Is the National Surgical Quality Improvement Program (NSQIP) Cost-effective: A Systematic Review

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2015 CAHSPR Conference
May 27th, 2015
Outline of the Presentation

- **Background**
  - Post-surgical complications
  - NSQIP

- **A systematic review**
  - Methods
  - Results
  - Conclusion/Discussion

- **Next Steps**
Post-surgical complication
“any deviation from the ideal postoperative course that is not inherent in the procedure and does not comprise a failure to cure” (Dindo & Clavien, 2008)

Post-surgical complication occurs frequently
- Incidence: 17 to 71% (Longo WE et al. 2000; Atchley KD et al. 2014)
- the most common adverse events in Canadian hospitals in 2004 (Baker R et al. 2004)

Post-surgical complications increase mortality, length of stay and healthcare costs
- 5-fold increase in hospital costs compared to without complications (Saint et al., 1998)

Various quality improvement efforts, such as the WHO Surgical Safety Checklist initiative and the NSQIP, have been implemented
• NSQIP is well-known for measuring and reporting surgical outcomes
  – found to significantly decrease hospital related complications
  – originated in the 1980s in Veterans Affairs Hospitals, modified and adopted by the American College of Surgeons
Geographic Distribution of ACS NSQIP Participating Sites

Source: ACS NSQIP Semiannual report, 2015
• NSQIP is well-known for measuring and reporting surgical outcomes
  – found to significantly decrease hospital related complications
  – originated in the 1980s in Veterans Affairs Hospitals, modified and adopted by the American College of Surgeons
  – prospectively collects detailed clinical data using standardized data definitions
  – provides 30-day risk-adjusted surgical outcome information for participating hospitals
  – allows comparison of surgical outcomes across participating hospitals
• There has been growing interest in NSQIP participation among Canadian hospitals
  – has been implemented in BC, Alberta, Quebec and Ontario
  – for Ontario,
    ▪ successfully implemented in 5 hospitals, including The Ottawa Hospital, Toronto General Hospital, Toronto Western Hospital, Hamilton Health Sciences, and Sunnybrook Health Sciences Center
    ▪ the Ontario NSQIP Collaborative (NSQIP-ON) (16 hospitals) has been established with the financial support from Health Quality Ontario

• Annual cost of participating NSQIP is about USD135,000
  – include data collection system, salary of a clinical reviewer, optional bonus payments to the surgical champion or quality improvement team
  – total cost of NSQIP participation would be $22.5 million Canadian dollars per year if all Ontario public hospitals participate in NSQIP

• Systematic evaluation of the impact of this program is imperative to ensure that the benefits of NSQIP justify its costs
To review studies assessing costs or cost-effectiveness of participating in NSQIP compared to no intervention or usual care
Methods

- Electronic databases from inception to March 31, 2015
  - MEDLINE, EMBASE, Cochrane Database of Systematic Reviews, and EconLit
  - websites of related organizations, abstracts/proceedings from conferences, and reference lists
  - Medical subject headings and text words: post-surgical complications, NSQIP, costs
  - The electronic searching strategies was peer-reviewed by CADTH staff

- Inclusion criteria
  - Studies assess the economic impacts of NSQIP
    - cost description/cost of illness, cost-outcome description, cost analysis, full economic evaluation (cost-minimization analysis, cost-benefit analysis, cost-effectiveness analysis, and cost-utility analysis)
  - Studies were screened, abstracted, and assessed independently by two reviewers
  - Any conflicts were resolved through team discussion
Results – PRISMA Diagram

- Records identified through searches (n=292)
- Records identified through other sources (n=27)
- Titles/abstracts screened (n=268)
- Full-texts screened (n=24)
- Studies included (n=7)
- Duplicates removed (n=51)
Results – Included Studies

Type of Studies

- Full economic evaluation
- Cost analysis
- Cost of illness

Participating NSQIP is cost-effective or cost-savings
### Results – Included Studies (1)

<table>
<thead>
<tr>
<th>Author/Year/Country</th>
<th>Setting/Perspective</th>
<th>Condition</th>
<th>Type of Study</th>
<th>Intervention/Control</th>
<th>Result</th>
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<tbody>
<tr>
<td>Hollenbeak et al., 2011; US</td>
<td>academic medical center; hospital</td>
<td>any post-operative complications</td>
<td>cost-effectiveness</td>
<td>initial vs. after NSQIP implementation</td>
<td>$25,471 and $7,316 per event avoided, after the 1st and 2nd of implementation</td>
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<td>Ceppa et al., 2012; US</td>
<td>Indiana University Hospital; NR</td>
<td>SSI following hepatopancreatobiliary</td>
<td>cost of illness</td>
<td>initial vs. after feedback from NSQIP and standardization of patient management</td>
<td>a savings of $11,462 per event avoided (a total savings of 370,223 in 2009)</td>
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<td>Guillaoni et al., 2012; US</td>
<td>10 hospitals within Tennessee Surgical Quality Collaborative (TSQC); NR</td>
<td>any post-operative complications</td>
<td>cost of illness</td>
<td>1-yr vs. 2-yrs after forming the TSQC and using NSQIP</td>
<td>a net savings of $23,723 per event avoided</td>
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<tr>
<td>Author/Year/Country</td>
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<td>Grand-Clément et al., 2013; US</td>
<td>7 hospitals participating NSQIP; NR</td>
<td>Colorectal SSIs</td>
<td>cost of illness</td>
<td>initial vs. 10-months after adopting the Robust Process Improvement</td>
<td>a savings of $27,407 per event avoided</td>
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<td>Tepas et al., 2014; US</td>
<td>54 hospitals participating NSQIP and the Florida Surgical Care Initiative; NR</td>
<td>UTI, SSI, adverse events for pts undergoing colorectal procedures, procedures for pts 65+</td>
<td>cost of illness</td>
<td>initial vs. 17 months after NSQIP participation</td>
<td>a savings of $40,403 per event avoided (a total savings of $6,666,431)</td>
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<td>McNelis et al., 2014;</td>
<td>Suburban university teaching; hospital</td>
<td>ventilator associated complications</td>
<td>cost of illness</td>
<td>1-yr, 1.5-yrs, and 2-yrs after NSQIP implementation</td>
<td>a savings $707,104/year for avoided pneumonia, $4,424,640/year for decreased ventilator days</td>
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<td>US</td>
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<td>Osborne et al., 2015;</td>
<td>US Medicare; hospital</td>
<td>any post-operative complications</td>
<td>cost analysis</td>
<td>NSQIP vs. no NSQIP</td>
<td>30-day mean total payments: $40 (95% CI -$268 to $348)</td>
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<td>US</td>
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Results – Summary of the Findings (1)

• 1 full economic evaluation (Hollenbeak et al., 2011)
  – **cost-effectiveness analysis** - participation in NSQIP is cost-effective
  – **poor quality** - derived the effectiveness of NSQIP from the pre-post study; no control group; no adjustment for the time trend and other co-interventions

• 1 cost analysis (Osborne et al., 2015)
  – **regression analysis** - participating in NSQIP did not significantly reduce Medicare payments

• 5 cost of illness studies
  – **NSQIP return on investment tool** - using NSQIP with/without quality improvement activities led to cost-savings to hospitals
    ▪ easy and simple
      – savings = no. cases avoided x unit cost of post-surgical complication
    ▪ overestimate the financial benefits of NSQIP
      – not include cost of NSQIP implementation
    ▪ unit costs of post-surgical complication were obtained from various studies which employed different costing strategies and perspective of analyses
## Results – Summary of the Findings (2)

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<th>H et al., 2011</th>
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<tr>
<td>NSQIP</td>
<td>✓</td>
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<td>QI activities*</td>
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<td>✓</td>
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<td>QI collaborative**</td>
<td></td>
<td>✓</td>
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*Quality improvement activities*: discussion among surgeons and changes in patient management

**Quality improvement collaborative**: benchmark and compare surgical outcomes, identify areas for improvement, and share best practices and improvement strategies
Two studies only assessed the impact of participating NSQIP and did not include or adjust for other quality improvement efforts.

Components of quality improvement activities

- NSQIP – collect, monitor, provide risk-adjusted post-surgical outcomes, and identify areas of improvement (7 studies)
- establishment of teams and implementation of quality improvement activities, such as preoperative antibiotics, early mobilization, and early nutrition (3 studies)
- establishment of a quality improvement collaborative across the hospitals to share surgical process and outcome data (3 studies)
Conclusion

- Is NSQIP participation cost-effective?
Conclusion/Discussion

- NSQIP serves as the foundation for quality improvement initiatives that are shared and disseminated through the program
  - does not make changes to health care delivery but provides data to identify areas for targeted quality improvement

- Evidence regarding the value for money of NSQIP is inconclusive
  - population, quality improvement activities, effectiveness measures

- Rigorous and well-designed cost-effectiveness studies are needed before the nation-wide implementation of NSQIP in Canada
Next Steps

- Conduct a cost-effectiveness analysis of NSQIP and subsequent quality improvement initiatives within the Ottawa Hospital
Acknowledgements

- Health Quality Ontario
- Canadian Agency for Drugs and Technologies in Health
- Becky Skidmore
- Raymond Daniel
- Roxanne Ward
Thank You

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