Canadian Cardiovascular Society
Leadership. Knowledge. Community.

Société canadienne de cardiologie
Communauté. Connaissances. Leadership.

THE CANADIAN CARDIOVASCULAR SOCIETY QUALITY INDICATORS E-CATALOGUE

QUALITY INDICATORS FOR CARDIAC SURGERY

A CCS CONSENSUS DOCUMENT

v1

Last updated: April 28, 2015

Copyright © 2015 The Canadian Cardiovascular Society
This publication may not be reproduced or modified without the permission of The Canadian Cardiovascular Society.

For authorised reproduction, please obtain permission from:

The Canadian Cardiovascular Society
222 Queen Street, Suite 1403
Ottawa, Ontario
Canada K1P 5V9
Email: **healthpolicy@ccs.ca**

BACKGROUND

The quality indicators outlined in this document have been selected through a national consensus process as the key quality indicators specific to **Cardiac Surgery (CS)**

In addition, there is a complementary set of CS related data elements and definitions within the data dictionary for the CCS Quality Project. Visit www.ccs.ca for the latest data dictionary.

Several of the quality indicators provide the following types of analysis options:

Cross-sectional Analysis – definition of indicator estimation using existing registries or databases.

Follow-up Analysis – definition of indicator calculation for more precise and detailed analysis using prospective databases including those designed specifically for this purpose.

TABLE OF CONTENTS

30-DAY RISK ADJUSTED MORTALITY FOR CABG	
Description	Risk-adjusted rate of 30-day all-cause mortality for adult patients undergoing isolated coronary artery bypass graft (CABG).
Numerator	Number of patients in the denominator who died, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, up to and including 30 days, and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure.
Denominator	All patients 18 years and older undergoing isolated CABG. Denominator time window = 12 months, but may vary depending on data set size to achieve model power.
Method of Calculation	Crude mortality calculated as (numerator/denominator) x 100 (%) A logistic risk-adjusted model will be developed for the population using standard univariate and multivariate modelling techniques. Predicted or expected mortality will be calculated for the specified population subset, and observed (O) divided by expected (E) ratio calculated. Risk-adjusted mortality is calculated by multiplying O/E ratio for the specified subset by the overall weighted mortality for the population.
Sources of Data	In-hospital mortality is captured in CIHI Discharge Abstract Database (DAD)/Hospital Morbidity Database (HMDB), however 30 day mortality is best ascertained from data linkage to provincial Vital Statistics and population data.

Rationale

Mortality is regarded as an excellent overall measure of quality of care in cardiac surgery, provided it is presented with a valid risk adjusted model. It permits regional, institutional and provider comparisons given proper sampling sizes. This procedure comprises 50-75% of institutional volume.

Clinical Recommendation(s)

Annual reporting by region, institution, and provider, with sequential trend analysis by year.

Method of Reporting

Results will be reported as crude rate (%),, O/E ratio, and risk-adjusted rate (%). All reporting must include 95% confidence intervals.

Challenges to Implementation/Interpretation

Need linked Vital statistic or population data for true 30d mortality.

A Canada-wide database with uniform outcome and variable definitions does not exist, however many high quality clinical databases do exist.

One of the most common uses of risk models is to compare provider's performance. This is statistically challenging from the onset because of the low incidence of binary outcomes like early mortality as well as the highly variable and often small sample sizes from different providers.

Risk adjusted 30 day mortality might be best used as the basis for confidential continuous QI activities. The main goal might not be public accountability but provider initiated determination of best practice, benchmarking and regional or system-wide improvement.

30-DAY RISK-ADJUSTED MORTALITY FOR AVR	
Description	Risk-adjusted rate of 30-day all-cause mortality for all adult patients undergoing isolated aortic valve replacement surgery (AVR).
Numerator	Number of patients in the denominator who died, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, up to and including 30 days, and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure.
Denominator	All patients 18 years and older undergoing AVR, excluding other cardiac procedures and all other surgeries. Time window = 12 months
Method of Calculation	Crude mortality calculated as (numerator/denominator) x 100 (%) A logistic risk-adjusted model will be developed for the population using standard univariate and multivariate modelling techniques. Predicted or expected mortality rate will be calculated for the specified population subset, and observed (O) divided by expected (E) ratio calculated. Risk-adjusted mortality rate is calculated by multiplying O/E ratio for the specified subset by the average mortality rate for the population..
Sources of Data	In-hospital mortality is captured in CIHI Discharge Abstract Database (DAD)/Hospital Morbidity Database (HMDB), however 30 day mortality is best ascertained from data linkage to provincial Vital Statistics and population data.

Rationale

Mortality is regarded as an excellent overall measure of quality of care in cardiac surgery. With proper risk-adjustment, it permits regional, institutional and provider comparisons given proper sampling sizes. This isolated procedure is the second most frequent in most institutions.

Clinical Recommendation(s)

Annual reporting by region, institution, and provider, with sequential trend analysis by year.

Contemporary high quality modelling is needed to guide optimal patient selection and comparison of outcomes with transcatheter aortic valve implantation (TAVI).

Method of Reporting

Results will be reported as crude rate (%), O/E ratio, and risk-adjusted rate (%). All reporting must include 95% confidence intervals.

Challenges to Implementation/Interpretation

Need linked Vital statistics or population data for true 30d mortality.

A Canada-wide database with uniform outcome and variable definitions does not exist, however many high quality clinical databases do exist.

One of the most common uses of risk models is to compare provider's performance. This is statistically challenging from the onset because of the low incidence of binary outcomes like early mortality as well as the highly variable and often small sample sizes from different providers.

Risk adjusted 30 day mortality might be best used as the basis for confidential continuous QI activities. The main goal might not be public accountability but provider initiated determination of best practice, benchmarking and regional or system-wide improvement.

30-DAY RISK-ADJUSTED MORTALITY FOR AVR + CABG	
Description	Risk-adjusted rate of 30-day all-cause mortality for all adult patients undergoing aortic valve replacement surgery (AVR) and coronary artery bypass graft surgery (CABG).
Numerator	Number of patients in the denominator who died, including both 1) all deaths occurring during the hospitalization in which the procedure was performed, up to and including 30 days, and 2) those deaths occurring after discharge from the hospital, but within 30 days of the procedure.
Denominator	All patients 18 years and older undergoing AVR and CABG, excluding other cardiac procedures and all other surgeries. Time window = 12 months, but may vary depending on data set size to achieve model power.
Method of Calculation	Crude mortality rate calculated as (numerator/denominator) x 100 (%) A logistic risk-adjusted model will be developed for the population using standard univariate and multivariate modelling techniques. Predicted or expected mortality will be calculated for the specified population subset, and observed (O) divided by expected (E) ratio calculated. Risk-adjusted mortality rate is calculated by multiplying O/E ratio for the specified subset by the average mortality rate for the population..
Sources of Data	In-hospital death is captured in CIHI Discharge Abstract Database (DAD)/Hospital Morbidity Database (HMDB); however 30 day death is best ascertained from data linkage to provincial Vital Statistics or population data.

Rationale

Mortality is regarded as an excellent overall measure of quality of care in cardiac surgery. With proper risk-adjustment it permits regional, institutional and provider comparisons given proper sampling sizes. This procedure is the third most frequent in most institutions.

Clinical Recommendation(s)

Annual reporting by region, institution, and provider, with sequential trend analysis by year.

Contemporary high quality modelling is needed to guide optimal patient selection and comparison of outcomes with transcatheter aortic valve implantation (TAVI).

Method of Reporting

Results will be reported as crude rate (%), O/E ratio, and risk-adjusted rate (%). All reporting must include 95% confidence intervals.

Challenges to Implementation/Interpretation

Need linked Vital statistics data for true 30d mortality..

A Canada-wide database with uniform outcome and variable definitions does not exist, however many high quality clinical databases do exist.

One of the most common uses of risk models is to compare provider's performance. This is statistically challenging from the onset because of the low incidence of the binary outcomes like early mortality as well as the highly variable and often small sample sizes from different providers.

Risk adjusted 30 day mortality might be best used as the basis for confidential continuous QI activities. The main goal might not be public accountability but provider initiated determination of best practice, benchmarking and regional or system-wide improvement.

Ref: The Society of Thoracic Surgeons 2008 Cardiac Surgery Risk Models: Part 3 – Valve plus Coronary Artery Bypass Grafting Surgery. Ann Thorac Surg 2009; 88: S43-62.

30-DAY ALL CAUSE READMISSION RATE AFTER CABG	
Description	The risk-adjusted rate of readmission to any hospital for any cause on or before the 30th day following the date of discharge from the index procedure among patients undergoing coronary artery bypass graft surgery (CABG). This quality indicator only applies to patients undergoing isolated CABG in the absence of any concomitant cardiac surgical procedure.
Numerator	Number of patients in the denominator who experience a readmission to any hospital for any cause on or before the 30th day following the date of discharge from the index isolated CABG.
Denominator	All patients 18 and older undergoing isolated CABG and who were discharged alive from the cardiac surgery institution. Transfers to another hospital or facility immediately following their index hospitalization will not be defined as a readmission. Follow-up of transfer patients will commence on the day of discharge from the last hospital in the transfer chain. Denominator time window – 12 months or as required to achieve good risk-adjusted model predictability
Method of Calculation	(numerator / denominator) * 100% Where risk adjustment models for 30-day readmission do not exist, a risk-adjustment model will be created using existing data and applied across provincial, regional and institutional jurisdictions to adjust for differences in baseline clinical characteristics and in-hospital post-operative clinical course (including post-operative length of stay) between patients.
Sources of Data	Discharge Abstract Database (DAD), Hospital Morbidity Database (HMDB), Canadian Institute for Health Information, and institutional clinical databases.

Rationale

Increased emphasis is being placed on 30-day rates of readmission as a metric by which quality of acute care may be gauged. While the reasons underlying readmissions to hospital may vary from patient to patient, common mechanisms may exist by which to reduce these encounters across all cardiac surgical centers. This metric is not commonly reported or available.

Clinical Recommendation(s)

Improvement in the rate of 30-day all-cause readmission to hospital following CABG.

Method of Reporting

Results will be reported as crude rate (%), O/E ratio, and risk-adjusted rate (%) calculated by multiplying the average rate for the population determined by the risk-adjusted model by the O/E ratio for that institution.

Challenges to Implementation/Interpretation

Rates of 30-day all-cause readmission is a broad variable that neither indicates when the patient is typically being readmitted, to which hospital they are being readmitted, and for what reason they are being readmitted. While rates of 30-day all-cause readmission will undoubtedly serve as a valuable quality metric, further study will be needed to better understand the mechanisms underlying these rates so that interventions may be established to reduce rates of readmission as needed.

365-DAY READMISSION FOR CARDIAC DIAGNOSIS (MI, UA, CHF)	
Description	The risk-adjusted rate of readmission to any hospital for any cardiac cause on or before the 365th day following the date of discharge from the index procedure among patients undergoing coronary artery bypass graft surgery (CABG). This quality indicator only applies to patients undergoing isolated CABG in the absence of any concomitant cardiac surgical procedure.
Numerator	Number of patients in the denominator who experience a readmission to hospital for any cardiac cause on or before the 365th day following the date of discharge from the index procedure among patients undergoing coronary artery bypass graft surgery (CABG). Readmission for any cardiac causes includes readmissions for an acute myocardial infarction (I21, I22), unstable angina (I20), congestive heart failure (I50), and PCI or CABG
Denominator	All patients 18 and older undergoing isolated CABG and who were discharged alive from hospital. Transfers to another hospital or facility immediately following their index hospitalization will not be defined as a readmission. Follow-up of transfer patients will commence on the day of discharge from the last hospital in the transfer chain Denominator time window – 12 months or as required to achieve good risk-adjusted model predictability
Method of Calculation	(numerator / denominator) * 100% Where risk adjustment models for 365-day readmission do not exist, a risk-adjustment model will be created using existing data and applied across provincial, regional and institutional jurisdictions to adjust for differences in baseline clinical characteristics and in-hospital post-operative clinical course (including post-operative length of stay) between patients.
Sources of Data	Discharge Abstract Database (DAD), Hospital Morbidity Database (HMDB), Canadian Institute for Health Information, and institutional clinical databases.

Rationale

365-day rates of readmission for any cardiac cause are a metric by which the quality of an isolated CABG procedure, secondary prevention, follow-up cardiac care, and the need for repeat reintervention may be evaluated. While the threshold for readmission for cardiac causes may vary from center to center, the overall rate will provide an assessment of the burden posed by ongoing cardiac events following CABG across all cardiac surgical centers. Furthermore, it will serve as a measure of the effectiveness of secondary prevention (including use of appropriate cardiac medications, heart failure management, implementation of preventative lifestyle changes and adherence to post-operative instruction) and, by extension, a measure of overall quality of the system of cardiac care (from time of symptom onset to time of referral to time of procedure to duration and intensity of follow-up). It may be a general quality metric applicable to any cardiac admission or procedure.

Clinical Recommendation(s)

Improvement in the rates of 365-day readmission to hospital for any cardiac cause following CABG.

Method of Reporting

Results will be reported as crude rate (%), O/E ratio per originating institution, and risk-adjusted rate in % calculated by multiplying the average rate for the population determined by risk-adjusted model by the O/E ratio for that institution.

Challenges to Implementation/Interpretation

This indicator provides a longer term assessment of cardiac outcomes following isolated CABG. By focusing on cardiac causes for readmission, one can ascertain whether or not a patient undergoing an isolated CABG procedure has benefited from the procedure and has remained free of any major adverse cardiac events. This indicator is not without its limitations however. First of all, this indicator is unable to detect what percentage of patients continue to experience symptoms or functional limitation that negatively impacts on quality of life but that does not warrant a readmission. Secondly, one year may not be a sufficient duration of time over which to follow patients having undergone isolated CABG procedures and deem whether the procedure was successful or not. CABG patients may continue to experience adverse outcomes beyond the first year that relate to the manner in which the procedure was performed (e.g. use of multiple arterial grafts versus vein grafts) or to the overall cardiac care provided to the patient over the long-term. Longer-term follow-up (3-years, 5-years and possibly 10-years) may be better suited for determining the quality of intervention in the setting of CABG. Despite these limitations, if successful, this indicator could serve as an important quality indicator for other procedures and disease processes including CHF, AF, cardiac catheterization and PCI for example.

ACKNOWLEDGEMENT

The Canadian Cardiovascular Society acknowledges and sincerely thanks the following individuals in the development of this Quality Indicators Cardiac Surgery Chapter:

Quality Indicators Cardiac Surgery Chapter Working Group (QI-CS-CWG)

James Abel (Chair), Providence Health Care, University of British Columbia
Ansar Hassan (Vice-Chair), New Brunswick Heart Centre, Saint John Regional Hospital (New Brunswick)
Stephen Fremes, Sunnybrook Health Sciences Centre (Ontario)
Anne Forsey and Garth Oakes, Cardiac Care Network of Ontario
Diane Galbraith, APPROACH (Alberta Provincial Project for Outcome Assessment in Coronary Heart disease)
Yanyan Gong, Canadian Institute for Health Information
Yves Langlois, Jewish General Hospital of Montreal (Quebec)

Quality Indicators Steering Committee

Paul Dorian (Chair), St. Michael's Hospital (Ontario)
Jafna Cox, Cardiovascular Health Nova Scotia
Virginia Flintloft, Canadian Patient Safety Institute
Karin Humphries, University of British Columbia
Kori Kingsbury, Cardiac Care Network of Ontario
Andrew Kmetic, Cardiac Services BC
Merril Knudtson, Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease
Anne McFarlane, Canadian Institute for Health Information
François Philippon, Réseau québécois de cardiologie tertiaire (Québec)
Jack Tu, Canadian Cardiovascular Outcomes Research Team
Sulan Dai, Public Health Agency of Canada
Mario Talajic (ex-officio), Montreal Heart Institute and President, Canadian Cardiovascular Society
Heather Ross (ex-officio), University Health Network and Vice-President, Canadian Cardiovascular Society
Blair O'Neill (ex-officio), Alberta Health Services and Past President, Canadian Cardiovascular Society

Project Support

Anne Ferguson, Chief Executive Officer, Canadian Cardiovascular Society
Nick Neuheimer, Project Director and Director, Health Policy, Advocacy and External Relations, Canadian Cardiovascular Society
Erin McGeachie, Project Coordinator, Canadian Cardiovascular Society
Philip Astles, Project Manager (external)

Production of these materials has been made possible by the Canadian Cardiovascular Society through a financial contribution from the Public Health Agency of Canada.

DISCLAIMER

The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada.

COPYRIGHT

© All rights reserved. No part of this document may be reproduced, stored in a retrieval system or transmitted in any format or by any means, electronic, mechanical, photocopying, recording or otherwise, without the proper written permission of The Canadian Cardiovascular Society™.