Survival, reintervention and surveillance reports: long-term, centre-level evaluation and feedback of vascular interventions

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ABSTRACT
The combination of registry and administrative claims data have facilitated research and quality improvement efforts. Using Vascular Quality Initiative (VQI) registry data and Medicare claims we have generated centre-specific survival, reintervention and surveillance reports which benchmark participating centres’ performance to the VQI as a whole and to published guidelines. In 2021, we distributed these reports to 303 participating centres. These reports offer an opportunity for centres to evaluate their performance and identify focus areas for quality improvement work.

BACKGROUND
Resources such as registry data and administrative claims data offer insights that have been used to advance clinical knowledge and practice in many ways. The combination of registry data with detailed clinical information and administrative claims data with more complete long-term follow-up, provide valuable information that neither source could offer independently. We have previously demonstrated the usefulness of the combined data sources in facilitating the evaluation of long-term vascular device outcomes. We sought to leverage this data infrastructure to create the survival, reintervention and surveillance (SRS) reports, which provide centre-specific feedback on select vascular procedures and outcomes. More specifically, the feedback provided allows each centre to compare their performance to the VQI overall and examine compliance to published guidelines.

AIMS OF THE REPORT
This report aims to describe the development of the VQI SRS reports including:
► Registry information collection and application to centre-specific reports.
► SRS report contents and report usage.
► Possible report applications and future improvements.

GENERAL METHODS
VQI registry data collection
The VQI represents a multidisciplinary, multicentre effort to collect key information needed to evaluate the quality and safety of vascular surgery procedures. Data collected by the VQI includes: preoperative risk factors, intraoperative variables, postoperative outcomes and 1-year follow-up data for 13 major vascular procedures as outlined in table 1. Data are entered into a secure cloud-based platform called Pathways designed to collect and store the data. The VQI then aggregates the data and generates blinded (deidentified)
Our colleagues have shown that Medicare data are successfully linked. Among them 88%–94% (again, procedure dependent) are eligible for Medicare linkage, and among patients captured in the VQI, 72%–88% (procedure dependent) are viable for Medicare linkage. As long-term benefit is known in the literature, these parameters are included to allow benchmarking to other participating centres as well as to published outcomes and guidelines. Surgeries, surveillance failure and freedom from death (Figure 2). As long-term benefit is known in the literature, these parameters are included to allow benchmarking to other participating centres as well as to published outcomes and guidelines.14–18 Surveillance metrics were included given consensus recommendations for lifelong annual imaging and because late aneurysm rupture may be related to surveillance failure.14 19 20 EVAR SRS reports also include median AAA diameter, median age, per cent male and per cent urgent/emergent (Figure 2). These additional variables were included for centres to better interpret their performance relative to the rest of the VQI; for example, a centre with an above average
Vascular Quality Initiative Endovascular Abdominal Aortic Aneurysm Repair (EVAR) Survival, Reintervention, and Surveillance Report

This report presents the following three outcomes related to the quality of care provided to Medicare patients treated with EVAR:

A: Your center’s five-year freedom from reintervention rate compared to all other VQI centers.
B: Your center’s five-year survival rate compared to all other VQI centers.
C: Your center’s five-year freedom from imaging surveillance failure rate compared to all other VQI centers.

These data are derived from 2003-2016 VQI registry data matched to Medicare fee-for-service claims, and are made possible by the Vascular Implant and Interventionsal Outcomes Network (VISION), a partnership between the SVS PSO and MIDEpNet.

Center data are not shown for centers with fewer than 11 events due to CMS suppression requirements.


Figure 2 Sample SRS report on EVAR performance. EVAR, endovascular aneurysm repair; SRS, survival, reintervention and surveillance.

Figure 3 Sample of SRS metrics for elective AAA surgeries. AAA, abdominal aortic aneurysm; SRS, survival, reintervention and surveillance.

The asymptomatic elective AAA reports include data on: 5-year survival, percentage of procedures performed for aneurysms less than 5.5 cm for males (or less than 5 cm for females), per cent of EVAR procedures with imaging within 15 months, and percentage of repairs on patients ≥80 years (figure 3). These metrics were chosen to help evaluate centre-specific morbidity, mortality and adherence to treatment size and imaging guidelines.

SRS reports for carotid interventions (endarterectomy and stenting) similarly provide information on 5-year survival and per cent of patients over 80 years old. Additional metrics provided for carotid interventions include per cent of procedures performed for asymptomatic disease, and per cent of patients prescribed statins and antiplatelets at discharge. Similar to the above procedures, these metrics were also chosen to allow for comparison to other participating centres and to evaluate adherence to established standards in the management of carotid atherosclerotic disease.

SRS report dissemination and use patterns
In 2021, SRS reports were distributed to 303 participating centres. To gain a preliminary understanding of how these reports were used, we examined how frequently each centre accessed their most recent SRS report and studied
how this was related to other VQI quality measures, especially centre-level long-term patient follow-up rates and centre-level aneurysm sac diameter reporting. Sac diameter reporting rates were chosen to serve as crude indicators of registry input engagement, and administrative (non-technical) centre performance.

Among these 303 centres, 180 (59.4%) had at least one access to their report. Long-term follow-up rates across all report receiving centres ranged from 0% to 100% with a mean follow-up rate of 64%. In contrast to sac rate reporting, mean long-term follow-up rates were significantly higher in centres with at least one access compared with those with no access (69% vs 55%, p<0.0001). Sac diameter reporting rates across all report receiving centres ranged from 0% to 100%, with a mean sac diameter reporting rate of 54%. Mean sac diameter reporting rates were similar in centres with at least one SRS report access compared with centres with no access (57% vs 49%, p=0.07).

Figure 4 demonstrates the distribution of long-term follow-up rates, where the trend towards greater follow-up among report accessing centres can be seen. Scatterplot analyses of number of accesses vs sac diameter reporting rates and number of accesses versus long-term follow-up rates, however, did not reveal a linear relationship ($R^2=0.01$ and $R^2=0.04$, respectively). Distribution plotting
revealed a pattern towards higher long-term follow-up rates and sac reporting rates among centres in or above the 95th percentile (>5 accesses) for report access. However, among centres with no access, the inverse relationship between the number of report accesses and sac diameter reporting rate was not apparent with sac long-term follow-up rates and sac reporting rates being more widely and evenly distributed (figure 5).

**DISCUSSION**

Tracking patient outcomes and quality of care is a long-standing effort that many registries have sought to address. These efforts most often use a single data source (eg, patient chart review, billing data). While such efforts are commendable, these methods—when used in isolation—possess inherent limitations in either the granularity of clinical information available, or the ability to follow patients across space and over larger swaths of time. Here, we outline a hybrid-data approach used to generate reports on centre-specific outcomes.

VQI SRS reports are a tool leveraging hybrid data sources to facilitate quality improvement within vascular surgery. The long-term follow-up offered by these reports represents a key strength of this approach. For example, patients being lost to follow-up (relocation, death, etc) has traditionally limited the collection of any further data from a given patient. VISION’s linkage to Medicare claims, however, allows for ongoing capture of pertinent clinical events (reintervention, amputation, death, etc) across multiple centres. In addition, the SRS reports can serve as a tool for a centre to compare its performance to other VQI participants. By easily visualising where one’s centre lies among peers on key performance indicators, it becomes easier to highlight specific areas for improvement. The quality metrics reviewed also offer insights into patient demographics which can be related to how well centres are conforming to various guidelines. For example, AAA metrics such as that seen in figure 3 demonstrate what per cent of elective AAA surgeries at a given centre are being performed below consensus size thresholds, as well as how well a centre meets recommended postoperative imaging surveillance guidelines.

The SRS reports are not without limitations. Due to CMS suppression requirements, reports are only available to centres that perform a sufficient number of cases with Medicare patients. In addition, the specificity could be improved with more granular data on patient demographics and device data, however, further disaggregation at the centre level would reveal smaller numbers which is not permitted by CMS. Another limitation of the SRS reports is the time lag of the necessary data due to the time needed for claims data cleaning, application, and processing; For example, only data up to 2018 was fully available for inclusion in the 2021 SRS reports.

Looking ahead, the SRS reports could be improved by focusing on centre adoption and additional reporting metrics. Regarding centre use of the SRS reports, our preliminary study of report access revealed that ~59% receiving centres actually opened the report. We hope with improved communications and ease of access to these reports we might be able to improve the uptake of these SRS reports. From a content standpoint we hope to improve the SRS reports by incorporating implant data. As a specialty heavily reliant on various devices such as grafts and stents, device-level outcomes could offer insights to not only vascular surgery centres, but to additional stakeholders such as device manufacturers, the Food and Drug Administration (FDA), and even patients themselves. For example, similar reports could be created to monitor device performance rather than centre-specific performance. If a specific device reveals a pattern of early failure, that could have implications for surgeon device selection, manufacturer recalls and FDA review. In the future, we also hope to further refine the reports with more granular additions such as sex-specific metrics.

Looking ahead, new or existing registries could adopt similar methods to deliver centre-specific reports. Importantly, the methods outlined for creating the SRS reports are not specific to vascular surgery and could be employed in other specialties, surgical or otherwise. Some potential uses for these methods could include assessing compliance with various evidence based guidelines or disparities in treatment based on sex, race/ethnicity, geography, etc. In addition, within the surgical community, registries have often focused on shorter-term outcomes such as in-hospital complications or 30-day mortality. Our methods show how leveraging Medicare claims data facilitates tracking patient outcomes over longer periods of time, and we believe that better understanding the longevity of our interventions and implantable devices is, and will continue to be, of growing importance.
REFERENCES


