

Introduction to the Canadian Cardiovascular Outcomes Research Team's (CCORT) *Canadian Cardiovascular Atlas* project

Jack V Tu MD PhD FRCPC^{1,2}, Susan E Brien PhD¹, Courtney C Kennedy MSc¹, Louise Pilote MD PhD FRCPC³, William A Ghali MD MPH FRCPC⁴, for the Canadian Cardiovascular Outcomes Research Team*

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The Canadian Cardiovascular Outcomes Research Team's (CCORT) *Canadian Cardiovascular Atlas* project was developed to provide Canadians with a national report on the state of cardiovascular health and health services in Canada. Written by a group of Canada's leading experts in cardiovascular outcomes research, the CCORT cardiac *Atlas* will cover a wide variety of topics ranging from cardiac risk factors and cardiac mortality rates to the treatment of patients with acute myocardial infarction and congestive heart failure and the outcomes of invasive cardiac procedures across Canada. Data in the *Atlas* will be presented at a national, provincial and health region level. The *Atlas* will be published as a series of 20 articles and chapters in future issues of *The Canadian Journal of Cardiology* and on CCORT's web site (www.ccort.ca). The journal version of the *Atlas* chapters will be written for a clinical audience and will include editorials written by invited experts, whereas the web-based version of each chapter will be written for a more general audience and will include additional supplemental information (for example, interactive colour maps and tables) that cannot be included in the journal version. Material from the *Journal* and the web will eventually be compiled into a book that will be distributed across Canada. This article serves as an introduction to the *Atlas* project and describes the rationale for and objectives of the CCORT national cardiac *Atlas* project.

Key Words: *Cardiovascular research; CCORT; Health care services*

Présentation du projet d'un Atlas canadien des maladies cardiovasculaires de l'Équipe de recherche canadienne sur les résultats des soins en cardiologie

RÉSUMÉ : Le projet d'un Atlas canadien des maladies cardiovasculaires (*Canadian Cardiovascular Atlas*) de l'Équipe de recherche canadienne sur les résultats des soins en cardiologie (*Canadian Cardiovascular Outcomes Research Team – CCORT*) a été élaboré dans le but d'offrir aux Canadiens un rapport national sur la santé cardiovasculaire et l'état des services de santé au Canada. Rédigé par un groupe de grands spécialistes du Canada en matière de recherche sur les résultats de la prise en charge des maladies cardiovasculaires, l'Atlas canadien des maladies cardiovasculaires de la CCORT couvrira un large éventail de sujets allant des facteurs de risque cardiaque et des taux de mortalité cardiaque au traitement des patients souffrant d'infarctus du myocarde et d'insuffisance cardiaque globale et aux résultats des interventions cardiaques effractives au Canada. Les données contenues dans cet Atlas seront présentées à l'échelle régionale, provinciale et nationale. L'Atlas prendra la forme d'une série de 20 articles et chapitres dans les numéros à venir du Journal canadien de cardiologie ainsi que sur le site Web de la CCORT (www.ccort.ca). La version de l'Atlas destinée au Journal s'adressera à un auditoire spécialisé et inclura des articles de fond signés par des spécialistes invités, tandis que la version destinée au site Web s'adressera à un auditoire plus général et inclura de l'information supplémentaire (tableaux et cartes en couleur interactifs, par exemple) ne pouvant être intégrée à la version imprimée. Le matériel présenté dans le Journal ainsi que sur le site Web sera éventuellement réuni dans un livre qui sera distribué partout au Canada. Cet article a pour but de présenter ce projet d'Atlas canadien des maladies cardiovasculaires de la CCORT et d'en décrire les fondements et les objectifs.

Cardiovascular disease is the leading cause of death and disability in Canada, accounting for 36% of all deaths nationally (1). In 1998, cardiovascular disease accounted for 18% of overall health care system costs, constituting the greatest direct cost of all illnesses. The total cost of cardiovascular disease in Canada has been estimated to be \$18 billion (2). In light of the large burden of cardiovascular disease on the Canadian health care system, there is a great need for a better

understanding of how cardiac health services are delivered in Canada and where improvements are needed in the system.

The Canadian Cardiovascular Outcomes Research Team's (CCORT) *Canadian Cardiovascular Atlas* project attempts to address this information gap through a comprehensive analysis of a number of important topics affecting the cardiovascular health and outcomes of Canadians. The *Atlas* is modelled after a previous 1999 Ontario-wide report entitled *Cardiovascular*

*The Canadian Cardiovascular Outcomes Research Team investigators are listed in the appendix

¹Institute for Clinical Evaluative Sciences, Toronto, Ontario; ²Division of General Internal Medicine and the Clinical Epidemiology and Health Care Research Program, Department of Medicine, Sunnybrook and Women's College Health Sciences Centre, University of Toronto, Toronto, Ontario, ³Department of Medicine, McGill University, Montreal, Quebec, ⁴Departments of Medicine and Community Health Sciences, Centre for Health and Policy Studies, University of Calgary, Calgary, Alberta

Correspondence and reprints: Dr Jack V Tu, Institute for Clinical Evaluative Sciences, G106-2075 Bayview Avenue, Toronto, Ontario M4N 3M5. Telephone 416-480-4700, fax 416-480-6048; email tu@ices.on.ca

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Health and Services in Ontario: An ICES Atlas, which was published by researchers at CCORT's host institution, the Institute for Clinical Evaluative Sciences (ICES) in Toronto (3). Written by a multidisciplinary team of Canada's leading outcomes researchers, the articles in the national *Atlas* series will cover a wide range of topics, ranging from the prevalence of cardiac risk factors in different health regions in Canada to the rates and outcomes of various invasive cardiac procedures. The specific topics addressed in the CCORT *Atlas* project are organized under five major categories: population health, acute myocardial infarction (AMI), congestive heart failure/atrial fibrillation, cardiac procedures and a miscellaneous section as shown in Table 1.

Through a unique partnership with Dr Eldon Smith, Editor-in-Chief of *The Canadian Journal of Cardiology*, and its publisher, Pulsus Group Inc, a version of each *Atlas* chapter written for a clinical audience will be published in the *Journal* in the upcoming months. Many of the chapters will have an accompanying editorial discussing the clinical or policy implications of the data contained within that chapter. A version of each chapter, written for a more general audience, will also be published on the CCORT web site (www.ccort.ca) and will include additional supplementary information (for example, interactive colour maps and supplementary tables) that cannot be included in the journal version due to space limitations. The CCORT web site will contain a version of each *Atlas* chapter translated into French. The 20 chapters from the *Atlas* will eventually be collated into a book format that will be distributed by the CCORT investigators to people and organizations throughout Canada. Readers interested in receiving a copy of the book can register for a copy on the CCORT web-site.

The editors of the CCORT cardiac *Atlas* (Drs Jack Tu, William Ghali and Louise Pilote) and the *Atlas* research coordinators (Susan Brien, Courtney Kennedy), along with the investigators from the CCORT initiative, hope to accomplish a number of important objectives through the development and publication of the *Atlas*:

1. To highlight important regional and interprovincial differences in the burden of cardiac disease, treatment patterns and outcomes of cardiac patients across Canada;

2. To stimulate discussion and quality improvement initiatives in communities and hospitals aimed at reducing the burden of cardiac diseases and improving the outcomes of cardiac patients throughout Canada;
3. To identify areas where future research is needed in Canada regarding the cardiovascular health and outcomes of Canadians;
4. To demonstrate to funding agencies and policy makers the value and importance of funding the large interdisciplinary research teams and population-based databases necessary to conduct comprehensive national health surveillance and outcomes research projects.

OBJECTIVE #1 HIGHLIGHTING REGIONAL VARIATIONS IN THE BURDEN OF ILLNESS AND QUALITY OF CARDIAC CARE

The cardiac *Atlas* will feature multiple analyses conducted at the provincial and health region levels across Canada. These analyses will show that, despite an attempt to create a universal health care system in which all Canadians have equal access to health care, 'geography is destiny' in many cases. The type of care that some patients receive depends in part on where he or she lives in Canada. This small-area rate variations phenomenon is by no means unique to Canada and has also been shown in other health care systems such as those in the United States and England (4,5). The reasons for these variations are highly complex and multifactorial; for example, variations in the prevalence of traditional cardiac risk factors are partially attributable to differences in the socioeconomic characteristics and ethnic mix of residents in different health regions of Canada. Different rates of angioplasty and bypass surgery are due to differences across provinces in the levels of investment in cardiac procedures by various provincial governments, who have historically made these decisions without the benefit of comparative information on rates of intervention in other jurisdictions in Canada. Random variation due to chance alone is also an important contributor to some of the variations observed.

TABLE 1
Topics covered in the Canadian Cardiovascular Outcomes Research Team (CCORT) *Canadian Cardiovascular Atlas* project

Population health	<ul style="list-style-type: none"> • Prevalence of cardiac risk factors • Burden of cardiovascular disease • Quality of life and cardiovascular disease • Hospitalization rates for cardiovascular conditions • Cardiovascular disease mortality
Acute myocardial infarction	<ul style="list-style-type: none"> • Acute myocardial infarction treatments (eg, thrombolytics, secondary prevention, cardiac procedures) • Acute myocardial infarction outcomes (eg, mortality, readmission rates) • Effects of socioeconomic status and geography on acute myocardial infarction procedure rates and outcomes
Congestive heart failure/atrial fibrillation	<ul style="list-style-type: none"> • Congestive heart failure treatment (eg, angiotensin-converting enzyme inhibitors, beta-blockers) • Use of warfarin in patients with atrial fibrillation • Congestive heart failure outcomes (eg, mortality rates, readmission rates) • Rates of stroke in patients with atrial fibrillation
Cardiac procedures	<ul style="list-style-type: none"> • Rates and outcomes of cardiac catheterization, angioplasty, bypass surgery, valve surgery
Miscellaneous	<ul style="list-style-type: none"> • Characteristics of physicians treating cardiovascular patients • Cardiovascular drug prescriptions

Although the CCORT investigators have attempted to elucidate some of the factors contributing to these variations in several chapters, a full understanding of all factors contributing to the variations observed would require additional data collection and analyses beyond the possible scope of this project. Administrative databases such as the Canadian Institute for Health Information's Hospital Morbidity Database are excellent resources for identifying regional variations but do not contain enough clinical detail to permit researchers to fully understand the variation observed. Information from the CCORT *Atlas* will not enable readers to determine the 'right rate' of intervention, but will show that important regional variations exist in Canada's health care system that require additional attention, study, debate and intervention before a more equitable health care system can be developed.

OBJECTIVE #2 STIMULATING QUALITY IMPROVEMENT INITIATIVES

The CCORT investigators hope that readers will use the information in the *Atlas* to develop quality improvement initiatives within their communities and hospitals where appropriate opportunities exist. Opportunities for improvement will probably be identified across the full continuum of cardiac care. For example, readers who find themselves living in communities with higher than average levels of cardiac risk factors (such as smoking, diabetes and hypertension) may wish to work with appropriate organizations such as their local Heart and Stroke Foundation chapter or their local regional health authority to reduce the impact of these risk factors through appropriate community-level health promotion programs. These can potentially be modelled after other well-known population-based health promotion initiatives such as the North Karelia project in Finland (6).

Readers from other regions of Canada may be surprised to find that they live or work in regions with suboptimal rates of secondary prevention after an AMI. Several interventions can potentially be undertaken in these areas. For example, hospitals serving patients in these areas may work together to implement standardized discharge orders or to develop secondary prevention clinics where patients can have appropriate secondary prevention medications reviewed and initiated if necessary.

Other readers may find that residents of their region have poorer access to cardiac procedures than those of other regions in Canada. They may use the information from the *Atlas* to lobby authorities at their local regional cardiovascular referral centres to make dedicated locations available for residents of their health region so that they can receive treatment interventions with the same timeliness as those who live closer to these centres.

The authors of the *Atlas* recognize that 'all change is local' and have not attempted to prescribe interventions for these variations that will work similarly all across Canada. Rather, they hope the *Atlas* data will be used by local readers to determine the types of interventions that are most suitable in their local jurisdictions. The authors are committed to producing findings that can be used by clinician and provider organizations to improve the quality of cardiac care in Canada. We hope to hear from readers of the *Atlas* about what they think of various *Atlas* articles and how they have used the material in various quality improvement initiatives. These comments may

be submitted through CCORT's website (www.ccort.ca), by email to ccort@ices.on.ca or by writing to the CCORT Investigators, c/o the Institute for Clinical Evaluative Sciences (ICES), G106-2075 Bayview Avenue, Toronto, Ontario, M4N 3M5, fax 416-480-6048 in Toronto. Examples of successful initiatives will be posted on the CCORT website so that other interested parties can learn from these 'best practices'.

OBJECTIVE #3 IDENTIFYING AREAS IN NEED OF FUTURE CARDIOVASCULAR RESEARCH IN CANADA

The *Atlas* brings together a diverse team of investigators from across Canada in an effort to address a number of important clinical, health services and population health topics regarding the burden of cardiac disease and outcomes of cardiac patients across Canada. Nevertheless, the authors recognize that it is not possible to address all possible dimensions of cardiac care in 20 articles and that much future research is needed. We hope that the *Atlas* will be used by the Canadian research community as a source for identifying gaps in cardiovascular research that warrant further study in the years ahead. Additional publications from the CCORT group are also planned that will integrate and expand beyond many of the topics covered in the *Atlas* series.

OBJECTIVE #4 INCREASED SUPPORT FOR FUNDING OF INTERDISCIPLINARY OUTCOMES RESEARCH TEAMS AND LARGE POPULATION-BASED CLINICAL AND ADMINISTRATIVE DATABASES

The creation of CCORT and its *Canadian Cardiovascular Atlas* project was made possible through large operating grants from the Canadian Institutes of Health Research (CIHR) Interdisciplinary Health Research Team program and the Heart and Stroke Foundation Research Fund. CCORT's home institute within CIHR is the Institute for Circulatory and Respiratory Health with CCORT's research of relevance to many of the 12 other institutes that make up CIHR.

CCORT consists of more than 30 cardiovascular outcomes researchers from five provinces across Canada (Nova Scotia, Quebec, Ontario, Alberta and British Columbia), who are working on a series of projects including the *Atlas* to measure and improve the quality of cardiac care across Canada. The CCORT investigators hope that the *Atlas* will be recognized as an important example of the value of CIHR's novel approach of bringing together well-established and new researchers from different disciplines (for example, medicine, surgery, statistics, computer science and economics) and regions of Canada to work collaboratively to achieve a final product that is much more substantial than can be achieved by an individual investigator alone. Cardiovascular outcomes research covering the clinical, health services and population health pillars of CIHR's research agenda has historically suffered from underfunding and a shortage of personnel in Canada. We hope that the publication of the *Atlas* will stimulate funding agencies and policy makers to increase their investments in this oft-neglected area of research so that further improvements in Canada's cardiac care delivery system can be achieved.

The publication of the *Atlas* draws upon a number of unique Canadian survey, clinical and administrative databases including data from Statistics Canada's Canadian Community

APPENDIX

Members of the Canadian Cardiovascular Outcomes Research Team (in addition to Drs Tu, Pilote and Ghali)

- David A Alter** MD PhD FRCPC, Institute for Clinical Evaluative Sciences, Cardiology, Schulich Heart Centre, Sunnybrook and Women's Health Sciences Centre, Department of Medicine, University of Toronto, Toronto, Ontario
- Peter C Austin** PhD, Institute for Clinical Evaluative Sciences, Department of Public Health Sciences, Faculty of Medicine, University of Toronto, Toronto, Ontario
- Jean-Marie Berthelot** BSc, Health Analysis and Measurement Group, Statistics Canada, Ottawa, Ontario
- Frederick I Burge** MD, Department of Family Medicine, Dalhousie University, Halifax, Nova Scotia
- Ronald G Carere** MD FRCPC, Heart Centre, St Paul's Hospital, University of British Columbia, Vancouver, British Columbia
- Eric Cohen** MD, Department of Medicine, University of Toronto, Department of Medicine, Division of Cardiology, Sunnybrook and Women's College Health Sciences Centre, Toronto, Ontario
- Jafna L Cox** MD FRCPC FACC, Departments of Medicine and Community Health and Epidemiology, Division of Cardiology, Health Services and Outcomes Research, Queen Elizabeth II Health Sciences Centre, Dalhousie University, Halifax, Nova Scotia
- Mark Eisenberg** MD MPH, Jewish General Hospital, McGill University, Montreal, Quebec
- Gordon Flowerdew** MSc DSc, Department of Community Health and Epidemiology, Dalhousie University, Halifax, Nova Scotia
- Michelle M Graham** MD FRCPC, Division of Cardiology, University of Alberta, Edmonton, Alberta
- Gregory M Hirsch** MD FRCSC, Division of Cardiac Surgery, Faculty of Medicine, Dalhousie University, Halifax, Nova Scotia
- Karin H Humphries** MSc MBA, DSc, Division of Cardiology, Department of Medicine, University of British Columbia, Centre for Health Evaluation and Outcomes Sciences, Vancouver, British Columbia
- Janet E Hux** MD SM FRCPC, Institute for Clinical Evaluative Sciences, Department of Medicine, University of Toronto, Clinical Epidemiology and Health Care Research Program, Sunnybrook and Women's College Health Sciences Centre, Toronto, Ontario
- Cynthia Jackevicius** BScPhM MSc FCSHP, University Health Network, Toronto General Hospital, Department of Pharmacy and Women's Health Program, Faculty of Medicine and Faculty of Pharmacy, University of Toronto, Institute for Clinical Evaluative Sciences, Toronto, Ontario
- Lois A Jackson** MA PhD, School of Health and Human Performance, Faculty of Health Professions, Dalhousie University, Halifax, Nova Scotia
- Helen L Johansen** PhD, Health Division, Statistics Canada, Ottawa, Ontario
- Kathryn King** RN PhD, Faculty of Nursing, Department of Community Health Sciences, Faculty of Medicine, University of Calgary, Calgary, Alberta
- Merril L Knudtson** MD, Division of Cardiology, Department of Medicine, University of Calgary and the Foothills Medical Centre, Calgary, Alberta
- Andreas Laupacis** MD MSc, Institute for Clinical Evaluative Sciences, Division of General Internal Medicine and the Clinical Epidemiology and Health Care Research Program, Department of Medicine, Sunnybrook and Women's College Health Sciences Centre, University of Toronto, Toronto, Ontario
- Peter Liu** MD FRCPC, Departments of Medicine and Physiology, Toronto General Hospital-University Health Network, Heart and Stroke/Richard Lewar Centre of Excellence, University of Toronto, Toronto, Ontario
- Douglas G Manuel** MD MSc FRCPC, Institute for Clinical Evaluative Sciences, Department of Public Health Sciences, Faculty of Medicine, University of Toronto, Toronto, Ontario
- Douglas K Martin** PhD, Department of Health Policy, Management and Evaluation, and the Joint Centre for Bioethics, University of Toronto, Toronto, Ontario
- Wayne Putnam** MD FCFP, Department of Family Medicine, Dalhousie University, Queen Elizabeth II Health Sciences Centre, Halifax, Nova Scotia
- Lawrence W Svenson** BSc, Health Surveillance Branch, Alberta Health and Wellness and the Department of Public Health Sciences, University of Alberta, Edmonton, Alberta
- Christopher R Thompson** MD CM FRCPC, Department of Medicine, University of British Columbia, St Paul's Hospital, Vancouver, British Columbia
- Michael Wolfson**, Statistics Canada, Ottawa, Ontario

Health Survey, the Canadian Institute for Health Information's Hospital Morbidity Database and various provincial databases such as the Improving Cardiovascular Outcomes in Nova Scotia (ICONS), Alberta Provincial Project for Outcomes Assessment in Coronary Heart Disease (APPROACH) cardiac procedure registries, Ontario Myocardial Infarction Database and Quebec AMI Database, among many others (7-10). The authors thank all of the many people across Canada who have participated in the collection of the data used in the *Atlas*, along with the data custodians who permitted the use of their data sets for this project.

Canada is at a crossroads in which fundamental decisions are being made about the need to balance patients' rights to

privacy and confidentiality regarding their health information with the need to allow anonymized data to be gathered and used by researchers and policy makers to monitor and improve the health system. The *CCORT Atlas* provides an important example of how large linkable anonymized population-based databases can be used to strengthen Canada's health system and benefit the health of Canadians. Very strict privacy and confidentiality procedures were used throughout the production of the *Atlas*.

The publication of the *Atlas* will highlight the potential benefits of developing a national cardiovascular surveillance system that would permit *Atlas*-like research to continue and expand into the future (1). To date, the federal and provincial

governments have not made the investments necessary to develop such a system, which is potentially putting the health and well-being of Canadians at risk, as noted in a recent report by the Auditor General of Canada (11). A national cardiovascular surveillance system, in which leading academic researchers work with governmental agencies with support from national funding organizations, would go a long way toward creating a more effective and accountable cardiac health care system for all Canadians. A well-funded national surveillance system would permit researchers the opportunity to gather the additional data necessary to fully understand the determinants of regional variation in the outcomes of cardiac patients in Canada and to conduct the fundamental methodological research that is necessary to achieve further advances in this field.

THE ROMANOW AND KIRBY HEALTH CARE COMMISSIONS

The recent publication of health care reform reports from both the Romanow and Kirby health care commissions have highlighted the need for more accountability in the Canadian health care system, and more research to guide and improve access to and quality of care in Canada (12,13). The CCORT *Atlas* is one of the most comprehensive cross-Canada health care evaluation studies ever to be published and we hope that it will serve as a template for the type of national research that is much needed in Canada. We hope that governments across Canada will see fit to support important national research initiatives so that national atlases and reports will be developed not only for cardiac disease but also for a wide spectrum of chronic conditions that affect the health and livelihood of millions of Canadians.

SUMMARY

The CCORT *Canadian Cardiovascular Atlas Project* was developed to provide Canadians with a national report on the state of cardiovascular health, care and outcomes. This report is different from others in that it brings together information from many sources into a series of articles that we hope will stimulate debate and change throughout Canada's health care sys-

tem. To reach as many interested Canadians as possible, a multifaceted 'knowledge transfer' research dissemination plan is being devised. The upcoming publication of the research in *The Canadian Journal of Cardiology* marks the first phase of the dissemination process and the release of the research into the public domain. We anticipate that the publication of the *Atlas* will be an important milestone in the evolution of cardiac care in Canada, leading to a more effective, transparent, and equitable health and cardiac care system for all Canadians.

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