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ORIGINAL ARTICLE



Surgical process improvement tools: defining quality gaps and priority areas in gastrointestinal cancer surgery

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ABSTRACT

Background

Surgery is a cornerstone of cancer treatment, but significant differences in the quality of surgery have been reported. Surgical process improvement tools (SPITS) modify the processes of care as a means to quality improvement (QI). We were interested in developing SPITS in the area of gastrointestinal (GI) cancer surgery. We report the recommendations of an expert panel held to define quality gaps and establish priority areas that would benefit from SPITS.

Methods

The present study used the knowledge-to-action cycle was as a framework. Canadian experts in QI and in GI cancer surgery were assembled in a nominal group workshop. Participants evaluated the merits of SPITS, described gaps in current knowledge, and identified and ranked processes of care that would benefit from QI. A qualitative analysis of the workshop deliberations using modified grounded theory methods identified major themes.

Results

The expert panel consisted of 22 participants. Experts confirmed that SPITS were an important strategy for QI. The top-rated SPITS included clinical pathways, electronic information technology, and patient safety tools. The preferred settings for use of SPITS included preoperative and intraoperative settings and multidisciplinary contexts. Outcomes of interest were cancer-related outcomes, process, and the technical quality of surgery measures.

Conclusions

Surgical process improvement tools were confirmed as an important strategy. Expert panel recommendations will be used to guide future research efforts for SPITS in GI cancer surgery.

KEY WORDS

Quality improvement, patient safety, knowledge translation, clinical pathways, perioperative care, cancer surgery

1. BACKGROUND

Cancer is the leading cause of mortality in Canada. It is responsible for an estimated 170,000 incident cases and more than 75,000 deaths annually[1,2]. Gastrointestinal (GI) cancers, including colorectal and pancreatic cancer, are leading causes of death. Surgery is a central modality in the treatment of cancer. Surgical care accounts for a significant percentage of cancer costs at initial diagnosis[3,4]. Most patients with cancer will undergo a surgical procedure at some point during the course of their treatment, for any one or a combination of diagnostic, curative, and palliative indications[5]. For solid tumours of the GI tract, surgery is the cornerstone of curative treatment. For colorectal cancer, resection is performed in 71%–90% of patients, and surgery is the sole modality of treatment for up to 53% of patients[6]. But substantial variation in the patterns of care delivery and the quality of surgical care for cancer has been reported. Factors such as geographic, provider, and institutional characteristics have been linked to important differences in clinical outcomes, including perioperative mortality, cancer recurrence, and long-term survival[7–13]. Despite the important role of surgery in the care of patients with cancer, high quality surgical care appears not to be universally available.

1.1 Quality and Processes of Care in Cancer Surgery

Donabedian[14] proposed a model of quality in health care composed of three domains: structure, process, and outcomes. Variability in care delivery

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is a suboptimal quality endpoint. Our research group previously characterized a group of quality improvement (QI) instruments that we call surgical process improvement tools (SPITS). These tools modify processes of care at the point of care—that is, at the time when care is actually delivered. For example, processes for cancer care can include activities related to diagnosis, treatment, and surveillance. Recently, we completed a scoping review of SPITS in cancer surgery and found that research in the area is very limited (Figure 1)[a]. Few high-quality studies are available; randomized controlled trials are rare. The research to date has been dominated by single-institution studies considering a modest number of subjects[a]. We identified wide gaps in current knowledge about SPITS that have the potential for success with further development.

1.2 Identifying the Problem in GI Cancer Surgery

Our research group was interested in developing QI strategies that use process change as a vehicle for introducing evidence into practice. In particular, we were interested in developing tools that can be used in GI cancer surgery in the Canadian context. We used the knowledge-to-action cycle described by Graham *et al.*[15] to inform our approach to this problem. We sought to initiate a knowledge-to-action cycle by identifying the knowledge gaps and seeking input from stakeholders about the important areas on which we should focus our efforts. To that end, we assembled an expert panel in GI cancer surgery and asked the group to delineate gaps in current knowledge and to define priority areas that could benefit from a process-based QI intervention. This paper reports the expert panel recommendations.

2. IMPLEMENTATION

2.1 Methodology

Invitations to attend an expert panel nominal group workshop were extended to Canadian stakeholders involved in the care of patients undergoing surgery for GI cancer and to QI experts. The workshop was designed with two goals:

- To act as a knowledge exchange opportunity, presenting research results and a new conceptual framework for SPITS
- To act as an information-gathering session, identifying problems that should be addressed using a knowledge-to-action cycle

"Nominal group technique" is a consensus method frequently used in health care decision-making[16]. Nominal groups are structured interactions in which participants contribute ideas in round-robin

[a] Wei A, Urbach D, Devitt K, *et al.* Improving quality through process change: a scoping review of process improvement tools in cancer surgery. Unpublished manuscript (under review by *BMC Surgery*), 2013.

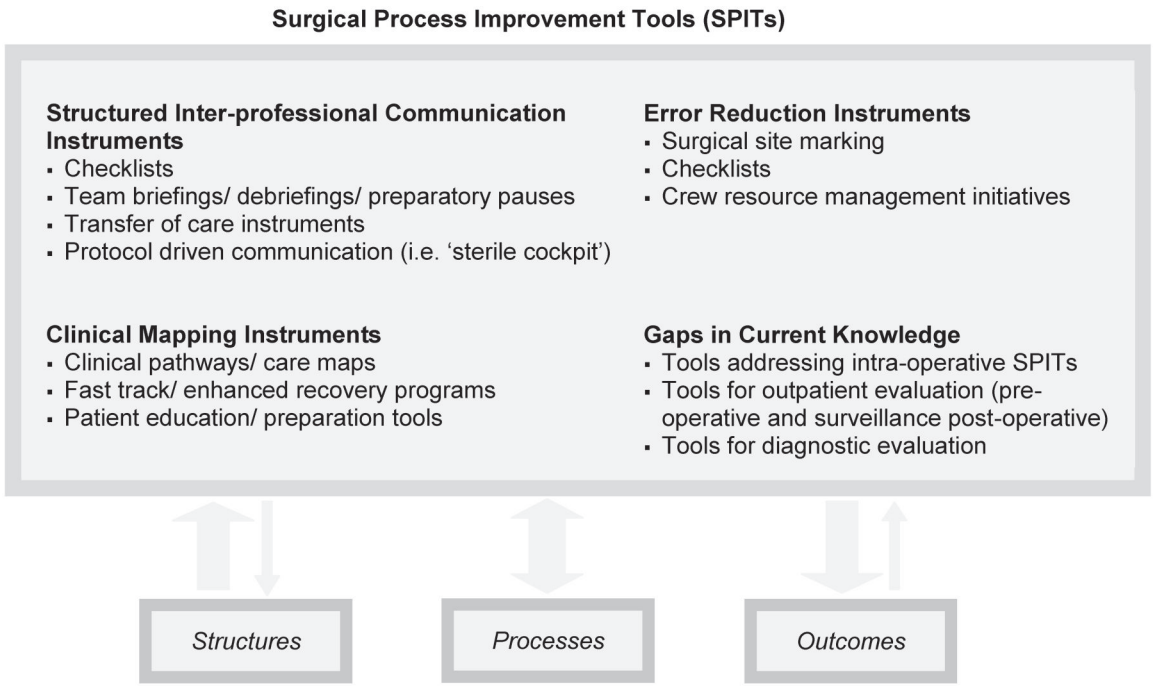


FIGURE 1 *Surgical process improvement tools (SPITS) conceptual framework.*

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sessions directed by a facilitator. Facilitators used a semi-structured interview guide to generate discussion. Similar suggestions are grouped and individually ranked. In an iterative process, the top-ranked concepts are discussed again in a group format, and participants then individually re-rank the options. A modified nominal group method was used because we included a final post-workshop round of voting to establish final recommendations[16,17].

To obtain representation from a diverse number of stakeholders, experts were selected using a purposive sampling strategy that included a variety of geographic and demographic groups[18]. To keep the interactive deliberations manageable, the size of the nominal group was limited to approximately 20 participants[16].

The agenda for the expert panel workshop included presentation of our research results, with a scoping review of the literature of SPITs for cancer; two rounds of group discussion and ranking of gaps in current knowledge; and identification of concepts worthy of future development, implementation, or evaluation.

Using rank ordering, topics were prioritized and grouped according to relevance, feasibility, and likely impact—that is, the factors considered essential for priority setting in health services research. A post-workshop final round of ranking was performed by electronic survey. Final results were tabulated and assessed using a weighted scoring system.

Workshop deliberations were also qualitatively analyzed. Thematic extraction of the barriers and enablers of SPITs development or implementation (or both) was completed by two independent coders (ACW, KSD) using modified grounded theory methods[19]. Both coders were experienced in the mixed-methods approach. Theory construction and strategy for data collection were reviewed with experts in the research group who had extensive experience in qualitative methodology (DRU and members of the Decision Support and Health Care research team)[20–23]. These data were sought to provide input for other elements of the knowledge-to-action cycle, including an understanding of local end-user needs and barriers that must be overcome to closed the observed gap in knowledge. After independent review of the transcripts, extracted themes were compared, and a consensus concerning unique themes was established.

2.2 Results and Recommendations

Of the 22 experts who participated in the nominal group workshop, most were practicing clinicians in a tertiary centre (n = 13, 59%) or community-based practice (n = 3, 14%), whose clinical subspecialties included general surgery (n = 5, 31%), hepatopancreatobiliary surgery (n = 5, 31%), surgical oncology (n = 3, 19%), colorectal surgery (n = 2, 13%), and another focus (n = 1, 6%). Most had overlapping domains of expertise in addition to their clinical area of specialization and represented nonclinical stakeholder interests. Geographic sampling obtained participants from Ontario (n = 17, 77%), Alberta (n = 1, 5%), British Columbia (n = 1, 5%), Nova Scotia (n = 1, 5%), and Quebec (n = 2, 9%). Table I lists the participants and their areas of expertise.

Two deliberative sessions were used to solicit potential SPITs, settings, and outcomes of interest to address current gaps in knowledge. Key concepts were tabulated and categorized thematically (Table II). The participants identified 5 major categories of SPITs that might have an impact in the clinical setting: clinical pathways and related products, structured communication tools, patient safety tools, checklists, and electronic information technologies. The potential settings identified were preoperative evaluation, intraoperative care, inpatient care, outpatient care, the multidisciplinary setting, and care transfer points. Potential outcomes of interest were resource utilization, patient satisfaction, adherence to guidelines, process outcomes, collaboration or communication outcomes, cancer-related health outcomes, and technical quality of surgery. After group deliberation, two rounds of voting were undertaken. In round 1, participants individually prioritized tools, settings, and outcomes during the nominal group workshop. The final round of voting was performed using a post-workshop electronic survey.

Of the 22 panel members, 21 participated in the ranking exercise. They ranked clinical pathways and related tools (for example, fast-track protocols) (n = 20, 95%) as the preferred SPIT, preoperative care or evaluation (n = 16, 76%) as the preferred setting, and cancer-related health outcomes (n = 18, 86%) as the preferred outcome. The lowest priority SPIT, setting, and outcome were checklists (n = 6, 29%), processes related to transfer of patient care (n = 4, 19%), and resource utilization (n = 3, 14%) respectively. Table III shows the final rankings.

TABLE I Domains of expertise among 22 expert panel participants

Domain[a]	*Panel expertise*[b]	
	*(*n*)*	*(%)*
Clinician, tertiary setting	13	59
Clinician, community setting	3	14
Researcher	10	45
Quality improvement	9	41
Gastrointestinal disease	7	32
Administration	4	18
Nursing or allied health	3	14
Policy-making	3	14
Patient safety	1	5

[a] Categorized by relevant disciplines.
[b] Some attendees were experts in more than one field.

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TABLE II Key concept categories from expert panel workshop

Research area and category	*Applicability*
Settings	
Preoperative care or evaluation	Preoperative outpatient evaluation
	Wait times or referral processes
	Access to care
	Diagnostic imaging or screening
	Patient triage and intake
Inpatient care or evaluation	Preoperative inpatient, immediately before surgery
	Postoperative inpatient
	Coordination of multidisciplinary care
	Postoperative clinical pathways
	Enhanced recovery after surgery
	Intraoperative checklist
	Surgical technical skills
Intraoperative care	Synoptic OR reports
Outpatient care or evaluation	Coordination of care between physicians
	Cancer surveillance
	Patient-owned record
	Transfer of care between institutions
	Outpatient clinics
	Diagnostic imaging
	Cancer screening
Multidisciplinary care	Transfer between institutions
	Information transfer points or sign-over
	Referral process or triage intake
	Coordination of care intra- and interprofessional
	Complex care or coordination
Transfer points	Transfer between institutions
	Coordination of setting
	Information transfer
	Referral processes
	Discharge processes
Outcomes	
Resource utilization	Economic outcomes
	Technical product
	Photo or video documentation
	Duplication of tests
Patient satisfaction	Quality of life
	Patient expectations
	Quality of recovery
Adherence to guidelines	Appropriateness of care
	Resection rates
	Appropriate patient selection
	Discharge criteria
Process outcomes	Wait times
	Economic outcomes
	Length of stay
	Clinical effectiveness
	Operative outcomes
	Time to care
	Variation in follow-up
	Quality indicators—for example, surgical site infection, urinary tract infection rates, and so on
Collaboration, communication, documentation	Multidisciplinary care
	Communication
	Clinical effectiveness
	Structured operative checklist
	Structured clinical notes
	Structured reports, operative and nonoperative
Cancer-related health outcomes	Morbidity
	Mortality
	Recurrence rates
	Margins
	Rates of non-resectability
	Resection rates
Technical quality of surgery	Pathology analysis of specimen margins
	Rates of non-resectability
	Technical assessment of specimen quality
Tools	
Clinical pathways and related tools	Clinical pathways, care maps, or ERAS
	Standardized order sets
	Coordination of care
	Disease management protocol
Other communication tools	Electronic sign-over
	Surgical time-outs
	Synoptic OR reports
	Information technology (IT)
	Structured summary reports
	Structured communication tools
	Performance management
	Information management
	Team building or crew management
Patient safety tools	Site marking
	Surgical site marking
	Electronic or automated reminders
Checklists	Revised WHO surgical checklist
	Intraoperative checklist
	Outpatient checklist
Electronic IT	Automated or electronic reminders
	Standardized electronic orders

OR = operating room; ERAS = enhanced recovery after surgery; WHO = World Health Organization.

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TABLE III Expert-panel-preferred priority research areas for quality improvement in gastrointestinal cancer surgery (n = 21)

Research area	*Preferred by*	
	*(*n*)*	*(%)*
Tools		
Clinical pathways and related tools	20	95
Electronic information technology	15	71
Patient safety tools	12	57
Other communication tools	10	48
Checklists	6	29
Settings		
Preoperative care or evaluation	16	76
Multidisciplinary care	13	62
Intraoperative care	11	52
Outpatient care or evaluation	10	48
Inpatient care or evaluation	9	43
Transfer points	4	19
Outcomes		
Cancer-related health outcomes	18	86
Process outcomes	12	57
Technical quality of surgery	11	52
Adherence to guidelines	7	33
Patient satisfaction	6	29
Collaboration, communication, documentation	6	29
Resource utilization	3	14

2.3 Qualitative Themes

The primary domains of interest emerging from the qualitative analysis were barriers to and enablers of QI tool implementation and themes related to potential outcome measures. Participants endorsed the use of SPITS as a QI strategy to address outcomes, including the need to standardize care within and between institutions, to improve resource utilization, to demonstrate appropriateness of patient care, to improve communication within multidisciplinary teams, and to improve immediate postoperative and long-term patient-centred outcomes.

Barriers to the implementation of SPITS included the mandatory use of a surgical checklist in all Canadian hospitals (resistance to the tool might impede the introduction of new tools); variability of resource utilization from one institution to another, which makes it difficult to design multi-institutional QI tools, resources, or infrastructure to support SPITS; the perception of losing decision-making autonomy; and poor or inconsistent messages about outcome goals to stakeholders. Identified enablers of implementation included recognition of the need to design tools that are sustainable and meaningful to staff and institutions, use of evidence-based recommendations to support a processes-of-care QI initiative, ongoing provision of feedback for patient outcomes, recognition of the need for improved communication and multidisciplinary teamwork, and engagement of physicians and institutions in QI strategies and outcomes (Table IV).

3. DISCUSSION

Improving the quality of care is an important mandate of health care. Tools that change the processes of care have the potential to positively affect clinical outcomes, but the uptake of those tools into routine clinical use has been poor. In this project, we assembled an expert panel to identify gaps in current knowledge that are relevant to stakeholders involved in the care of patients with GI cancer. Our expert panel endorsed SPITS as a strategy for QI and identified high-priority areas to target with QI initiatives. The development of clinical pathway tools and electronic information technology tools for the multidisciplinary, preoperative, or intraoperative settings are reported as the principal areas that could benefit from process change. Clinical outcomes, including cancer-related outcomes, were rated the most important; processes of care outcomes were also ranked highly.

Our research group is interested in developing SPITS for use in GI surgery in Canada. By seeking input from stakeholders at the beginning of the research process, we have entered a knowledge-to-action cycle that we anticipate will lead to SPITS that are relevant and sustainable in the Canadian health care environment. Further, by developing tools that address current and relevant clinical gaps in knowledge, we anticipate that uptake of SPITS will be facilitated.

The panel rated clinical pathways and related tools—multidisciplinary care maps, fast-track protocols, and enhanced recovery pathways—as the priority SPIT for development. These process improvement tools have gained popularity in many different surgical settings[24–27]. Most have been developed and implemented at an institutional level[24]. Very few multi-institutional clinical pathways have been reported, and few clinical pathways have the best evidence to support their use[24,27,28,b]. However, few controlled trials have been undertaken, and most clinical pathways have been developed without the explicit incorporation of best practices or evidence-based guidelines into the clinical pathway content. Thus, one potential avenue for future research is the development of clinical pathways in GI cancer surgery that standardize care between institutions or build best evidence into the tool content.

[b] Wei A, Urbach D, Devitt K, *et al.* Improving quality through process change: a scoping review of process improvement tools in cancer surgery. Unpublished manuscript (under review by *BMC Surgery*), 2013.

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TABLE IV Qualitative themes from expert panel workshop for top research areas

Theme	*Implementation of quality improvement (QI) tool*		*Outcomes*
	Barriers	*Enablers*	
Clinical pathways and related tools	Presence of current surgical checklist tools may impede implementation of new tools	Design tools to be sustainable and meaningful to staff and institutions	Standardized care processes across and within institutions
	Variation of resource utilization makes it difficult to design multi-institutional QI tools	Present evidence-based recommendations to support processes of care	Efficient and standardized utilization of resources
Preoperative care or evaluation	Lack of access to resources or infrastructure, or both	Provide ongoing feedback for patient outcomes	Appropriate patient care decision-making
	Perception of losing decision-making autonomy	Recognize need for improved communication and multidisciplinary teamwork	Improved communication between multidisciplinary teams
Cancer-related health outcomes	Poor or inconsistent messages of outcome goals	Engage physicians and institutions in QI strategies and outcomes	Postoperative and patient-centred

The ranked settings were those in which process improvement interventions would be helpful. They included the preoperative evaluation period (for example, referral and access-to-care processes, diagnostic testing period, and pre-surgical assessments) intraoperative processes, and multidisciplinary cancer care. The preoperative evaluation and multidisciplinary settings are both primarily outpatient settings, and very little work in process change has been undertaken in those areas. Even more striking, the intraoperative setting is of particular interest because almost no physician-level QI has been undertaken to structure or standardize the surgical maneuvers performed—or even the commonly performed procedures.

Cancer-related health outcomes—such as margin positivity rates, rates of surgical resection, mortality, and cancer-related recurrence rates—were identified as outcomes of interest. Some of those outcomes, cancer-related survival in particular, might be difficult to measure because of the long interval before the outcome occurs. As a result, many QI initiatives to date have focused on intermediate process-related outcomes. Interestingly, some of the more "technical" outcomes of surgery, including margin positivity rates and resection rates, are directly related to the quality of the surgical technique and reflect meaningful cancer-related process outcomes. We recommend that future research be directed at developing these intermediate outcomes as measures of quality.

Interestingly, resource-related outcomes such as wait times and resource utilization were rated as low priority. That rating might have been a consequence of the experts mostly being end users rather than policymakers. The qualitative analysis made it clear that many participants felt that resource-related outcomes should not be used as a measure of health care quality.

In addition to ranking of priorities, several barriers and enablers to implementation of a SPITS QI intervention were identified. We recognize that barriers present a challenge to successful implementation of any QI strategy. A structured implementation strategy that minimizes identified barriers is required, and the results of the present study should be used a framework to that end. Because many of the barriers are not specific to the operative setting, similar barriers and enablers are likely to be present in other clinical settings in Canada, and our results might be generalizable to these settings.

This study has several limitations. We acknowledge that a single workshop is inadequate to fully understand SPITS. Our study is the first in Canada to assemble a surgical group to explore this concept. The goal of our expert panel was to survey interest in the area and to establish priorities that will be further evaluated. We used a purposive sampling strategy to identify a 22-member participant group representative of diverse stakeholders. We deliberately kept the panel small to promote interactive deliberation between the experts. As a consequence, some stakeholder groups were absent, and their opinions might not be reflected in our findings. However, many of the participants are influential national opinion leaders and, in their varied roles, represented multiple stakeholder groups simultaneously (for example, general surgery and administration). Thus, it is likely that the priority areas identified represent most of the opinions available; however, we recognize that further engagement with additional stakeholders is necessary. We view the results of this study as a first step in a larger research program, and we anticipate that, with further engagement, the identified priorities will likely change over time. As a follow-up to the expert panel, we have engaged with the Canadian

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HepatoPancreaticoBiliary Community of Surgical Oncologists: Clinical, Evaluative, and Prospective Trials Team with a SPITS trial proposal: an "enhanced recovery after surgery" tool for pancreatectomy. That group has endorsed our SPIT as the highest ranked trial for development.

4. NEXT STEPS

Importantly, the expert panel verified that QI interventions should focus on process improvement. They confirmed that SPITS are useful interventions for reaching that goal and have established key SPITS, settings, and outcomes that are important for Canadian stakeholders. We will use the expert panel recommendations to guide the design and development of QI tools in GI cancer surgery.

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6. CONFLICT OF INTEREST DISCLOSURES

The authors declare that they have no competing interests.

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