Training/Practice
Health Policy and Promotion

The Development and Feasibility Assessment of Canadian Quality Indicators for Atrial Fibrillation

Jafna L. Cox, MD,[a] Sulan Dai, PhD,[b] Yanyan Gong, MSc,[c] Robert McKelvie, MD, PhD,[d] M. Sean McMurtry, MD, PhD,[e] Garth H. Oakes, PhD,[f] Allan Skanes, MD,[g] Atul Verma, MD,[h] Stephen B. Wilton, MD, MSc,[i] and D. George Wyse, MD, PhD[i]

[a] *Departments of Medicine and of Community Health and Epidemiology, Dalhousie University, Halifax, Nova Scotia, Canada*

[b] *Centre for Chronic Disease Prevention and Control, Public Health Agency of Canada, Ottawa, Ontario, Canada*

[c] *Health System Performance, Canadian Institute for Health Information, Ottawa, Ontario, Canada*

[d] *Department of Medicine, Population Health Research Institute, McMaster University, London, Ontario, Canada*

[e] *Department of Medicine, Mazankowski Alberta Heart Institute, University of Alberta, Edmonton, Alberta, Canada*

[f] *Cardiac Care Network of Ontario, Toronto, Ontario, Canada*

[g] *Department of Medicine, London Heart Institute, University of Western Ontario, London, Ontario, Canada*

[h] *Southlake Regional Health Centre, University of Toronto, Newmarket, Ontario, Canada*

[i] *Department of Cardiac Sciences, Libin Cardiovascular Institute of Alberta, University of Calgary, Calgary, Alberta, Canada*

ABSTRACT

In 2010, the Canadian Cardiovascular Society embarked on an initiative to develop pan-Canadian quality indicators (QIs) and standardized data definitions with the ultimate goal of monitoring, comparing, and contrasting national cardiovascular care and its outcomes. One of the first working groups to be established was tasked with identifying and then defining a set of QIs for atrial fibrillation/flutter (AF/AFL). The Canadian Cardiovascular Society "Best Practices for Developing Cardiovascular Quality Indicators" methodology was used to develop an initial catalogue of 25 QIs intended to measure critical issues around access, process, and outcomes relating to AF/AFL management. This list was subsequently pared down to 5 QIs felt to have the greatest relative importance for quality assurance and measurability so as to facilitate early adoption. Three of these QIs were finally selected to

RÉSUMÉ

En 2010, la Société canadienne de cardiologie (SCC) a entrepris une démarche afin d'établir des indicateurs de qualité (IQ) pancanadiens et des définitions de données normalisées dans le but ultime de surveiller, de comparer et de différencier les soins cardiovasculaires à l'échelle nationale ainsi que leurs résultats. L'un des premiers groupes de travail formés devait établir, puis définir un ensemble d'IQ concernant la fibrillation et le flutter auriculaires (FA/FLA). La méthodologie d'élaboration des indicateurs de qualité en soins cardiovasculaires selon les meilleures pratiques de la SCC a été utilisée pour créer un catalogue initial comprenant 25 IQ visant à évaluer les principaux enjeux entourant l'accès, les protocoles et les résultats liés à la prise en charge de la FA et du FLA. Cette liste a ensuite été réduite aux 5 IQ considérés comme ayant la plus grande importance relative

Atrial fibrillation/atrial flutter (AF/AFL), the most common sustained cardiac arrhythmia, is an increasing public health challenge.[1] Its impact is expected to grow, with a predicted tripling in prevalence between 2030 and 2050.[2] The mean

individual annual system cost is estimated at \$5450 in 2010 Canadian dollars.[3]

Assessments of the quality of AF/AFL care have traditionally been based on limited performance metrics concentrated around antithrombotic therapy. For instance, a 2008 report on performance measures for adults with nonvalvular AF/AFL (NVAF/AFL) listed only 3 metrics: (1) assessment and documentation of thromboembolic risk factors; (2) use of anticoagulation therapy (warfarin); and (3) monthly international normalized ratio (INR) measurement for warfarin-treated patients.[4] The Agency for Healthcare Research and Quality lists only 2 indicators related to AF/AFL: the "percent of ischemic stroke patients

Cox et al.
Development and Assessment of the Canadian AF QIs

1567

assess the feasibility of their measurement using existing administrative datasets. These were the number of patients with a diagnosis of nonvalvular AF/AFL at high risk of stroke (75 years or older, or $CHADS_2$ $\geq$ 2) receiving an oral anticoagulant, and the rates of stroke and major haemorrhage in patients with nonvalvular AF/AFL according to CHA_2DS_2-VASc score and anticoagulant use. Despite their clear importance in assessing AF/AFL care, none of these 3 QIs were found to be readily measurable across Canada using existing national datasets. Investment in new medical data infrastructure is required to facilitate regular monitoring of QIs to improve cardiovascular care.

au regard de l'assurance de la qualité et la mesurabilité pour faciliter l'adoption précoce. Finalement, trois de ces IQ ont été choisis pour évaluer la faisabilité de leur mesure à l'aide de l'ensemble des données administratives existantes. Il s'agissait du nombre de patients ayant reçu un diagnostic de FA/FLA non valvulaire exposés à un risque élevé d'AVC (75 ans ou plus ou score à l'échelle $CHADS_2$ $\geq$ 2) et recevant un anticoagulant par voie orale, ainsi que des fréquences respectives des AVC et des hémorragies majeures chez les patients souffrant de FA/FLA non valvulaire selon le score à l'échelle CHA_2DS_2-VASc et l'usage d'anticoagulants. Malgré leur importance évidente dans l'évaluation des soins chez les patients atteints de FA/FLA, aucun de ces trois IQ ne s'est révélé facilement mesurable à l'aide de l'ensemble des données existantes à l'échelle du Canada. Il est nécessaire d'investir dans une nouvelle infrastructure de données médicales pour faciliter la surveillance régulière des IQ afin d'améliorer les soins cardiovasculaires.

prescribed antithrombotic therapy at hospital discharge" (http://www.qualitymeasures.ahrq.gov/content.aspx?id=48124&search=atrial +fibrillation) and the "percent time in therapeutic INR range" (http://www.qualitymeasures.ahrq.gov/content.aspx?id=32739). The 2 suggested quality indicators in the UK are the percentage of patients with AF/AFL with stroke risk assessed using a risk scoring system and the percentage of patients with a $CHADS_2$ score $\geq$ 2 receiving anticoagulant therapy (https://www.nice.org.uk/standards-and-indicators/qofindicators).

Methods

In 2010, the Canadian Cardiovascular Society (CCS) began an initiative to develop pan-Canadian data definitions and quality indicators (QIs) for cardiovascular care. QI and Data Definition Committees, assembled to deal with specific cardiac diseases or interventions, were tasked with establishing a national e-catalogue of performance measures. The aim was to have QIs developed and defined that local, provincial, and national registries, databases, and health organizations would congruently adopt, collect, and report so as to evaluate both guideline uptake and the outcomes achieved.

The AF/AFL QI Committee was one of the first of these working groups. Multidisciplinary and pan-Canadian, its membership encompassed clinicians, including members of the CCS AF/AFL Clinical Practice Guidelines Committee and CCS AF/AFL Data Definitions Subcommittee, as well as representatives from such national and provincial health data organizations as the Public Health Agency of Canada, Canadian Institute for Health Information (CIHI), Cardiac Care Network of Ontario, and Institut National d'Excellence en Santé et en Services Sociaux.

QI development and selection

The CCS, which centrally coordinated this national initiative, mandated QI committees to follow a set approach to identify and define variables; involve provincial and national database managers throughout the process; and solicit broad external review of, and response to, proposed measures.

All QI committees developed quality measures according to a standardized 3-phase process: (1) planning and organizing the committee's membership, tasks, and timelines; (2) drafting a preliminary list of QIs, then selecting an essential but limited core set; and (3) collaborating with data administrators to operationalize the QIs through field testing and ultimately encourage their adoption as regularly monitored and reported performance statistics.

Following a systematic literature review to identify published AF/AFL QIs, as well as consideration of recommendations from the CCS AF/AFL guidelines committee, the AF/AFL QI Committee created a preliminary long list of QIs with supporting evidence; indicator descriptions; technical specifications (definitions of numerator, denominator, calculation method, and rationale); potential data sources; proposed assessment and update mechanisms; and anticipated implementation challenges.

The initial QI list underwent internal review using a 7-point Likert scale that evaluated importance, scientific acceptability, and feasibility. Three different rating strategies were then applied: (1) selection of QIs with an overall rating $\geq$ 5; (2) selection of QIs where 70% or more of the respondents assigned an overall rating $\geq$ 5; and (3) selection of QIs in the top third of access, process, and outcome domains. This methodology resulted in a smaller QI subset, which was then reviewed by outside experts and stakeholders, and posted on the CCS website for a 30-day period to allow comments from CCS membership.

QI implementation

The AF/AFL QI Committee, in association with its CCS oversight body, identified a preliminary list of clinical and administrative database administrators who were asked to complete a questionnaire and participate in a follow-up interview evaluating the feasibility, effort, cost, and collection time needed to acquire the data.

Results

Selection of QIs

A total of 25 QIs were initially proposed (see Supplemental Appendix S1). Following the process outlined above, and

Table 1. Summary of selected CCS atrial fibrillation quality indicators

Access Indicator
- A. Diagnosis of AF/AFL and echocardiographic assessment
  - Percentage of patients newly diagnosed with AF/AFL and echocardiography assessment within 12 mo ($\pm$ 6 mo) from diagnosis
    - Numerator: All patients newly diagnosed with AF/AFL who have had an echocardiogram performed $\pm$ 6 mo from diagnosis
    - Denominator: All patients newly diagnosed with AF/AFL
    - Period of assessment: 6 mo before and 6 mo after the qualifying episode
    - Rationale: Assessment of cardiac function, left atrial size, and ruling out valve disease are important components for management of newly diagnosed AF/AFL

Process Indicators
- B. Diagnosis of NVAF/AFL and at high risk of stroke (age $\geq$ 75 y, or CHADS$_2$ $\geq$ 2) receiving an OAC
  - Percentage of patients with a diagnosis NVAF/AFL $\geq$ 75 y of age OR <75 y of age with a CHADS$_2$ score $\geq$ 2, and without a contraindication for anticoagulation, who are receiving a prescription for an OAC (warfarin [or other VKA], apixaban, dabigatran, rivaroxaban)
    - Numerator: All patients with NVAF/AFL $\geq$ 75 y of age OR <75 y of age and a CHADS$_2$ score $\geq$ 2, and without a contraindication for OAC, who are receiving a prescription for an OAC (warfarin [or other VKA] apixaban, dabigatran, rivaroxaban)
    - Denominator: All patients with NVAF/AFL $\geq$ 75 y of age OR <75 y of age and a CHADS$_2$ score $\geq$ 2
    - Period of assessment: Annually
    - Rationale: Patients who are at high risk for stroke should be on an OAC for stroke prevention
- C. Risk stratification of subjects with NVAF/AFL for stroke
  - Percentage of patients with a new diagnosis of NVAF/AFL who have a stroke risk prediction (CHADS$_2$, CHA$_2$DS$_2$VASc) score documented in their medical record, or have the relevant elements of such scores recorded such that they can be readily and automatically calculated
    - Numerator: All patients with a diagnosis of NVAF/AFL who have a CHADS$_2$ or CHA$_2$DS$_2$VASc score or the elements of these scores (stroke/TIA/SE, hypertension, heart failure, age $\geq$ 75, diabetes, atherosclerotic disease, age 65-74, female sex) documented in their medical record
    - Denominator: All patients with a diagnosis of NVAF/AFL
    - Period of assessment: Annually
    - Rationale: Will measure the proportion of patients with AF/AFL stratified for stroke risk using a recommended objective tool (CHADS$_2$ or CHA$_2$DS$_2$VASc)

Outcome Indicators
- D. Rate of stroke in patients with NVAF/AFL
  - Numerator: Primary analysis: The number of patients with NVAF/AFL who suffer a stroke (within a year)
  - Secondary analysis: Include the possibility of reporting according to the CHA$_2$DS$_2$-VASc score and type of antithrombotic therapy at the time of stroke
    - CHA$_2$DS$_2$-VASc score
      1. Score = 0
      2. Score = 1
      3. Score = 2
      4. Score = 3
      5. Score = 4 or greater
      6. Score unknown/uncertain
    - Antithrombotic therapy
      1. No antithrombotic therapy
      2. Anticoagulation only
      3. Antiplatelet only
      4. Anticoagulation and antiplatelet
      5. Unknown/uncertain
    - CHA$_2$DS$_2$-VASc score and type of antithrombotic therapy at the time of stroke
  - Denominator: The number of patients with NVAF/AFL
  - Period of assessment: 2 y after qualifying episode of AF/AFL
  - Rationale: Will measure the rate of stroke in patients with AF/AFL (according to risk score and antithrombotic use)
- E. Rate of major haemorrhage in patients with NVAF
  - Annual rate of major haemorrhage in patients with diagnosis of NVAF/AFL receiving an OAC (warfarin [or VKA]), dabigatran, rivaroxaban, apixaban)
    - Numerator: Primary analysis: The number of patients with NVAF/AFL who are hospitalized due to haemorrhage of any kind (an arbitrary definition of major bleeding) within a calendar year while taking an OAC.
    - Secondary analysis: Possibility of reporting according to type of OAC (warfarin [or other VKA], apixaban, dabigatran, rivaroxaban)
    - Denominator: All patients with NVAF/AFL
    - Period of assessment: Annually
    - Rationale: Will measure the proportion of patients with NVAF/AFL who experience complication of anticoagulation (according to type of anticoagulant)

NVAF/AFL, nonvalvular atrial fibrillation/flutter; OAC, oral anticoagulant; SE, systemic embolus; TIA, transient ischemic attack; VKA, vitamin K antagonist.

direction from the CCS to submit a shorter list for initial consideration, 5 QIs were selected (Table 1).

Results of feasibility assessment

Sixteen assessment questionnaires were sent to data holders across Canada and 11 were returned (69% response rate). A follow-up telephone interview was conducted with each of the responding organizations, including administrative data institutes (CIHI, Institute for Clinical Evaluative Sciences), AF clinics (Foothills Medical Centre, McGill University Health Centre), provincial registries (Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease,

Cardiac Services BC, Cardiovascular Health Nova Scotia), and international registries (RE-LY AF Registry, Global Anticoagulant Registry in the Field). The interview sought to identify feasibility issues around collecting and reporting the proposed QIs. This process revealed that none of the QIs as defined could be readily measured across Canada with existing databases.

With regard to administrative data, definitions for Rate of Stroke, Risk-stratification of Patients, and Rate of Major Haemorrhage could be altered to allow measurement, but at the cost of relevance, accuracy, and conformance with CCS guidelines. For example, although an 10th revision of the *International Statistical Classification of Diseases and Related*

Cox et al.
Development and Assessment of the Canadian AF QIs

1569

Health Problems (ICD-10) code exists for haemorrhage within the CIHI Discharge Abstract Database, it has insufficient clinical detail to specify whether this was major or minor. Thus, current Canadian administrative databases can only monitor event occurrence but not its severity. Another limitation is their inability to deal with relevant subtleties. Although they can identify the proportion of patients with AF/AFL with a given stroke risk, they cannot identify those receiving oral anticoagulation. Even if this could be ascertained through linkage to administrative or pharmaceutical claims datasets, no insight could be obtained as to which patients are "without a contraindication for oral anticoagulant" or whether those on warfarin are at target INR. Procedure use and outcomes can be effectively monitored using administrative and vital statistics data, but adequate assessment of medical treatments requires more detail.

As to clinical data sources, provincial registries have a limited ability to measure the quality of AF/AFL care, but differences in data definitions obviate meaningful interprovincial comparisons. International AF/AFL registries and AF/AFL clinics have data to measure comparably all 5 of the QIs, but the extent to which the patients in these registries reflect the broader Canadian AF/AFL population is unclear.

The AF/AFL QI Committee felt it was inappropriate simply to propose QIs that "could" be measured but rather ones that "needed" to be measured. The CCS ultimately directed that a final list of no more than 3 QIs be submitted to facilitate manageable implementation. Time constraints imposed by the CCS precluded yet another round of external consultations and voting; therefore, the AF/AFL QI committee itself made the final selection of 3 indicators felt to be the most clinically important to the broadest patient population. Specifically, these were as follows:

1. Proportion of patients with a diagnosis of NVAF/AFL at high risk of stroke (age $\geq$ 75 years or CHADS$_2$ $\geq$ 2) receiving an oral anticoagulant.
2. Annual rate of stroke in patients with NVAF/AFL.
3. Annual rate of major haemorrhage in patients with NVAF/AFL.

Although the first of these QIs conflicts with the 2014 update of the CCS AF/AFL Clinical Practice Guidelines, where the anticoagulation treatment age threshold was lowered to $\geq$ 65 years, it provides a good example of the struggle around defining performance measures when there is a lack of consensus in terms of what "must" (QI) versus "should" (guideline) be surveyed. It also provides a good example of why such metrics need to be reviewed regularly and updated because new insights and changes in consensus might require a corresponding revision of QI definition.

The near-term goal was to examine whether patients with AF were receiving appropriate antithrombotic therapy while concurrently monitoring the attendant risks and benefits, serendipitously involving those QIs that, with some modification of definitions, could immediately be captured. The longer term goal is to collect as many of the originally proposed QIs as feasible.

Discussion

Because AF/AFL is most commonly managed through community outpatient encounters, there is currently no way, at either regional, provincial, or national levels, to ascertain the numerators and denominators, or diagnostic and prescribing information, required to monitor any of the proposed AF/AFL QIs. Extrapolation from surveys or local datasets is equally problematic given discordant definitions uncertainty about generalizability and data quality. A compromise approach would be to use sentinel registries within provinces, monitoring at least the 3 most important AF/AFL QIs using common definitions and procedures, as a means of more reliably estimating true clinical processes and outcomes.

The current inability to monitor even basic QIs seeking to track fundamental standards of care and their outcomes is a major problem that does not relate solely to AF/AFL. Rapid progress in electronic data collection and storage is occurring such that real-time monitoring of treatment processes and outcomes is already feasible. It seems just a matter of time before investment in such infrastructure grows across Canada. Health care providers therefore need to engage rapidly in the definition of appropriate QIs; otherwise, government and payer groups will independently establish them based on less rigorous assessment.

Disclosures

The authors have no conflicts of interest to disclose.

References

1. Ball J, Carrington M, McMurray JJV, Stewart S. Atrial fibrillation: profile and burden of an evolving epidemic in the 21st century. Int J Cardiol 2013;167:1807-24.

2. Colilla S, Crow A, Petkun W, et al. Estimates of current and future incidence and prevalence of atrial fibrillation in the U.S. adult population. Am J Cardiol 2013;112:1142-7.

3. Wodchis WP, Bhatia RS, LeBlanc K, Meshkat M, Morra D. A review of the cost of atrial fibrillation. Value Health 2012;15:240-8.

4. Estes NAM III, Halperin JL, Calkins H, et al. ACC/AHA/Physician Consortium 2008 clinical performance measures for adults with non-valvular atrial fibrillation or atrial flutter: a report of the American College of Cardiology/American Heart Association Task Force on Performance Measures and the Physician Consortium for Performance Improvement (Writing Committee to Develop Performance Measures for Atrial Fibrillation). Circulation 2008;117:1101-20.

Supplementary Material

To access the supplementary material accompanying this article, visit the online version of the *Canadian Journal of Cardiology* at www.onlinecjc.ca and at http://dx.doi.org/10.1016/j.cjca.2016.02.059.