that represent strong opportunities for improvement and manage risks carefully.

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