

A COMMON SET OF NATIONAL SURGICAL SAFETY INDICATORS: PHASE ONE

Canadian Institute for Health Information

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Introduction

The Canadian Institute for Health Information (CIH) assembled a working group to review surgical care safety indicators to identify a common set of national surgical safety indicators. The impetus for this work came from the Integrated Patient Safety Action Plan.

The National Patient Safety Consortium, made up of over 50 organizations from across Canada and convened by the Canadian Patient Safety Institute, identified surgical care safety as one of the four primary areas of focus for an Integrated Patient Safety Action Plan. In March 2014, a National Surgical Care Safety Summit was convened and stakeholders identified a need to accelerate surgical care safety improvement in Canada. An action plan was developed which identified 15 actions organized around 7 themes. One of the key themes was measurement and analysis of timely, relevant and robust data specific to surgical care safety including outcomes and never events. The goal was a common set of national surgical safety indicators. The actions were: (1) to assemble a working group to review current surgical care safety indicators including those used in the National Surgical Quality Improvement Program (NSQIP) and Enhanced Recovery After Surgery (ERAS) for suitability for inclusion in a national set of surgical safety indicators; and (2) to assemble a group for evaluation and implementation of the common set of national surgical safety indicators.¹

CIHI was asked to lead the first phase of this initiative to bring together a Surgical Care Safety Indicators Working Group to review and select a national set of priority surgical care safety indicators. These indicators would support meaningful measurement that can tell us how Canadian health care systems are functioning and act as a catalyst to drive quality improvement as well as sharing of best practices.

Surgical Care Safety Indicators Working Group

The Surgical Care Safety Indicators Working Group was comprised of 17 members from across Canada. It included health care providers, researchers, policy makers, and system representatives with expertise in:

- Clinical, administrative and/or research in the acute care sector with knowledge of system issues and priorities related to surgical care safety;
- Surgical care safety performance measurement and relevant data sources in acute care; and/or
- Current data and measurement capacity related to surgical care safety in the acute care sector.

Working Group members participated in a project kick-off meeting that took place via teleconference in June 2016. They also completed a modified Delphi panel indicator inventory review survey to identify priority indicators (Round 1: July to August 2016) and a panel discussion via web conference to finalize the shortlist of priority indicators (Round 2: November 2016).

The Surgical Care Safety Indicators Working Group Membership List can be found in Appendix A.

Modified Delphi Panel Survey - Round One

Indicator Inventory Review Survey

A modified Delphi panel indicator inventory review took place in July to August 2016. Working Group members were invited to participate in the modified Delphi panel indicator survey by email and were asked to forward the survey to other key stakeholders in their jurisdiction. Of the 25 surveys that were sent out, 22 were completed, for a response rate of 88%. Some of the completed surveys represented individual responses; while others were completed by multiple individuals from within the same organization and responses represented the group consensus.

Panelists were provided with some guiding principles to consider in completing the indicator inventory review survey. They were to take a big picture view to identify priority measures for all of Canada, that cover various dimensions of safety, and that are applicable to the majority of surgery specialities. No direction was provided as to whether indicators should focus on specific populations (e.g., adult versus pediatric). They were informed they did not need to consider the feasibility of the measures and how they might be operationalized as this would be part of phase two of the initiative.

The panel assessed 37 measures identified through an environmental scan of surgical care safety programs in Canada and abroad. Sources for the environmental scan included:

- Agency for Healthcare Research and Quality
- American Society of Anesthesiologists
- BC Patient Safety & Quality Council
- Canadian Institute for Health Information
- Canadian Nosocomial Infection Surveillance Program
- Canadian Patient Safety Institute
- Centers for Medicare & Medicaid Services
- Enhanced Recovery After Surgery (ERAS)

- Health Quality Council of Alberta
- Health Quality Ontario
- National Surgical Quality Improvement Program (NSQIP)
- National Health Service
- Organisation for Economic Co-operation and Development
- Saskatchewan Health Quality Council
- The Joint Commission

Measures were grouped into high-level categories to help structure the review process. Categories included:

- Infections
- Deaths
- Never events
- Other complications
- Unplanned procedures
- Readmissions
- Anesthesia complications
- Patient-centred measures
- Structure or inputs
- System prevention

The survey included the name of the measure, a description of the measure, measure type (i.e., structure, process or outcome), and examples of indicators that could fall under the measure.

Several systematic evaluation tools and criteria for assessing health quality measures were reviewed to establish the review criteria.²⁻⁶ Since the goal was to identify priority indicators, alignment was greatest with the evaluation criteria related to importance. In the literature, four questions were often raised with regard to rating the importance of a measure, including: (1) Does the measure address a problem with a high impact on health?; (2) Are the stakeholders concerned or interested?; (3) Is it possible to improve health outcomes?; and (4) Are the results interpretable (e.g., sufficient volume, significant variation)? These questions informed the review criteria that were established for the indicator inventory review survey.

Panelists were asked to rate the measures on four criteria related to importance: (1) Impact on Health; (2) Relevance; (3) Actionability; and (4) Interpretability. Panelists were also asked to assign priority to the measure by providing an overall priority rating. The overall rating provided a global assessment of the measure to determine whether it should be included in the national set of priority surgical care safety indicators. Panelists

were asked to assess the measure on each criterion using a 9-point rating scale: low (1 to 3), medium (4 to 6) and high (7 to 9). Refer to Table 1 for the review criteria definitions and rating scales.

Table 1: Review Criteria Definitions and Rating Scale

Criteria	Definition	Rating Scale		
		1, 2, 3	4, 5, 6	7, 8, 9
Impact on Health	The indicator reflects a surgical care safety issue with a high impact on health outcomes and/or quality of life and a significant variation in care.	Low Impact	Medium Impact	High Impact
Relevance	The indicator addresses or flags an area of significant surgical care safety concern for stakeholders, including policy-makers, health professionals, patients and the public.	Low Relevance	Medium Relevance	High Relevance
Actionability	The indicator reflects an area where the opportunity for improvement exists and may provide information to meaningfully address surgical care safety.	Low Actionability	Medium Actionability	High Actionability
Interpretability	The indicator provides clear information to the stakeholders that support understanding of variations over time and comparisons for surgical care safety.	Low Interpretability	Medium Interpretability	High Interpretability
Overall Rating	Provide an overall assessment of the indicator to determine inclusion in the priority national set of surgical care safety indicators.	Low Priority	Medium Priority	High Priority

A copy of the Modified Delphi Panel Indicator Inventory Review Survey can be found in Appendix B.

Survey Scoring and Agreement Methodology

The RAND/UCLA Appropriateness Method was used to analyze the survey responses.⁷ Panelist ratings were summarized as a median score for each of the four review criteria and overall priority rating: **low** (1 to 3), **medium** (4 to 6), and **high** (7 to 9). The first step in the analysis was to focus on the median score of the overall priority rating and then assess whether panelists agreed on the overall priority rating. The agreement level threshold was at least 60% of panelist ratings fall in the same 3-point range of the median. If the median score was high (7 to 9) and at least 60% of panelist ratings fell from 7 to 9, the measure was considered to be a high priority with panelists agreeing on the overall priority rating. If the median score was high (7 to 9) and less than 60% of panelist ratings fell from 7 to 9, the measure was considered to be a high priority with panelists disagreeing on the overall priority rating. The same approach was used to summarize the other four review criteria to provide contextual information.

Survey Results Summary

A copy of the Survey Results Summary can be found in Appendix C. For each of the surgical care safety measures that were reviewed, median scores are shown for each of the review criteria. Colour coding is used to show panelist agreement on high, medium and low scores and where there was no agreement. The agreement level threshold was 60% as outlined above.

All 37 measures had a median score in the medium to high overall priority rating.

Sixteen measures had a high median score (7 to 9) on the overall priority rating. Of these, 8 measures had at least 60% of panelist ratings fall within the high median score (7 to 9) (refer to Table 2). The modified Delphi panel survey results suggest consensus among panelists that these eight measures should be considered a high priority and included in the national set of priority surgical care safety indicators.

Table 2: High Median Score with Panelist Agreement on Overall Priority Rating

Category	Measure	Measure Type
Never events	• Wrong surgery (body part/patient/ procedure)	Outcome
	• Retained foreign body	Outcome
System prevention	• Surgical Site Infection (SSI) prevention	Process
	• Surgical care safety checklist compliance	Process
Infections	• Surgical Site Infection (SSI) outcome	Outcome
	• Post-operative sepsis	Outcome
Other Complications	• Perioperative deep vein thrombosis or pulmonary embolism	Outcome
Patient Centred Measures	• Patient-reported outcome measures	Outcome

In addition, 8 measures had a high median score (7 to 9) on the overall priority rating but less than 60% of panelist ratings fell within the high median score (7 to 9) (refer to Table 3). The modified Delphi panel survey results indicate disagreement among panelists as to whether these measures should be considered a high priority and included in the national set of priority surgical care safety indicators.

Twenty-one measures had a medium median score (4 to 6) on the overall priority rating. Of these, one measure (accidental puncture or laceration) had at least 60% of panelist ratings fall within the medium median score (4 to 6) indicating consensus among panelists that the measure was a medium priority.

Table 3: High Median Score with Panelist Disagreement on Overall Priority Rating

Category	Measure	Measure Type
System prevention	• Intraoperative process – complications prevention	Process
	• Postoperative process – complications prevention	Process
	• Anesthesia complications prevention	Process
	• Deep vein thrombosis or pulmonary embolism prevention	Process
	• Communications at transitions of care	Process
Unplanned procedures	• Reoperation	Outcome
Death	• Surgical mortality	Outcome
Patient Centred Measures	• Patient-reported experience measures	Outcome

Modified Delphi Panel Discussion – Round Two

Only the 16 measures that had a high median score (7 to 9) on the overall priority rating were brought forward for the modified Delphi panel discussion – Round 2 since the goal was consensus on a national set of priority surgical care safety indicators.

Working group members were first asked to review the eight measures which had a high median score (7 to 9) with at least 60% of panelists agreeing on the high overall priority rating ([see Table 2](#)). The measures fell into the following high-level categories: never events, system prevention, infections, other complications, and patient-centred measures. They included two process and six outcome measures.

Working group members were asked to consider whether these measures were sufficient to represent a national set of priority surgical care safety indicators. They were satisfied with the inclusion of the six outcome measures, but had concerns with including process measures (e.g., surgical care safety checklist compliance) in the final list of priority indicators given that they are not reflective of the ultimate safety outcomes that would need to be actioned for improvement. Process measures need to be linked to outcome measures.

Although the working group was informed they did not need to consider the feasibility of the indicators and how they might be operationalized (i.e., indicator definitions and data

sources), members believed that what data is collected and how it is collected for a measure is important to consider because that will influence whether the measure should be considered a high priority. For example, results for surgical care safety checklist compliance are different if they are collected through self-report versus an audit process. One member cautioned that if surgical care safety checklist compliance is a part of the common set of national surgical care safety indicators, there needs to be a caveat that high data quality standards are required for robust data collection and reporting.

Working group members also discussed the 8 measures which had a high median score (7 to 9) but less than 60% of panelist agreed on the high overall priority rating ([see Table 3](#)). The measures fell into the following high-level categories: system prevention, unplanned procedures, death, and patient-centred measures. They included five process and three outcome measures. The process measures were quickly excluded from further discussion based on the decisions made earlier. The three outcome measures were discussed and voted on as to whether they should be included in the final list of priority indicators. Members came to consensus that reoperation and surgical mortality be kept and that patient reported experience measures be dropped.

There were some caveats to including surgical mortality in the list of priority measures. Members expressed concern with looking at surgical mortality from an in-hospital versus whole system perspective and that indicators should include both inter-operative and post-operative surgical mortality. It was suggested that the metric would be more useful if it was measured along the continuum of care after the patient is discharged from hospital.

Working group members believed that patient reported experience measures were relevant but felt that it may not capture patient safety and favored dropping the measure knowing that patient reported outcome measures were already on the priority list and a systems approach should include the patient journey pathway.

Recommended National Set of Priority Surgical Care Safety Indicators

The following eight outcome measures were identified for inclusion in the national set of priority surgical care safety indicators. These measures apply to major surgeries in the adult population. They are not a reflection of surgical care safety for pediatrics.

Category	Measure	Description	Select Indicator Examples
Never events	<ul style="list-style-type: none"> Wrong surgery (body part/patient/ procedure) 	<ul style="list-style-type: none"> Number of hospital discharges with surgery on wrong body part / wrong patient / wrong procedure 	<ul style="list-style-type: none"> Surgery on wrong body part / wrong patient / wrong procedure
	<ul style="list-style-type: none"> Retained foreign body 	<ul style="list-style-type: none"> Number of hospital discharges with a retained surgical item or unretrieved 	<ul style="list-style-type: none"> Retained foreign body / foreign body left in during procedure Retained surgical item or unretrieved device fragment count
Infections	<ul style="list-style-type: none"> Surgical Site Infection (SSI) outcome 	<ul style="list-style-type: none"> Rate of hospitalized surgical site infections 	<ul style="list-style-type: none"> Percent of clean and clean contaminated surgery patients with evidence of surgical site infection at the time of, or prior to discharge Hospitalized surgical site infections 30 day organ space SSI after lower extremity bypass surgery 30 day organ space SSI after colorectal surgery 30 day deep incisional SSIs after colorectal surgery 30 day organ space SSI for patients 65 years or older after surgery 30 day deep incisional SSIs for patients 65 years or older after surgery Hip and knee arthroplasty SSI rates Cerebrospinal fluid shunt (CSF) associated infection

Category	Measure	Description	Select Indicator Examples
	<ul style="list-style-type: none"> Postoperative sepsis 	<ul style="list-style-type: none"> Rate of sepsis occurring within 30 days after surgery 	rates <ul style="list-style-type: none"> 30 day sepsis/sever sepsis/septic shock for patients 65 years or older after surgery 30 day sepsis/sever sepsis/septic shock after lower extremity bypass surgery 30 day sepsis/sever sepsis/septic shock after colorectal surgery Postoperative sepsis rate
Other Complications	<ul style="list-style-type: none"> Perioperative Deep Vein Thrombosis or Pulmonary Embolism Outcome 	<ul style="list-style-type: none"> Rate of Deep Vein Thrombosis or Pulmonary Embolism occurring within certain time period perioperatively 	<ul style="list-style-type: none"> 30 day postoperative Deep Vein Thrombosis 30 day postoperative Pulmonary Embolism 30 day Deep Vein Thrombosis after colorectal surgery 30 day Deep Vein Thrombosis for patients 65 years or older after surgery
Unplanned procedures	<ul style="list-style-type: none"> Reoperation 	<ul style="list-style-type: none"> Rate of unplanned reoperation or surgical procedures within 30 days after surgery 	<ul style="list-style-type: none"> Unplanned reoperation for respiratory/cardiac failure after colon surgical outcomes Unplanned reoperation in surgeries for patients 65 years old or older after surgery
Death	<ul style="list-style-type: none"> Surgical mortality 	<ul style="list-style-type: none"> Rate of in-hospital deaths due to all causes occurring within certain days after 	<ul style="list-style-type: none"> Hospital standardized mortality ratio (HSMR) – surgical cases

Category	Measure	Description	Select Indicator Examples
		surgery	<ul style="list-style-type: none"> • 30 day in-hospital mortality following major surgery • 30 day mortality in surgeries for patients 65 years or older after surgery • 30 day mortality after lower extremity bypass surgery • 30 day mortality after colorectal surgery • 30 day in-hospital mortality after (Percutaneous Coronary Intervention, Coronary Artery Bypass Graft, Aortic Valve Surgery, Coronary Artery Bypass Graft and Aortic Value Surgery)
Patient Centred Measures	<ul style="list-style-type: none"> • Patient-reported outcome measures 	<ul style="list-style-type: none"> • Measures of patient reported outcomes of complications after surgery 	<ul style="list-style-type: none"> • Percent of patients reporting whether, after their operation, they have experienced any of the following problems: <ul style="list-style-type: none"> ○ allergy or reaction to drug ○ urinary problems ○ bleeding ○ wound problems • Assessment of Acute • Postoperative Pain

- Note: Although the recommended national set of priority surgical care safety indicators do not include measures related to system prevention, they are still important for facilities to measure and monitor and can be linked with outcome measures to inform improvements in surgical care safety.

References

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5. German Medical Association, the National Association of Statutory Health Insurance Physicians and Association of the Scientific Medical Societies in Germany (AWMF). [*Critical Appraisal of Clinical Performance Measures for Quality Management Quality Criteria and Quality Indicators in Health Care*](#). Agency for Quality in Medicine. 2001.
6. National Quality Forum. [*Measure Evaluation Criteria and Guidance Summary Tables*](#). 2013.
7. Fitch K, et al. [*The RAND/UCLA Appropriateness Method User's Manual*](#). 2001.

**APPENDIX A: Surgical Care Safety Indicators Working Group
Membership List**

Surgical Care Safety Indicators Working Group – Membership List

Name	Title	Organization	Email
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APPENDIX B: Modified Delphi Panel Indicator Inventory Review Survey

APPENDIX C: Modified Delphi Panel Survey Results Summary

National Set of Priority Surgical Care Safety Indicators for Canada

Survey Results, September 2016

Canadian Institute for Health Information

	Agreed on high score (6.5 - 9)
	Agreed on middle score (3.5 - 6)
	Agreed on low score (1 - 3)
	No agreement

Total number of respondents = 22

Rank	Category	Measure	Median Scores				Overall Priority
			Impact on Health	Relevance	Actionability	Interpretability	
1	Never Event	Wrong Surgery (body part / patient / procedure)	9	9	9	9	9
2	Never Event	Retained Foreign Body	8	8	9	9	8
3	System Prevention	Surgical Site Infections (SSI) prevention	8	8	8	7	8
4	Infections	Surgical Site Infections (SSI) outcome	8.5	8	8	7	8
5	Infections	Postoperative Sepsis	9	8	8	7.5	7
6	Other Complications	Perioperative Deep Vein Thrombosis or Pulmonary Embolism outcome	7.5	7	8	7	7
7	Patient Centred Measures	Patient Reported Outcome Measures	8	7.5	7	6	7
8	System Prevention	Surgical Safety Checklist Compliance	7	7	7	7	7
9	Other Complications	Accidental Puncture or Laceration	7	6	5.5	5.5	5.5
10	System Prevention	Intraoperative Process - Complications Prevention	8	8	8	8	7.5
11	System Prevention	Postoperative Process - Complications Prevention	7.5	8	8	7	7
12	System Prevention	Anesthesia Complications prevention	8	7	7	8	7
13	System Prevention	Deep Vein Thrombosis or Pulmonary Embolism prevention	8	7	7.5	6.5	7
14	Death	Surgical Mortality	9	8	6	6	7
15	System Prevention	Communication at Transitions of Care	7	7	7	6	7
16	Unplanned Procedures	Reoperation	7	7	6.5	7	7
17	Patient Centred Measures	Patient Reported Experience Measures	7	7	6	6	7

Rank	Category	Measure	Impact on Health	Relevance	Actionability	Interpretability	Overall Priority
18	System Prevention	Preoperative Process - Complications Prevention	8	8	8	6	6.5
19	Other Complications	Perioperative Hemorrhage	7	7	7	6.5	6.5
20	Other Complications	Postoperative Cardiac event	8	7	6	6	6.5
21	Infections	Postoperative Urinary Tract Infection	7	7	7	7	6
22	Other Complications	Postoperative Renal Failure	8	7	6	6	6
23	Other Complications	Postoperative Respiratory Failure	8	7	6	6	6
24	Readmission	Surgical Readmissions	7	7	6	6	6
25	Structure/Inputs	Nurse to Patient Ratio	7	6	6.5	6	6
26	Other Complications	Postoperative Wound Disruption / Dehiscence	7	7	6	6	6
27	Other Complications	Postoperative Stroke	8	6	6	6	6
28	Anesthesia Complications	Anesthesia Complications outcome	7	6	6	6	6
29	Other Complications	Postoperative Hip Fracture	7	6	6	6	6
30	Infections	Postoperative Pneumonia	7	6	6	6	6
31	Structure/Inputs	Procedure Volume	6	6	6	6	6
32	Structure/Inputs	Fellowship Trained Surgeons	6	6	6.5	5.5	5.5
33	Structure/Inputs	Surgical Training	7	7	6	6	5
34	Unplanned Procedures	Unplanned Ventilator >48 hours	8	6	6	5	5
35	Other Complications	Nurse Sensitive Adverse Events	7	6.5	5.5	5	5
36	Unplanned Procedures	Unplanned Intubation	7	6	5	5	5
37	Other Complications	Postoperative Delirium	7	5.5	5	5	5