

## Reduction in Hospital-Acquired Complications and Infections

Monitoring the number of hospital-acquired complications and infections can help organizations determine whether health information technology (health IT) has impacted patient safety in hospital settings.

**Measure Category:** Clinical Outcomes

**Quality Domain:** Patient Safety

**Current Findings in the Literature:** The reduction of hospital-acquired complications and infections is currently being targeted in patient safety initiatives. While they fall into a variety of categories, they all significantly impact patient safety, causing morbidity and sometimes death, and are costly to treat.<sup>1-7</sup> Yet, many are often preventable, if evidence-based guidelines are followed.

Some examples of hospital-acquired infections and complications that are often preventable include: nosocomial infections; falls; pressure ulcers; catheter-related infections; ventilator-associated pneumonia; surgical site infections; and postoperative pulmonary embolism and deep vein thrombosis. In the last decade, standard-setting organizations have published guidelines and recommendations in an effort to decrease these preventable complications and infections. For example: (a) Pressure ulcers may be prevented using best practices such as risk assessments, turning schedules, pressure reduction devices, incontinence management, and nutritional support<sup>8</sup> and (b) Formation of blood clots in the leg (deep vein thrombosis), which may cause pulmonary

embolism, can be prevented by following recommendations of the American College of Chest Physicians for use of anticoagulants, compression stockings, and pneumatic compression devices.<sup>9</sup> (See an aggregated list of evidence-based guidelines on the National Guideline Clearinghouse Web site, an AHRQ-funded initiative). These recommendations may be built into health IT applications, such as clinical decision support, in the form of computerized alerts and reminders. These alerts and reminders about recommendations and guidelines can be displayed in response to an entered order or upon opening a patient's record, thus avoiding these complications.

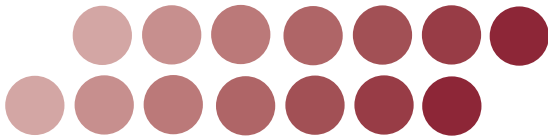
Catheter-associated urinary tract infections (CAUTIs) are the most common of the nosocomial infections.<sup>10</sup> Research has shown that the risk of infection is directly associated with the length of time a catheter is in place. The cost of these nosocomial infections is estimated at \$676 in direct costs per infection.<sup>11</sup> As such, the Centers for Disease Control and Prevention recommends the use of catheters only when indicated, coupled with proper insertion and maintenance techniques and prompt removal when no longer needed.<sup>12</sup>

Topal et al. examined the use of computerized provider order entry (CPOE) to improve the awareness by physicians that a urinary catheter had been inserted by an emergency department (ED) physician.<sup>13</sup> In this prospective, cohort study at an urban hospital, if a catheter was inserted in the ED, this documentation was added as part of the nursing floor report and sent as an alert via CPOE to the physician as part of the admission orders. This alert would then prompt the physicians to: (1) discontinue the device, (2) maintain the catheter for 48 hours, or (3) maintain the device continually. In



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Health IT



this pre-post study, the researchers found a significant decrease in the CAUTIs, from 36 per 1000 catheter days in the baseline period to 11 per 1000 catheter days in the followup period ( $p < .001$ ).<sup>13</sup>

Another patient safety initiative is aimed at decreasing pressure ulcers,<sup>14,15</sup> a common but preventable condition occurring most often in high-risk populations such as the elderly and individuals with physical impairments.<sup>16</sup> In 2006, there were over 500,000 total hospital stays with pressure ulcers noted as a diagnosis—an increase of nearly 80 percent since 1993, totaling \$11 billion in hospital costs.<sup>17</sup> In one hospital system, the Braden Scale for Predicting Pressure Sore Risk was implemented into the electronic nursing charting for admission and daily assessment;<sup>18</sup> the electronic medical record tallied the score and generated an automatic consult to the wound ostomy continence (WOC) nurse when the score fell below 13, indicating that the patient was at a high or very high risk for developing a pressure ulcer.<sup>19</sup> Following this assessment, the WOC nurse entered pressure relief orders that were based on evidence-based guidelines<sup>20</sup> embedded into the order entry system. This computerized charting and order entry embedded with evidence-based guidelines decreased the prevalence of hospital-acquired pressure ulcers from 12.8 to 5.1 percent, 18 months postimplementation.

**Source of Data:** Electronic Data Repository; CPOE Usage Logs; Medical Chart Review

## Methodology for Measurement

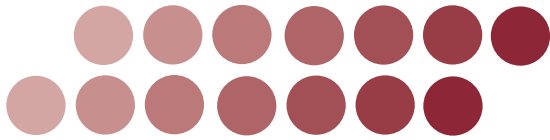
**Study Design:** Pre- and post-health IT implementation or time series. Evaluators should first determine a start date and then regular intervals to track over time (e.g., monthly, quarterly).

**Evaluation:** Change in the number, rate, or percentage of hospital-acquired complications or

infections pre- to post-health IT implementation or at set time periods postimplementation.

## Analysis Considerations

1. Your data collection and analysis plan should be based on sound methodology. To achieve valid, robust results, consider planning your analysis with the input of a trained statistician to determine sample size and appropriate statistical techniques. It is not uncommon to begin analyzing data, only to find the original statistical plan was flawed, leaving you with data that is inadequate for analysis.
2. A simple chart or graph that visually displays hospital-acquired complications or infections over time is an effective way to communicate this information to stakeholders.
3. Often the occurrence of a complication or infection will be preexisting to the hospitalization, for example, a pressure ulcer. Evaluators will need to put into place a process to determine whether the condition is preexisting or hospital-acquired.
4. Similarly, evaluators need to ensure that the event is really a complication and not a predictable outcome of the patient's natural disease process. For example, a pneumothorax in a patient who has bullous emphysema is not considered a hospital complication, while a pneumothorax in a patient who had just undergone a thoracentesis is considered a hospital complication.
5. Depending on the type of complication or infection, it may be too difficult to identify and may warrant the help of an expert or an infectious disease specialist.
6. Evaluators should be aware of a documentation effect. For example, falls may become more reliably documented because the intervention makes it easier to document them, thus



potentially falsely increasing the effect of the intervention.

7. Evaluators will need to weigh the occurrence of hospital-acquired complications or infections based on a severity of disease index. For example, diabetic patients are much more prone to postsurgical wound infections than nondiabetics, regardless of the quality of postsurgical wound care. This is especially true for orthopedic procedures.

**Relative Cost:** Low, if data are captured electronically, although additional resources may be needed to collect data in the preimplementation phase or have the input of an expert or infectious disease specialist. Costs will be higher if the evaluation requires manual chart review.

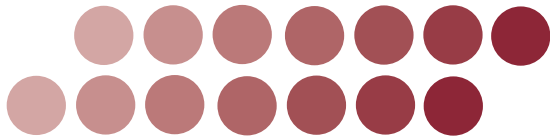
**Potential Risks:**

1. Evaluators will need to be aware of the “data” needed to drive the computerized alerts and guidelines. Many times this data is not captured by EMR systems and a CPOE system cannot effectively deliver that guideline. For example, documentation of a urinary catheter present at admission may not be captured by EMRs in a structured way. It may be documented in the clinical notes, but guidelines are driven by structured data fields. Thus, to assess whether a CPOE system can effectively alert for certain preventable hospital-acquired complications or infections, evaluators will need to ensure that the data needed to drive those alerts is captured by the EMR consistently, accurately, and in a structured manner.
2. Evaluators will also need to consider existing staff support for hospital complication and infection prevention. Smaller, community hospitals may lack specialized support services (such as wound care nursing staff) making

them more prone to the development of complications. Thus, evaluators should account for this in their analysis, i.e., even when an EMR alerts for possible preventive measures to be taken, the right support staff may not be available to act on those orders in a timely manner.

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