

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

Methods

Estimating reductions in BSIs associated with UBCL

- FY07-09 data from the HUP infection control dashboard
- Quasi-experimental design with a group of similar units which had the same set of other interventions implemented at HUP with the exception of the UBCL model selected as controls (Figure 1)
- Compared the reduction in the quarterly rates of number of BSIs per 1000 device days before-after UBCL transition in Intervention 1 group and control group
 - Exclude Q1Q208 (phase in period of UBCL)
 - Compare BSI rates in Q3Q407 (before-UBCL) with rates in Q308Q109 (after-UBCL) in each group
 - This difference-in-difference was an estimate of the reduction in the number of BSIs attributable to the UBCL
- Same rate of BSI reduction observed in Intervention 1 group was applied to Intervention 2 group to calculate number of BSIs avoided due to UBCL

Figure 1. Intervention and Control Groups

Group	Units	FY07 Q1	FY07 Q2	FY07 Q3	FY07 Q4	FY08 Q1	FY08 Q2	FY08 Q3	FY08 Q4
UBCL Intervention Group	Intervention 1	Fluoride 12	Fluoride 14	Shardens 11 (new 11_03)		UBCL phase-in	UBCL in progress	UBCL in progress	Dispatch (Feb 2008)
						Theradoc (Aug 2008)			CLC Cap removed (Feb 2008)
						New dressing			
Intervention 2	Phosid 6					UBCL phase-in	UBCL in progress	UBCL in progress	Dispatch (Feb 2008)
	Phosid 7					Sept 07 Jul 2007-Dec 2008	Sept 07 Jul 2008	BSI definition change (Jan 2008)	
						Theradoc (Aug 2008)			CLC Cap removed (Feb 2008)
						New dressing			Value Capture (May 08)
Potential Control Group	Unit 4								
	CICU								
	Phosid 1					Theradoc (Aug 2008)			Dispatch (Feb 2008)
	Phosid 7								CLC Cap removed (Feb 2008)
	Shardens 9								
	Phosid 9 11_03 (new 11_03)								

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.