Factors related to the implementation and use of an innovation in cancer surgery

R. Urquhart MSc,[*†] *J. Sargeant PhD,*[‡§] *and G.A. Porter MD MSc*[*||#]

ABSTRACT

Objective

Nationally, efforts to implement an innovation in cancer surgery—a Web-based synoptic reporting tool—are ongoing in five provinces. The objective of the present study was to identify the key multilevel factors influencing implementation and early use of this innovation for breast and colorectal cancer surgery at two academic hospitals in Halifax, Nova Scotia.

Methods

We used case-study methodology to examine the implementation of surgical synoptic reporting. Methods included semi-structured interviews with key informants (surgeons, implementation team members, and report end users; $n = 9$), nonparticipant observation, and document analysis. A thematic analysis was conducted separately for each method, followed by explanation-building to integrate the evidence and to identify the key multilevel factors influencing implementation. An audit was performed to determine use.

Results

Key factors influencing implementation were these:

- Innovation–values fit
- Flexibility with the innovation and implementation
- The innovation is not flawless
- Strengthening the climate for implementation
- Resource needs and availability
- Partner engagement
- Surgeon champions and involvement

In a 6-month period after implementation, 91.2% and 58.0% respectively of eligible breast and colorectal cancer surgeries were reported using the new tool.

Conclusions

An improved understanding of the multilevel factors influencing the implementation of innovations is critical to planning effective change interventions in health care. Further study is needed to explore differences in the use of the innovation between breast and colorectal cancer surgeons. Findings will inform the study of additional cases of synoptic reporting implementation, enabling cross-case analyses and identification of higher-level themes that may be applied in similar settings or contexts.

KEY WORDS

Implementation, synoptic reporting, cancer, surgery

1. BACKGROUND

The operative report records details of a surgical procedure and findings, and thus documents information that is important to subsequent patient care and management. The traditional method of reporting findings from surgery is the narrative report, involving a descriptive free-text account of the procedure, suspected or confirmed findings, and proposed treatment. Although report dictation is an important practice, a survey of academic general surgeons found that only 18% of general surgery programs provide training in this skill [1]. As medicine becomes increasingly multidisciplinary and technology-supported, several issues related to narrative reporting provide an impetus to change reporting mechanisms.

First, for patients with cancer, a clear and thorough record of the surgical procedure and findings supports accurate diagnosis and staging, and therefore facilitates improved estimates of prognosis and postoperative treatment planning. The completion of a cancer operation is a unique point in time at which the surgeon has not only specific knowledge of the technical details of the procedure, but also detailed knowledge of important presentation, diagnostic, staging, and presurgical care

elements of the patient's cancer journey. However, narrative reports inadequately and inconsistently provide the information required to understand the disease and to make informed patient care decisions [2,3].

Second, much literature demonstrates that the quality of the surgical procedure is linked to outcomes for patients with cancer [4]. Surgical volume and surgeon training and specialization are associated with improved outcomes, but an understanding of the relationship between the surgical procedure and patient outcome could be improved substantially with data on actual intraoperative processes. Yet, data on these processes are (in most jurisdictions) lacking, given that dictated reports do not consistently contain the data items of interest and do not permit efficient data capture or collection because chart reviews are required to gather the information. However, high-quality data on surgical processes are essential for optimal outcomes analyses and subsequent efforts to improve outcomes [5].

One solution to both issues—completeness of operative reports and availability of data on actual surgical processes—is to replace narrative reporting with electronic synoptic reporting. A synoptic report captures data items in a structured format and contains information critical for understanding the disease and the subsequent effects on patient care. Use of synoptic reporting has been shown to improve completeness and timeliness of pathology and operative reports for a variety of malignancies [3,6–9] and can efficiently generate data from the perioperative period [10].

The synoptic report is a complex innovation (new tool or practice) in cancer care, requiring fundamental shifts in physician behavior and practice culture [11] and also changes in existing organizational processes and structures (for example, automated dictation systems, transcription procedures). Accordingly, successful implementation of synoptic reporting for cancer surgery requires surgeon engagement and adoption, and organizational support (for example, provision of infrastructure, workflow changes). Because knowledge translation researchers have focused largely on improving the uptake of evidence in individual clinicians [12], only limited guidance on the multilevel (team, organization, system) factors affecting implementation processes in health care organizations is available [13].

The objective of the present study was to identify the key multilevel factors influencing implementation and early use of a Web-based synoptic reporting tool for breast and colorectal cancer surgeries at two hospitals in Halifax, Nova Scotia. The implementation was part of a national initiative occurring in five provinces across Canada.

2. IMPLEMENTATION

2.1 Innovation

The surgical synoptic reporting tool implemented in Nova Scotia was the Web-based Surgical Medical Record (WebSMR) originally developed in Alberta (by Alberta Health Services and Softworks Group Inc., Edmonton, AB) [10] and adapted locally for this implementation. In WebSMR, information related to patient presentation (for example, symptomatology, diagnostic procedures), preoperative period (for example, investigations, use of preoperative safety checklist, neoadjuvant treatment), operative procedure (for example, technical details, intraoperative decision-making), and follow-up planning is divided into discrete fields, many of which are based on practice guidelines. Data are entered using drop-down menus, option buttons, and check boxes. Software characteristics include prefilled demographics, branching logic, smart navigation, and automated clinical staging calculations. Some sections contain text boxes to document additional information not captured in the individual fields. All details considered essential to the operative report are mandatory. Upon reviewing and submitting the report, an electronic signature is added, and the final synoptic operative report, presented in a checklist format, is ready for immediate placement in the patient's chart, with transcription and subsequent surgeon review and sign-off no longer required. The final report is also automatically faxed to all involved in the patient's care—for example, the referring physician, surgeon's office, cancer centre, and family physician.

2.2 Initiative

In an attempt to capitalize on Alberta's synoptic reporting experiences [3,6,10], the Canadian Partnership Against Cancer funded a pan-Canadian pilot project to implement WebSMR for 4 disease sites (breast, colorectal, ovarian, head-and-neck) in five provinces (Alberta, Manitoba, Ontario, Quebec, Nova Scotia). The Nova Scotia project included breast and colorectal surgeries performed at two academic hospitals, which serve a population of approximately 400,000.

Implementation occurred over a 2.5-year time period and included establishment of national data standards for the two disease sites, interprovincial adaptation of the Alberta templates (data fields could be modified or added, but the national elements remained), integration of the WebSMR software into the complex provincial information technology (IT) environment, and development of knowledge translation and change management strategies to engage the relevant clinical and administrative communities. The provincial implementation team consisted of the project lead (surgical oncologist), a project coordinator, and an IT lead (part-time, hired October 2009).

Surgeon adoption of WebSMR was voluntary, but for the pilot project, the implementation team selected two diseases (breast and colorectal cancer) to whose

treatment a defined number of surgeons (4 breast, 3 colorectal) was dedicated. These 7 surgeons were approached for inclusion in the pilot project, and all agreed to participate. The implementation team hoped these surgeons would be "early adopters" and thus would lead the way for others as the project expanded. WebSMR was subsequently implemented in June 2011 at one community hospital; implementation of a head-and-neck cancer surgery template is ongoing.

The knowledge translation and change management strategy involved inviting the lead of the Alberta initiative to visit Nova Scotia on two occasions to introduce the concept to surgeons (including presentations at general surgery rounds, oncology rounds, and a surgical oncology refresher course); a full-day "kick-off" meeting to bring together people from the Alberta initiative with representatives from each of the key provincial partners (for example, hospitals, provincial health IT services, cancer agency); small group sessions and one-on-one meetings with key partners to discuss the project and gather support; and customized training sessions (small group and one-on-one) for surgeons and administrative end users of the report (for example, health records personnel, coders). Moreover, the implementation team established three working groups (IT, information management and quality, and privacy) early in the project to discuss the impact the innovation would have on the Nova Scotia environment and to discuss issues related to its implementation. Members of these working groups included representatives from the clinical, research, and administrative communities (health records, coding and classification services, IT, and cancer registry, among others).

2.3 Evaluation

Case-study methodology [14] was used to study the implementation of WebSMR in Nova Scotia. Three existing frameworks informed development of the study, including choice of methods and analytic techniques:

- Promoting Action on Research Implementation in Health Services framework [12]
- Framework for change in health service organizations [15]
- Organizational framework of innovation implementation [13]

These frameworks were selected based on our knowledge of the empirical and theoretical literature on research or innovation implementation and because of our interest in the multilevel factors affecting the implementation processes. Taken together, these frameworks present a range of multilevel influences on implementation and practice change. Our study was approved by the relevant institutional research ethics boards.

Data were collected using interviews, nonparticipant observation, document analysis, and a WebSMR audit. Semi-structured interviews [16] were conducted with key informants to gain an overall view of the implementation and in-depth perspectives on the experiences of the team members and the users with the implementation. Participants were asked to describe and discuss their views on the innovation, their role in the implementation or project, their experiences throughout implementation, and any specific barriers to or facilitators of implementation and use.

Nonparticipant observation [16] was used to examine the training sessions and initial surgeon reactions to viewing and using the tool. This observation provided the opportunity to collect descriptive and reflective data on the perspectives and concerns of the surgeons related to the tool, how the data would be used (for example, performance feedback or reporting), and any barriers the surgeons perceived at the time of training. Documentary records were reviewed to gain a historical perspective on the initiative (for example, Why and how did the initiative begin? Who were the specific people or partners involved?) and to corroborate and augment evidence from the interviews and observations [14]. Where documentary evidence conflicted with findings from other sources, we attempted to resolve the contradictions through further inquiry (for example, follow-up with interviewees, contact with the national project team). Audits of WebSMR and the operating room scheduling systems at the various institutions were used to determine the proportions of surgeons trained on WebSMR who subsequently used the tool, and the proportions of eligible surgeries reported using WebSMR during the 6-month period from November 1, 2010, to April 30, 2011. (All surgeons were trained by end October 2010.)

All interviews were tape-recorded and transcribed verbatim. Interviews, field notes from the observation sessions, and documents were analyzed using the thematic analysis approach presented by Braun and Clarke [17], which involves coding the data and then collating the codes with the aim of generating, reviewing, and refining themes. This approach entails searching across the entire dataset to find "repeated patterns of meaning"; the resulting themes must be present throughout the dataset, not just in a single data item—that is, data from a single interview, even if highlighting an important concept or issue, would not be included in the final analysis.

We first conducted separate thematic analyses for each method; we then used cross-method analysis of themes to compare, contrast, and synthesize findings. Next, we used the analytic technique of explanation-building [14] to coalesce and integrate the evidence, to develop a deeper understanding of the implementation process and of the multilevel factors that influenced implementation and use, and to link the data to theory and to the broader literature.

3. FINDINGS

WebSMR went "live" July 2010. Surgeons were trained and registered on the system in an incremental manner, providing a test period during which any technical difficulties or other user issues could be worked through and resolved before the system was expanded to other surgeons. Table I summarizes the implementation milestones.

The 9 key informants interviewed included 2 surgeons, 3 implementation team members, 2 managers of relevant organizational departments, and 2 report end users (1 clinician report user, 1 coder). Six training sessions were observed, and numerous documents (for example, the project plan, lessons learned, and national project scope and evaluation) were retrieved from the provincial and national project teams. From these evidence sources, 7 themes were identified: 5 appeared in all three sources, and 2 were present only in the interviews and documents (Tables II and III). This finding was anticipated, because the purpose and "richness" of each method varied.

TABLE I Timelines and key milestones of the surgical synoptic reporting tool implementation in Nova Scotia

Timeline	*Milestone*
Apr–May 2008	Kick-off meeting for project, with Alberta surgical synoptic reporting team and Nova Scotia partners
	National meeting in Montreal, QC, with key decision-makers from participating provinces
May–Nov 2008	Development of project plan
	Engagement of partners through small-group meetings
	Establishment of 3 working groups [information technology (IT), quality/information management, privacy]
Feb–Dec 2009	IT "gap" analysis with visiting software vendor
	Funding delays
	Completion of privacy impact assessment and threat risk assessment
	Formal request for funding proposals to conduct the IT work identified by the gap analysis
	Hiring of part-time IT lead (October)
	Work to integrate provincial IT systems starts by end of year
Jan–Jun 2010	Continuation of IT integration work
	Intensive change-management focus as project nears "go-live" date
Jul–Aug 2010	System goes "live" (July)
	Training and initiation of a small number of surgeons
	Testing period and resolution of identified issues
Sep–Dec 2010	Training of all surgeons, initial adoption, and use
	Consensus on national data standards for surgical reporting[a]

[a] Adaptation or customization of disease site templates and work toward establishment of national data standards occurred throughout the first 2 years of the project.

3.1 Innovation–Values Fit

The innovation aligned with the values, interests, and strategic directions of the relevant partners in the province (surgeons and clinicians, organizational departments, and the cancer agency, among others). The values related to the clinical utility of synoptic reporting (for example, educational tool for residents and community surgeons, enhanced communication with oncologists, improved patient care) and to the broader benefits of improved data capture and quality monitoring and improvement. The promise of standardized data capture was a key facilitator to partner buy-in and subsequent WebSMR implementation. Many interviewees felt that synoptic reporting was another step toward improved performance monitoring and reporting.

3.2 Flexibility with the Innovation and Implementation

The implementation team demonstrated a high degree of flexibility throughout the planning and implementation processes. With respect to the innovation, the team recognized that the environment in Nova Scotia differed from that in other provinces, and they aligned the innovation's attributes to the local context. This alignment included integration of the WebSMR application with existing IT systems ("IT integration"), adaptation of the templates to local practice, and modifications to the amendment process and the final amended report.

The IT integration was a challenging task, but crucial to the functioning of the system and to buy-in from stakeholders. For example, integration permits the final report to be automatically sent to the patient's chart (electronic or paper) upon submission. Moreover, the team demonstrated flexibility and responsiveness during the implementation, and a capability to adapt and customize implementation policies and practices (for example, user training, support) to meet partner needs.

3.3 The Innovation Is Not Flawless

All interviewees discussed specific elements of the system or the report, or both, that created uncertainty or frustration (technical difficulties, relevance of

TABLE II Seven themes, with representative quotations from the interview data

Theme	*Representative interview data*
Innovation–values fit: synoptic reporting aligns with values, goals, interests, and strategic directions	
	"My preconceived notion [was that] it would be beneficial to those taking care of the patients and ultimately [to] the patients." (Surgeon 1)
	"I think for [many partners], they see the value of synoptic because it is a standardized format, everything is electronic ... being able to pull out and monitor progress and monitor the data, that was a big piece. Quality is a big piece of it, and that all fits within what they are doing now." (Team member 1)
Flexibility with the innovation and implementation	
	"I thought that, from a coding perspective, they were receptive to anything that we had to say, and we certainly had lots of one-on-ones with [the project lead] and said 'This is the challenge. This is what we think is missing. This is what we need to be clear on in terms of breast conservation versus mastectomy. This is how we code.' ... [The team was] more than receptive to take our concerns, our input, and then [to] offer solutions or feedback." (Manager 1)
	"When we thought things were [close to going live,] we pulled together the partners at each of the sites, [and] so we held meetings ... basically identifying, okay, what are their needs? ... What do they need from us to roll it out?" (Team member 1)
	"They were flexible. They were open to our questions and suggestions, concerns." (Manager 2)
The innovation is not flawless; it will require continual review and revisions	
	"One of the things I would like to see is, when we have the final printed report, that any field that has not had it entered, have that eliminated so that it won't be 7 or 8 pages long, it will be just 2 or 3 pages and that would crisp it up so nicely." (Surgeon 1)
	"For particularly complex cases, [WebSMR] bugs me because I can't describe that complex finding." (Surgeon 2)
Strengthening the implementation climate	
	"[In meetings with partners,] we went through what ... we had to do.... What are users that need to be trained in the end, and how do I train them. So, for example, some of them were one-on-one sessions, some of them were small group sessions.... The three different districts had different needs, and so it was just tailored to what they wanted." (Team member 1)
	"Before we engaged in the training, ... I was very cognizant that I didn't want to keep going and saying 'Okay, we are going to be on,' then 'We are going to be on,' then 'We are going to be on,' [and] so we in fact, with the exception of myself, we never ... told somebody they are going to be online and didn't have that. So, although it took a fair long time. ... there was never ... a date given and then [someone] saying 'Okay, it is not going to be this; it is going to be 2 months from now.' And, similarly, we made sure that the training occurred very close to when they were going to start." (Team member 3)
Resource needs and availability for implementation	
	"[Meeting the needs of our partners] required extra interfaces, and it required interfaces that had to be built that were outside of the actual scope, but were still required. And so there was a lot of fighting with that, you know, to get that and [to get] an IT resource." (Team member 1)
	"I think that ... what is purported as the advantage of this is also the problem: The advantage being that this is grassroots, that it is being driven by the surgeon. Unfortunately, I think ... there [are] not a whole lot of things that will work this way, and you know, there [are] only so many hours in the day." (Team member 3)
Partner engagement: early and ongoing contact with partners was key to implementation[a]	
	"We ... received an invite to attend a meeting to discuss the project.... We received some education at [that meeting] about what the project entailed, and we were all asked at that time about what our experience was, or what ... we bring to the table in terms of how it was relevant, and how we would support then the implementation of it." (Manager 1)
	"I think the fact that we listened to, met the requirements of what our partners said—that was probably a huge thing of why they were so helpful to us.... Without that engagement, nothing would have happened at all." (Team member 1)
Surgeon champions and involvement[a]	
	"You need a clinician who can give ... time, who can champion ... and [who] gets compensated accordingly." (Team member 1)
	"[Leading this project] is a ridiculous amount of time.... But at the same time, ... there needs to be a clinical context and ... somebody with a more clinical background." (Team member 3)

[a] Theme present in the interview and documentary data only (not observation data).

TABLE III Findings from non-participant observation and documentary evidence

Evidence type	*Findings by theme*
Nonparticipant observation (*n*=6)	
	Innovation–values fit: synoptic reporting aligns with values, goals, interests, and strategic directions
	Surgeons indicated willingness to use innovation; most stated that they saw value in new tool, but the key was to make the system as easy to use as existing practice
	Most surgeons expressed interest in standardized data capture and the implications for performance monitoring and research; some questioned who "owned" the data; others expressed skepticism related to promises from other initiatives of similar capabilities that had not yet materialized
	Flexibility with the innovation and implementation
	Training sessions were customized to meet the particular surgeon's or department's needs: some sessions were one-on-one, others were small-group; all occurred on the surgeon's "turf"
	The innovation is not flawless; it will require continual review and revisions
	All surgeons had some questions related to specific data elements and their relevance to the operative report; most also suggested at least 1 or 2 elements that they felt should be in the template
	Strengthening the implementation climate
	Trainers were responsive to surgeons' questions and requests regarding the templates or its elements, minimizing initial issues and concerns
	The information technology (IT) lead joined all training sessions, either in person or by teleconference; his presence was helpful in addressing technical issues and concerns
	Small-group training appeared to work well in terms of contributing a clinical perspective, because training was conducted by nonclinical trainers—for example, initial skepticism concerning particular elements could be talked through with colleagues and (sometimes) resolved
	Resource needs and availability for implementation
	Ongoing 24/7 technical support will be required during WebSMR rollout to minimize technology-related challenges
	Additional tools and resources are needed to realize the potential of this system in terms of data mining and performance monitoring and feedback
Documentary evidence	
	Innovation–values fit: synoptic reporting aligns with values, goals, interests, and strategic directions
	The national evaluation found that surgeons using the innovation believe that synoptic reporting better prepared them for surgery and that the tool will revolutionize data capture and lead to improved quality of care and patient outcomes
	The main facilitator to adoption was the prospect of outcomes reporting and data mining; yet, one of the main project challenges was the lack of tools and resources for measuring and reporting outcomes
	Flexibility with the innovation and implementation
	Each province's template was customized for local implementation—a step that was crucial for local buy-in and adoption
	Accepting that each jurisdiction was unique and customizing the tool and training to that jurisdiction was critical to the implementation and will remain so with further rollout
	The innovation is not flawless; it will require continual review and revisions
	Barriers to adoption and use were largely related to the innovation itself and included ease of access and use, IT-related challenges (forgotten passwords, login difficulties), complex cases, and complexity or length of the tool
	Strengthening the implementation climate
	Change management strategies occurred broadly (not just with surgeons) and was tailored depending on user needs and preferences
	All provinces emphasized that training should not be underestimated; the more training, the better the implementation experience
	Facilitators to adoption and use included customization of the final report for end users and system access improvements (for example, putting laptops in operating theatres)
	Resource needs and availability for implementation
	Nationally, a key success factor to WebSMR deployment was having key expert (IT) resources
	The Nova Scotia team perceived that the project was underfunded from both the IT and the project (clinical) lead perspectives; the project lead diverted funds from his stipend to support the necessary IT work for the project's implementation
	Partner engagement: early and ongoing contact with partners was key to implementation
	The early engagement of partners, especially surgeons, was viewed as a critical success factor for implementation
	At all pilot sites, implementation required engagement with many different stakeholders
	The innovation's limits and abilities should be defined from IT, information management, and privacy perspectives, and not just surgeon perspectives
	Surgeon champions and involvement
	Surgeon involvement and leadership was a critical factor for success; included were surgeon enthusiasm and a willingness to work together on a national scale to create pan-Canadian data standards and templates

data elements, length of final report, and amendment process, among others); they expected that many of these issues would be resolved through a process of feedback and revision. Barriers and facilitators were perceived to be largely related to the innovation itself (for example, IT challenges, utility for complex cases, customization of templates).

Similarly, the innovation itself is not static. Because scientific evidence and practice guidelines change, the templates will require ongoing review and revision. Currently, the review process is planned to occur every 6 months for each of the templates; national and provincial processes are both in place to support that schedule.

3.4 Strengthening the Implementation Climate

The team worked to improve the implementation climate by increasing the skill level for innovation use (for example, customized training for surgeons and for administrative end users, coding and review of test scenarios), by providing incentives for use (for example, continuing medical education credits for surgeons), and by removing obstacles to use (for example, ongoing 24/7 telephone support for surgeons, in-person support on the first day of use, the purchase of more computers for the operating theatres). Change management strategies commenced early in the planning process, involved a broad range of partners, and were tailored depending on needs and preferences. Importantly, engaged partners also helped to enhance the implementation climate by promoting the initiative with colleagues and by having staff members attend meetings with the implementation team to increase their awareness and understanding of the initiative.

3.5 Resource Needs and Availability for Implementation

A number of resources were needed to implement WebSMR, including specific human resources (IT and clinical expertise) and additional IT infrastructure to integrate the tool with existing IT systems. Documentary evidence revealed that the team perceived the project to be underfunded from the IT and clinical perspectives. Nonetheless, the project lead secured the resources required to complete the work—in part, by diverting funds from the project lead's stipend to support the necessary IT work for the project's implementation. Team members did not necessarily perceive funding as the main threat to sustainability.

3.6 Partner Engagement

Early and ongoing contact with partners was viewed as a critical facilitator to implementation. The implementation team used various methods to engage partners throughout the duration of the project (for example, large- and small-group meetings, working groups, e-mail communication, peer contact). Discussions with partners began even before the project was formalized, which was helpful for gaining buy-in.

3.7 Surgeon Champions and Involvement

A surgeon is needed to champion the innovation to colleagues and to provide the clinical expertise to support a credible implementation process. This need appeared particularly pertinent in terms of garnering support from surgeons. The time investment required to champion, and the need to be compensated accordingly, was also highlighted.

The audit revealed that all surgeons who were trained (4 breast, 3 colorectal) used WebSMR in the ensuing 6 months. Between November 2010 and April 2011, 91.2% of eligible breast surgeries and 58.0% of eligible colorectal cancer surgeries were reported using WebSMR.

4. DISCUSSION

The present study sought to identify the multilevel factors influencing implementation and early use of an innovation in surgical oncology practice. The factors identified demonstrate the complexity of implementation processes. We found that surgeon users believed in the utility of the innovation and that the innovation "fit" with individual values and interests, but that the successful implementation and early use of the innovation was affected by many factors external to the individual user. Factors such as alignment with professional group and organizational values, flexibility during implementation, partner engagement, resource needs and availability, surgeon champions, and implementation climate all relate to the work of the implementation team and of the organization itself and the larger system in which it operates. All of those factors were important for initial buy-in and subsequent implementation. People planning for, introducing, and leading change must therefore consider and act upon a broad range of inhibiting and facilitating factors in their attempts to embed a new practice into normal work routines.

Our findings are consistent with the literature on innovation implementation in health care. Research has demonstrated the importance of champions [13,18,19] and of leadership and management support [12,13,15] to the success or failure of implementation efforts. In the present study, leadership was closely tied to many of the factors identified, including attainment of the necessary resources and funding to implement the innovation and establishment of a supportive implementation climate. Moreover, Kitson [20] suggested that innovation in health care is most effective when it involves key stakeholders, particularly as it relates to control of immediate physical resources,

the immediate context, and the external environment. Early and ongoing involvement of partners and the willingness and capacity of the implementation team to adapt the innovation to meet partner needs and expectations were especially germane to the successful implementation of WebSMR within the provincial health infrastructure. In fact, one of the biggest "lessons learned" was that each jurisdiction involved in the national pilot project was unique and, therefore, that there was "no one way" to implement WebSMR. Health IT infrastructure, for example, is quite different across provinces. Thus, tools and technologies implemented in one jurisdiction may require significant modification and customization if they are to be successfully implemented in other jurisdictions. Understanding this reality and planning appropriately (for example, allocating funds, acquiring expertise) is critical to supporting further roll-out of surgical synoptic reporting. For example, a greater appreciation of the extent and specifics of the IT resources required for WebSMR implementation early on would have allowed the team to navigate the IT challenges in a more timely fashion, speeding up implementation and reducing frustrations for both the implementation team and others involved in the project. In addition, although clinical leadership regarding specific aspects of the project (for example, template content) was definable, an underappreciated and unfunded amount of more general clinical leadership ("flag-waving") was also required to push through many of the challenges during implementation.

As others have demonstrated, a strong implementation climate does not guarantee innovation use [21]. In the present study, we observed differences in WebSMR use between breast and colorectal cancer surgeons. Our evidence indicates that barriers to use are related mainly to aspects of the innovation itself, including technology issues, access to computers, and uncertainty about specific data fields. Those barriers raise two salient points:

- Use of the innovation must be as easy as what users currently do.
- Early users of the innovation must not only believe in its value, but be willing to use the system despite the inefficiencies and uncertainties encountered during implementation.

The barriers were largely similar for both groups of surgeons, and thus other factors may be affecting WebSMR use. During WebSMR implementation and training, colorectal cancer surgeons demonstrated interest in the capabilities related to standardized data capture (performance feedback, for instance), and yet their experiences with other projects in the province, which had promised similar capabilities but had failed to meet expectations, led to scepticism about this one (see observation data in Table III). Additional factors include a greater number of (real or perceived) technical details in colorectal procedures; organizational characteristics ("culture"), given that the breast and colorectal cancer surgeries are largely performed at two different institutions; and the socio-historical context of advocacy and improvement within the breast cancer community in Canada [22]. These factors require further study and suggest that, to plan and intervene appropriately, leaders must understand the multiple contextual issues that help create the prevailing implementation climate.

One limitation of our study is the small number of participants interviewed, including only 2 surgeons (1 breast, 1 colorectal). Thus, it is possible that the sample is not representative of the people involved in the project, particularly the surgeons who are the key participants interacting with the innovation. Nonetheless, the 6 observation sessions also permitted data collection on the attitudes and perspectives of surgeons about using the synoptic reporting tool, with many of the same issues and perspectives arising in both evidence sources and being repeated across surgeons. Furthermore, given the pilot nature of much of the work to date, we are unable to examine factors affecting the sustainability of this innovation in practice. Indeed, initial implementation success does not predict institutionalization [23]; many evidence-based practices have proved difficult to sustain beyond the initial pilot or implementation period [24]. In the present study, the promise of improved monitoring and reporting on surgical processes and outcomes facilitated the adoption and implementation of WebSMR. To demonstrate the value of the innovation, that capability must be realized in the short term if its use among colorectal cancer surgeons is to increase and if its institutionalization and expansion to other hospitals and disease sites is to be supported.

An improved understanding of the multilevel factors influencing the implementation and use of innovations is critical to planning and targeting effective change interventions in health care settings [25]. Not only do multiple factors, at multiple levels, influence the implementation of innovations, but the complexity of the relationships between those factors requires thoughtful and rigorous study. Our findings will inform the study of additional cases of synoptic reporting implementation, enabling cross-case analyses and identification of higher-level themes that may be applied in similar settings and contexts.

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6. CONFLICT OF INTEREST DISCLOSURES

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Correspondence to: Robin Urquhart, Cancer Outcomes Research Program, 1276 South Park Street, Room 804, Victoria Building, Halifax, Nova Scotia B3H 2Y9.
E-mail: urquhartr@cdha.nshealth.ca

* Cancer Outcomes Research Program, Cancer Care Nova Scotia, Halifax, NS.
† Interdisciplinary PhD Program, Dalhousie University, Halifax, NS.
‡ Division of Medical Education, Dalhousie University, Halifax, NS.
§ Continuing Medical Education, Dalhousie University, Halifax, NS.
‖ Department of Surgery, Dalhousie University, Halifax, NS.
QEII Health Sciences Centre, Halifax, NS.