Assessing the Financial Impact of a Unit Based Clinical Leadership Model at a University Hospital: A Case Study of Reductions in Central Line-Associated Bloodstream Infections

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Background
- Hospitals have undertaken numerous efforts to reduce central line-associated bloodstream infections (BSI) in recent years.
- A unit-based clinical leadership (UBCL) model was transitioned into five units at the Hospital of the University of Pennsylvania (HUP) between July and December 2007.
  - Physician leader, nurse leader, and quality coordinator
- The goal of the UBCL teams was to improve quality of care on their unit. Chief among this goal was the reduction of BSI.
  - Other quality improvement projects included UTI reduction, interdisciplinary rounds, hand washing initiative, and house staff orientation.
  - However, other interventions introduced on these units may also impact BSI rates.
    - Biopatch
    - Theradoc
    - Discontinuation of pressure caps
    - Newer transparent dressings
    - Change in definition of BSI
    - QI initiative to reduce BSI by “Value capture”
- This study presents a framework for and evaluation of the financial impact of a quality improvement intervention like UBCL in the presence of multifaceted quality improvement processes implemented in real-world hospital settings.

Methods

Estimating incremental costs of BSIs
- FY08 data from the HUP hospital accounting database
  - Created a list of DRGs for all BSI-related hospitalizations
  - Limited FY08 data to all BSI & non-BSI hospitalizations with one of the BSI-related DRGs
  - Further excluded DRGs not likely to result in stay in one of the five UBCL units (e.g., neonatal DRGs)
- Compared direct variable supply costs and length of stay (LOS) of BSI vs. non-BSI hospitalizations
- Generalized linear models controlling for age, sex, DRG, and insurance were used to estimate the incremental direct variable supply (DVS) cost and LOS associated with a BSI-related hospitalization

Estimating investment in UBCL program in 5 units
- 4 Physician leaders ($20,000 each annually)
- 3 Asst. nurse managers to free up time of nurse managers in UBCL units ($120,000 each annually; however, only 1 hired, two available)
- 5 Quality coordinators (reassigned from other quality roles)

Estimating net impact of UBCL program
- Net Impact = BSI-related Cost Savings – UBCL Program Cost
- Measured statistical uncertainty surrounding these estimates

Results

Total # of BSIs avoided over 3 quarters
- 10.8 in Intervention 1 Group & 22.2 in Intervention 2 Group
- 33.0 total BSIs avoided in UBCL units (p-value = ns)

Incremental Cost of BSI-related Hospitalization
- Incremental Cost: $25,931 (unadj.); $14,425 (adj., p < 0.05)
- Incremental LOS: 31.5 days (unadj.); 20.3 days (adj., p < 0.05)

BSI-related Cost Savings Associated with UBCL
- # of BSIs avoided (33) x Incremental Cost of BSI ($14,425) = $477,200

UBCL Program Cost over 3 quarters
- More conservative: $330,000 (4 physicians, 3 asst. nurse mgrs)
- Less conservative: $150,000 (4 physicians, 1 asst. nurse mgr)

Net impact of UBCL over 3 quarters
- More conservative estimate: $147,200 total net savings
  - One can be 95% confident that the UBCL program offers good value if the hospital’s willingness to pay (WTP) to avoid one BSI is >= $6500 and <= $81,000
- Less conservative estimate: $327,200 total net savings
  - One can be 95% confident that the UBCL program offers good value if the hospital’s WTP to avoid one BSI is >= $4000 and <= $100,000

Discussion
- Our results suggest that the UBCL program has a high likelihood of saving costs while avoiding BSIs.
  - In the small likelihood that the program were to increase costs while avoiding BSIs, we can be 95% confident that it would do so at a maximum cost of $6500 per BSI avoided.
  - While there is a very low likelihood that the absence of the UBCL program would be associated with fewer BSIs, we can be 95% confident that this alternative scenario would at a minimum cost $81,000 per BSI avoided.
- Our estimates do not account for potential cost savings due to other quality improvement outcomes in UBCL units, less litigation, improved bed utilization, revenue from pay-for-performance contracting, and avoided loss in reimbursement for healthcare-associated infections.
- This case-study provides an example of the challenges faced and approaches used while evaluating specific interventions in the presence of multifaceted quality improvement processes in real-world hospital settings.