

CCORT/CCS quality indicators for congestive heart failure care

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BACKGROUND: Quality indicators are measurement tools for assessing the structure, processes and outcomes of care. Although quality indicators have been developed in other countries, Canadian cardiovascular disease indicators do not exist.

OBJECTIVE: To develop quality indicators for measuring and improving congestive heart failure (CHF) care in Canada.

METHODS: An 11-member multidisciplinary national expert panel was selected from nominees from national medical organizations. Potential quality indicators were identified by a detailed search of published guidelines, randomized trials and outcomes studies. A two-step modified Delphi process was employed with an initial screening round of indicator ratings, followed by a national quality indicator panel meeting, where definitions of the indicators were developed using consensus methods. Indicators were designed to be measurable, using retrospective chart review and linking existing administrative databases.

RESULTS: The case definition criterion was developed based on a discharge diagnosis of CHF (*International Classification of Diseases*, 9th revision [ICD-9] code 428.x), with diagnostic confirmation using clinical criteria. In total, 29 indicators and five test indicators were recommended. Process indicators included prescription for angiotensin-converting enzyme inhibitors, beta-blockers or warfarin (for atrial fibrillation) at hospital discharge. Nonpharmacological in hospital process indicators included evaluation of left ventricular function, weight measurement and selected patient education counselling instructions. Process indicators in the ambulatory setting included prescription and adherence to drug therapies and physician follow-up. Outcome indicators included mortality, readmissions and emergency visits.

CONCLUSIONS: A set of Canadian quality indicators for CHF care encompassing organizational attributes, pharmacotherapy, investigations, counselling, continuity of care and disease outcomes has been developed. These quality indicators will serve as a foundation for future studies evaluating the quality of CHF care in Canada.

Key Words: *Canadian health system; Congestive heart failure; Health care delivery; Health outcomes; Health policy; Population health*

Les indicateurs de qualité du CCORT et de la SCC pour les soins secondaires à une insuffisance cardiaque congestive

HISTORIQUE : Les indicateurs de qualité sont des outils de mesure servant à évaluer la structure, les processus et les issues des soins. Bien que des indicateurs de qualité aient été mis au point dans d'autres pays, il n'existe pas d'indicateur de maladies cardiovasculaires au Canada.

OBJECTIF : Élaborer des indicateurs de qualité pour mesurer et améliorer les soins secondaires à une insuffisance cardiaque congestive (ICC) au Canada.

MÉTHODOLOGIE : Un groupe multidisciplinaire national d'experts, composé de 11 membres, a été sélectionné parmi les candidats d'organisations médicales nationales. Des indicateurs de qualité potentiels ont été repérés au moyen d'une recherche détaillée des publications de directives, d'essais aléatoires et d'études d'issues. Un processus Delphi modifié en deux étapes a été utilisé avec une première série d'évaluations d'indicateurs et a été suivi d'une réunion du groupe national sur les indicateurs de qualité, au cours de laquelle des indicateurs ont été élaborés au moyen de méthodes consensuelles. Les indicateurs ont été conçus pour être mesurables, au moyen d'examen rétrospectifs des dossiers et de liens avec les bases de données administratives existantes.

RÉSULTATS : Le critère de définition de cas a été élaboré d'après un diagnostic d'ICC au congé hospitalier (Manuel de la classification statistique internationale des maladies, traumatismes et causes de décès, 9^e révision [CIM-9], code 428.x), la confirmation diagnostique étant obtenue au moyen de critères cliniques. Au total, 29 indicateurs et cinq indicateurs d'examen ont été recommandés. Les indicateurs de processus incluaient une ordonnance d'inhibiteurs de l'enzyme de conversion de l'angiotensine, de bêtabloquants ou de warfarine (contre la fibrillation auriculaire) au congé de l'hôpital. Les indicateurs de processus hospitalier non pharmacologiques incluaient l'évaluation de la fonction ventriculaire gauche, la mesure de poids et des directives sélectionnées de counseling pour informer les patients. Les indicateurs de processus en clinique externe incluaient l'ordonnance et le respect de la médication et du suivi auprès du médecin. Les indicateurs d'issue incluaient la mortalité, les réhospitalisations et les consultations d'urgence.

CONCLUSIONS : Un ensemble canadien d'indicateurs de qualité pour les soins secondaires à une ICC a été élaboré, incluant les caractéristiques organisationnelles, la pharmacothérapie, les explorations, le counseling, la continuité des soins et les issues des maladies. Ces indicateurs de qualité serviront de fondements aux futures études visant à évaluer la qualité des soins secondaires à une ICC au Canada.

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The Canadian Cardiovascular Outcomes Research Team (CCORT) was formed in 2001, funded by an operating grant from the Canadian Institutes of Health Research Interdisciplinary Health Research Teams program and the Heart and Stroke Foundation of Canada. The primary objective of CCORT is to conduct studies to measure and improve the outcomes of acute myocardial infarction patients, congestive heart failure (CHF) patients and patients undergoing cardiac procedures in Canada. To accomplish these goals, the CCORT investigators set out to develop, in collaboration with the Canadian Cardiovascular Society (CCS), a series of quality indicators that could serve as a foundation for future studies of cardiovascular care in Canada.

Quality indicators assess health care structure, processes and outcomes (1). Structure refers to static or technical aspects (eg, attributes of service providers or organizational characteristics) of care. Process refers to the steps taken in caring for the patient, and outcome refers to the impact on the health status of patients or populations. Indicators are distinct from practice guidelines because they are intended to measure aggregate practice patterns as compared with guidelines, which suggest optimal practice for individual patients.

Previous efforts in the CHF quality indicator field have been based primarily in the United States. The RAND organization and the American College of Cardiology/American Heart Association (ACC/AHA) have developed CHF-specific indicators (2,3) using the methods of appropriateness rating and expert consensus, respectively (4). The National Heart Failure Quality Improvement Project and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) have also developed guideline-based quality indicators and have measured them using primary data abstraction (5,6). These indicators were based on recommendations from the Agency for Health Care Policy and Research and the ACC/AHA CHF Task Force Report guidelines (7,8). Due to the important differences between the Canadian and American health care systems (9,10), this project's aim was to develop indicators that could be used by clinicians and researchers to measure the quality of CHF care in Canada. Although these indicators will require modification over time, the CCORT investigators hope that this document can serve as a starting point for future studies in the area. The indicators were intended to reflect the standard of care in Canada in 2001 and to be concordant with the new CCS CHF guidelines (11).

METHODS

Panel composition

Nominations for members of a Canadian CHF quality indicator expert panel were requested from the Heart and Stroke Foundation of Canada, Canadian Society of Internal Medicine, College of Family Physicians of Canada and the CCS. A clinical expert (PPL) and a methodologist (JVT) were selected as co-chairs. Panel composition was intended to represent a diverse multidisciplinary background, with representation from academic and community physicians, and a broad geographic distribution. The panel consisted of 11 members. One panel cochair (PPL) had previously chaired the 2000 CCS heart failure guidelines committee (11). The panel members included a family physician, heart failure clinical nurse, doctor of pharmacy, general internist and seven cardiologists with an interest in CHF. The panel had broad Canadian representation from Alberta, Nova Scotia, Quebec and

Ontario, and from urban teaching centres and rural health centres. Expertise in quality indicator development was provided by a panelist from the Yale New Haven Health System, Yale University, Connecticut (MR), who had participated in the development of quality indicators in the United States.

Previous indicators and guidelines

A literature search was conducted with a focus on randomized controlled trials and clinical guidelines. Heart failure guidelines from the United States and Canada were reviewed for recommendations in management and pharmacological therapy (7,8,11-16). Previously employed heart failure quality indicators (2,3,5,6) were identified by searching existing medical literature databases (MEDLINE, EMBASE, HealthSTAR using OVID technology), personal files and internet-based data sources. Previously developed quality indicators that were identified included those devised by the National Heart Failure Quality Improvement Project (funded by the US Health Care Financing Administration), JCAHO, ACC/AHA, Large State Peer Review Organization Consortium and RAND (2,5-7,17).

Based on the above data sources, potential indicator definitions, with appropriate inclusion and exclusion criteria, were developed for the purpose of identifying an ideal subset of patients for each potential indicator. Ideal patients are those who meet eligibility criteria for an intervention and have no contraindications to that intervention. The lists of exclusion criteria were supplemented by reviewing protocols of landmark randomized trials of CHF (18-37). The literature was also searched for previously published criteria for case definitions, which could be applied to chart abstraction of heart failure cases. Previously, studies examining outcomes were reviewed to ascertain important mortality/morbidity outcomes relevant to CHF (38-47).

Preliminary rating of indicators

The expert panel rated 46 potential process and 14 potential outcome indicators, using a web-based indicator rating form. Indicators had to be measurable using either retrospective chart review or linked administrative data sets.

Panelists were asked to rate each potential indicator for its *meaningfulness, usefulness, potential for improvement in clinical practices, impact on patient outcomes, feasibility of data collection and overall assessment*. These dimensions of rating were adapted and modified from previously published position papers on quality indicator development (48). The rating scale for each dimension was a five-point Likert scale, with a score of 5 for the highest possible rating (49). For the overall assessment, the strength of the indicator score ranged from *do not include* (rating=1), *little reason to include* (rating=2), *could include* (rating=3), *should include* (rating=4) to *must include* (rating=5). The prespecified criterion for inclusion of potential indicators beyond the initial round was a mean overall rating greater than or equal to 4.0 although indicators with lower overall scores were also considered if panelists felt they were important (see appendixes at www.ccort.ca for a list of potential indicators and initial rating scores).

Panel meeting

The second round of the process was convened at the National Congestive Heart Failure Canadian Quality Indicator Panel Meeting moderated by the panel co-chairs. The presentation of first-round summary indicator scores was followed by discussion of potential indicator definitions.

During the panel discussions, attempts were made to obtain opinions from all panelists and to avoid predominant discussion by individual panel members. Indicators and their definitions were only approved if a strong majority (ie, eight of 11) of the panelists agreed.

Secondary review

A postpanel mailing of the CHF quality indicators to panel members was followed by a teleconference to reach a final consensus on previously discussed issues surrounding the definitions. The indicators were also posted on the CCS website for secondary review by CCS members from across Canada.

RESULTS

A summary of the indicators is presented here. Detailed indicator definitions are available in a series of appendixes (<http://www.ccort.ca>) for readers who would like to use them in research studies or assessments of clinical practice.

Case definition criteria

The recommended criterion for retrospectively identifying heart failure cases was a most responsible or primary/secondary diagnosis of heart failure by the *International Classification of Diseases*, 9th revision code (ICD-9 428.x) in the Canadian Institute for Health Information hospital discharge abstract database. In hospitals with only a small number of cases, the inclusion of discharges coded with a primary/secondary diagnosis of CHF would result in an increase in the number of potential CHF cases, although some of these may be false positive (not true CHF case). It was recommended that charts be reviewed to ensure patients have symptoms and signs consistent with the clinical criteria for CHF adapted from the Framingham study (50) or Carlson et al (51). These criteria include elements of history, physical examination and chest

radiography (Table 1), which need to be collected by chart review. Comparatively, of the clinical CHF validation methods, the Framingham criteria are more frequently referenced in the literature (39,46,52,53), although the panel felt that the Carlson criteria were more clinically oriented. Recommended exclusion criteria are shown in Table 1. Exclusion criteria included any CHF admission in the three years before the index admission, which was termed the 'washout' period. The washout period recommended by the panel represented a balance between identification of a hospitalization-naïve cohort and preservation of sample size, particularly in small- to medium-sized regions. Transfers from another acute care hospital were excluded to avoid improper attribution of outcome to any specific hospital, because it would be unclear to what extent any outcome (favourable or adverse) would be attributed to the sending or receiving hospital.

A summary list of the CCORT/CCS quality indicators is shown in Table 2 and specific details are described below.

Inpatient process indicators

The recommended process indicators were (i) angiotensin-converting enzyme (ACE) inhibitor prescribed at hospital discharge; (ii) beta-blocker prescribed at discharge; (iii) warfarin for atrial fibrillation; (iv) left ventricular function evaluated in hospital; (v) weights measured on at least 50% of hospital stay days; and (vi) discharge instructions to patient or surrogate. At the panel meeting, spironolactone and angiotensin receptor blocker indicators were removed from the final set of indicators because of difficulties in identifying inclusion/exclusion criteria (spironolactone) or limited evidence (angiotensin receptor blocker) supporting their role in CHF management. Specific detailed-inclusion/exclusion criteria for selected pharmacological indicators are shown in Table 3.

TABLE 1
Proposed criteria for identifying congestive heart failure (CHF) patients from hospital administrative data. The validity of a final coded diagnosis of CHF using administrative data can be assessed using either the Framingham criteria or Carlson scoring system

Inclusion criteria (administrative data)	
1.0	Most responsible ± primary/secondary diagnosis of heart failure (ICD-9 428.x)
Exclusion criteria	
1.0	Not admitted to an acute care hospital
2.0	Age <20 or >105 years
3.0	Invalid health card number
4.0	Transferred from another acute care facility
5.0	CHF coded as in hospital complication
6.0	CHF admission within the past three years
7.0	Admitted to surgical service
CHF diagnosis clinical validation criteria (chart review)	
Criterion 1	Framingham (two major or one major + two minor) (50) Major: PND, orthopnea, neck vein distension, elevated JVP, rales, cardiomegaly (radiographic), pulmonary edema, third heart sound, positive HJR Minor: edema, nocturnal cough, dyspnea, hepatomegaly, pleural effusion, tachycardia, weight loss in response to diuretics
Criterion 2	Carlson (eight to 12 definite, five to seven possible, four or less unlikely) (51) History: rest dyspnea, orthopnea, PND, dyspnea on exertion Physical examination: increased heart rate, elevated JVP, crackles, wheeze, third heart sound Radiographic: alveolar pulmonary edema, interstitial pulmonary edema, bilateral pleural effusions, cardiothoracic ratio >0.50, upper zone vascular redistribution

ICD International classification of diseases, 9th revision; JVP Jugular venous pulse; HJR Hepatojugular reflux; PND Paroxysmal nocturnal dyspnea

TABLE 2
Summary of congestive heart failure (CHF) quality indicators

CHF quality indicator summary		Data source		
		Administrative data	Chart data	
Structure	Coordinated program of ambulatory CHF care		x	
	Coding accuracy of heart failure discharge abstracts	x	x	
	Care by specialist (test*)	x	x	
	Standing admission orders for CHF (test*)		x	
Process (inpatient)	ACE inhibitor prescription at hospital discharge		x	
	Beta-blocker at hospital discharge		x	
	Warfarin at hospital discharge for atrial fibrillation		x	
	LV function evaluation before or during admission		x	
	Weights measured/recorded $\geq 50\%$ of in hospital days		x	
	Discharge instructions regarding discharge medications		x	
	Discharge instructions regarding salt/fluid restriction		x	
	Discharge instructions regarding daily weight monitoring		x	
	Discharge instructions regarding symptoms of worsening heart failure		x	
	Discharge instructions regarding follow-up appointment		x	
	Length of hospital stay	x	x	
	Process (outpatient)	ACE inhibitor prescription within 90 days of discharge	x	
		One-year ACE inhibitor adherence after discharge	x	
Beta-blocker prescription within 90 days of discharge		x		
One-year beta-blocker adherence after discharge		x		
One-year spironolactone adherence after discharge		x		
Warfarin for atrial fibrillation within 90 days of discharge		x		
One-year adherence with warfarin after discharge		x		
LV function evaluation within one month of discharge in those not assessed before or during admission (test*)		x		
Follow-up provider visit within four weeks of discharge	x			
Outcomes	In hospital mortality	x	x	
	30-day mortality	x		
	One-year mortality	x		
	All-cause readmission rate within 30 days of discharge	x		
	CHF readmission rate within 30 days of discharge	x		
	CHF readmission rate within one year of discharge	x		
	ED visits for CHF within 30 days of discharge (test†)	x		
	ED visits for CHF within one year of discharge (test†)	x		
	Any cardiovascular ED visit within 30 days of discharge	x		
	Any cardiovascular ED visit within one year of discharge	x		

*Test indicator: quality indicator that has not been incorporated in published guideline or for which it is uncertain whether the process of care can be feasibly and reliably measured or uncertain whether it is amenable to quality improvement efforts; †Test outcome indicator: outcome indicator for which it is uncertain whether it can be feasibly, accurately and reliably assessed or uncertain whether it is amenable to quality improvement efforts; ACE Angiotensin-converting enzyme; ED Emergency department; LV Left ventricular. Precise definitions for each indicator are available on the Canadian Cardiovascular Outcomes Research Team website (www.ccoort.ca)

The nonpharmacological inpatient process indicators (Table 2) included left ventricular function assessment in hospital for all patients unless evaluated and documented previously. The panel agreed that discharge instruction regarding essential critical information should comprise five independent quality indicators – salt/fluid restriction, weight monitoring, recognition and actions advised for worsening heart failure symptoms, follow-up appointment and medication counselling – although they recognized that chart documentation of these instructions may be suboptimal.

Outpatient process indicators

Potential indicators that were recommended included ACE inhibitor, beta-blocker or warfarin prescription within 90 days of hospital discharge. One-year adherence for the above therapies (including spironolactone) was also considered important. These indicators will need to be measured

through record linkage of hospital discharge databases to pharmacy claims databases.

Structural indicators

Organizational and structural quality indicators included presence of coordinated programmes for ambulatory CHF care (eg, heart failure clinics or an equivalent program of surveillance, monitoring, access to health professionals and patient education). The quality of CHF coding, determined by the proportion of patients who qualify as CHF cases based on clinical criteria (50,51), was a highly rated indicator.

Heart failure outcomes

A number of important outcomes were deemed potentially reflective of quality of CHF care and included mortality, all-cause readmissions, CHF readmissions and length of stay. Any cardiovascular emergency department visit within 30 days

TABLE 3
Detailed congestive heart failure (CHF) process indicator eligibility and exclusion criteria

ACEI prescription at discharge	
Eligible	LV systolic dysfunction (EF <40% or equivalent grade) Discharged alive
Exclusions	Contraindications to ACEI Moderate or severe aortic stenosis Bilateral renal artery stenosis Angioedema, hives, severe rash, other allergy or intolerance to ACEI use Hyperkalemia (K ⁺ >5.5 mmol/L) Hypotension (SBP <90 mmHg) Renal dysfunction (creatinine >200 µmol/L) Physician documentation of reason for nonuse (eg, patient refusal) Enrolled in clinical trial testing alternatives to ACEI
Beta-blocker for heart failure at discharge	
Eligible	LV systolic dysfunction (EF <40% or equivalent grade) Discharged alive
Exclusions	Conduction system disease Symptomatic bradycardia (HR <60 beats/min) not on beta-blocker Bifascicular block PR interval prolongation (>0.24 s) 2nd or 3rd degree AV block Hypotension Asthma Severe obstructive lung disease Physician documentation of reason for nonuse (eg, patient refusal) Allergy or intolerance to beta-blocker
Warfarin at hospital discharge for atrial fibrillation	
Eligible	Atrial fibrillation during the index admission documented in chart OR principal or secondary discharge diagnosis of atrial fibrillation in administrative data Discharged alive
Exclusions	Contraindication to warfarin Any documented bleeding episode Liver disease Uncontrolled seizure disorder History of frequent falls Inability to cooperate with treatment regimen Pregnancy Physician documentation of reason for nonuse (eg, patient refusal) Allergy or intolerance to warfarin

ACEI Angiotensin-converting enzyme inhibitor; AV Atrioventricular; EF Ejection fraction; HR Heart rate; LV Left ventricular; SBP Systolic blood pressure

or within one year of discharge was identified. Emergency department visits may be difficult to measure accurately using existing administrative databases, although it is anticipated that these databases will improve in the future.

The recommended benchmark/target values for optimal performance on selected inpatient process indicators in ideal patients are shown in Table 4. These targets were set at less than 100%, in recognition of the fact that contraindications to an intervention are not always captured in the indicator

TABLE 4
Recommended target levels for congestive heart failure process indicators in ideal patients (patients with no contraindication to an intervention)

Indicator	Minimum target level (%)
ACEI at discharge	≥85
Beta-blocker at discharge*	≥50
Warfarin for atrial fibrillation at discharge	≥85
LV function in hospital or before admission	≥75
Weighted ≥50% of days	≥90
Discharge instruction regarding medication	≥90
Discharge instruction regarding salt/fluid restriction	≥90
Discharge instruction regarding daily weights	≥90
Discharge instruction regarding symptoms of worsening	≥90
Discharge instruction regarding follow-up appointment	≥90
Follow-up provider visit within four weeks postdischarge	≥90

*It was recognized that this intervention may be more appropriately started in the outpatient setting. ACEI Angiotensin-converting enzyme inhibitor; LV Left ventricular

definitions. Targets for outcomes and outpatient process indicators were not developed because of uncertainty regarding the optimal achievable level of certain outcomes at present, and difficulty in identifying drug contraindications using administrative data, respectively.

DISCUSSION

The CCORT/CCS CHF quality indicators are the first set of CHF-specific indicators developed specifically for use in the context of the Canadian health care system. These indicators are distinct from other CHF indicator projects (5,6) in their breadth and scope because of the inclusion of quality indicators encompassing outpatient processes and the range of outcomes. The intent of developing these indicators was to identify a highly 'measurable' level of care delivered to CHF patients, as defined by a national expert panel. It is anticipated that these indicators should be useful to clinicians, researchers and others who want to assess the quality of CHF care provided in Canada, and potentially to users in other countries as well.

These quality indicators address the structure, process and outcomes of CHF care. The structural quality indicators embody concepts of continuity of health services, access to health care and patient education. These concepts are pillars of heart failure clinics, which have been shown to reduce rehospitalization (54-57) and decrease costs of CHF care (55,56). It was recognized that similar goals might be achieved in equivalent programs that stress patient education and continuity of care from hospital discharge as alternatives to structured heart failure clinics.

Processes of care for hospitalized patients include the assessment of left ventricular function, which may help to differentiate heart failure with low left ventricular ejection fraction from that with preserved systolic function. Based on the multiplicity of randomized trial evidence, the expert consensus panel viewed the initiation of ACE inhibitors, beta-blockers or warfarin (for atrial fibrillation) by the time of hospital discharge as important therapeutic processes

that may improve outcomes in CHF care. Before hospital discharge, the importance of instructing patients about five crucial elements that could potentially affect outcome was also identified (Table 2).

The exclusion criteria proposed in indicator definitions were moderately conservative. It is expected that some patients may receive an intervention even though they are not ideal candidates for the intervention. Panelists who were heart failure specialists stated that their normal practice would be to aggressively institute the above therapies even in the presence of relative contraindications. However, the panel erred on the side of conservatism, recognizing that most heart failure patients would be managed by generalists, and in consideration of the potential implications for institutional or regional quality assessments.

In the ambulatory patient who has been discharged from hospital, the importance of ACE inhibitor, beta-blocker or warfarin (for atrial fibrillation) prescription and adherence with therapy was identified. These indicators require access to pharmaceutical benefit administrative databases, which are available in many jurisdictions in Canada. These outpatient quality indicators are relatively unique to the Canadian CHF indicators and are important because of disease chronicity, change in health service delivery from the inpatient to the ambulatory setting and medication adherence.

The outcomes were considered to be important indicators because they are potentially modifiable by improvements in structure and process of care, and focused on mortality and hospital readmissions. The timing of outcomes considered the demography of community-based patients and the comorbidities that they may possess. Other important outcome indicators, including quality of life and patient satisfaction, were considered to be outside the scope of this endeavour, being very difficult to measure on a large scale.

Quality indicators may be used to describe and measure the quality of care delivered to patients by physicians, hospitals and organizations. The effect of quality improvement efforts (eg, report cards, educational programs or direct physician feedback) may potentially be measured using these parameters. Benchmarks for appropriate levels of implementation of quality indicators may help identify outlier regions or institutions that require improvement, and may help increase understanding of factors contributing to variations in disease outcomes. Quality indicators may also be used to assess adherence to clinical practice guidelines on an aggregate level and to target areas for quality improvement efforts.

Quality indicators are a relatively new method by which clinicians and researchers can begin to evaluate the care being provided and are based on high quality randomized trials, practice guidelines and outcomes studies. There are limitations to the generalizability of randomized clinical trials and, in the absence of sufficient outcomes data, there is potential for inaccuracy in some quality indicator definitions. As new evidence becomes available, the indicators may be modified to reflect current evidence-based practice. The precise nature of the definition of quality indicators may lend the impression that individual practice, which deviates from indicator recommendations, is in error. However, there may be situations where other extenuating circumstances explain why a particular intervention was not performed. Thus, these indicators should not be used for medicolegal purposes because of these limitations. They are intended primarily for

the quantitative assessment of CHF care for quality improvement purposes.

CONCLUSIONS

Canadian quality indicators for heart failure care have been developed. Quality indicators for heart failure may potentially be employed to detect both strengths and weaknesses in existing practice patterns, and serve as a foundation for interprovincial, interregional and interhospital comparative studies of quality of care. Selected indicators may also assist in local hospital quality improvement initiatives and guide physician education programs. The CCORT investigators hope that these indicators will have a beneficial impact on health care delivery in Canada and welcome feedback from Canadian physicians on their experience using these indicators.

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CONTRIBUTORS

All investigators contributed to the conception, design and execution of this project. Dr Lee was primarily responsible for selecting, reviewing and collating the background material in preparation for the expert panel meeting and writing the manuscript. Ms Tran assisted in reviewing the selected papers and manuscript revision. Dr Grant provided assistance with project planning, oversight and data interpretation. Ms Flinto coordinated the panel process and was primarily responsible for its day-to-day operations. She contributed to instrument design and manuscript revision. Drs Liu and Tu co-chaired the expert panel, guided discussion leading to consensus and provided logistical support. Dr Tu conceived the idea, supervised the panel project, and obtained funding for and contributed to writing the manuscript. All authors contributed to revising the manuscript.

APPENDIX

Members of the CCORT/CCS Canadian Congestive Heart Failure Quality Indicator Panel: Ian Arnold MD CCFP, Sunnybrook and Women's College Health Science Centre, Toronto, Ontario; Ross Davies MD FRCPC, University of Ottawa Heart Institute, Ottawa, Ontario; Jonathan Howlett MD FRCPC, New Halifax Infirmary, Halifax, Nova Scotia; Debra Isaac MD FRCPC, Foothills Medical Centre, Calgary, Alberta; Marie-Hélène Leblanc MD FRCPC, Hôpital Laval, Sainte-Foy, Québec; Hui Lee MD MSc FRCPC, The Group Health Centre, Sault Ste Marie, Ontario; Gordon Moe MD MSc FRCPC, St Michael's Hospital, Toronto, Ontario; Martha Radford MD, Yale New Haven Health System, New Haven, Connecticut; Stuart Smith MD FRCPC, St Mary's Hospital, Kitchener, Ontario; Christine Struthers MScN, University of Ottawa Heart Institute, Ottawa, Ontario; Ross Tsuyuki PharmD MSc, EPICORE Centre, Division of Cardiology, University of Alberta, Edmonton, Alberta.

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