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# Health Care Delivery in Canada and the United States: Are There Relevant Differences in Health Care Outcomes?

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**T E C H N I C A L  R E P O R T**

# Health Care Delivery in Canada and The United States: Are There Relevant Differences in Health Care Outcomes?

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# Executive Summary

Almost four decades ago, Canada and the United States had very similar health care systems. Today, they are very different. The Canadian system is predominantly publicly financed, whereas the American one is funded primarily through a private system, resulting in many sequelae. What is less clear is whether the two different health care systems produce differences in the quality of care for their respective populations.

We set out to address this question using the systematic review approach (i.e. the systematic identification, appraisal and qualitative synthesis of all relevant studies on a specific topic according to a predetermined and explicit methodology). Although 18 studies were included, none of them set out to address this question specifically. The synthesis of four cohort studies did not conclude significant differences in outcomes (mortality or recurrent disease event) despite differences in the aggressiveness or timing of treatment between Canada and the United States. A further 13 studies examined the relationship as part of a secondary analysis of surgical and medical interventions, with a focus on cardiovascular disease (six studies). In general, few differences between both countries were found in terms of relevant outcomes such as mortality.

Following an extensive search, this review found 18 relevant studies that compared health outcomes between the United States and Canada. None of these studies proved that differences in health outcomes were due solely to differences in the health care systems of these two countries. As a result, formulation of a distinct hypothesis regarding the relationship(s) between quality of care of each distinct health care system and outcomes in comparison to each other is unlikely.

This area of research is of interest to policymakers and health care programmers in their quest to maximize the effectiveness, efficiency and quality of the care being delivered within each health care system. This review has made apparent the need for more conclusive research in this area that specifically addresses the nature and causes of any relationships between processes and outcomes of care, and comparisons of these relationships and outcomes between Canada and the United States.

Specific recommendations include:

- An objective and operational definition of “quality” is necessary.
- Development of a standard or structured criteria for analysis of the quality of non-experimental designed studies is necessary.
- The applicability and appropriateness of systematic reviews to make comparisons between health outcomes in Canada with those in the United States needs to be examined (i.e. it may not be the ideal way to compare international health systems/policy). Alteration of the systematic review process so that it is specific and useful to designs other than randomized trials should be considered.
- Since there is likely little to be gained by conducting a more refined systematic review based on a larger sample size, a comprehensive comparison of primary data is needed.

In order to compare health outcomes between the United States and Canada, samples need to be drawn from similar time periods and types of insurance coverage (e.g. U.S. managed care vs. Canadian Ministry of Health) and of similar diagnoses. As well, adjustments must be made for risk (severity of illness), and the interventions received must be well-defined and similar.

# Introduction

## Background and Rationale

Almost four decades ago, Canada and the United States had very similar health care systems. Today they are very different. The divergence of the Canadian system to a predominantly publicly-financed and privately-delivered health care system has resulted in two systems that differ not only in the comprehensiveness and universality of their insurance coverage, but also differ in hospital budgeting, physician reimbursement, medical malpractice, administration costs and, possibly, resource availability.[1]

These facets of both health care systems have been examined and contrasted over the years. However, a more difficult dimension of these systems that has not been comprehensively or definitively evaluated is whether the health outcomes of patients of both countries are equivalent given similar treatments or procedures. Relatively few studies have been done which attempt to address this issue. Those studies that have attempted to determine any differences in health outcomes resulting from differences in the health care systems have focussed on a limited number of diagnoses, treatments or procedures.

This analysis represents an exploratory examination of these studies. It will look at:

1. the robustness of the literature in this area, both in terms of assessing quality of care and in comparing the outcomes of Canada and the United States

2. reported differences in health outcomes between the United States and Canada

3. how outcome differences have been linked to the quality of care

This information will provide an initial step toward a more detailed examination of this issue.

Since Canada's current health care environment consists of resource constraints, restructuring of health services and an aging of the population, this review represents the preliminary phase in a program whose ultimate goal is to help policy and decision makers determine what might be changed to ensure the best health care outcomes for Canadians, both at individual and population health levels.

## Quality of Care: Structure, Process and Outcomes

Assessment of quality of care can occur at one or more levels, from the care provided by an entire health system or plan to that provided by an individual hospital of health professional.[2]

Quality of care is the fundamental goal of health care, yet it is difficult to define. It is a concept that health care policy and programming strives for, and that many have attempted to elucidate. Given its many components and manifestations, defining and quantifying quality of care, in the context of health, is extremely difficult.[3]

Rhee et al stated that this difficulty is due to:

1. the influence of decision-makers who determine the value of the manifestations and quantities of health produced by alternative strategies of care

2. the complexity of health care that makes it necessary to decide whether the assessments will be confined to the technical process of care or will also include the amenities of care and the personal interaction between the patient and practitioner

3. the monetary cost which also influences the definition and assessment of quality

There are many factors that must be considered and integrated in the definition of quality of care, all of which are needed for health care to be of the highest quality. First, a health service must be provided that is needed, competent, cost-effective, timely, consistent with current knowledge and presents a minimal risk to the patients.[3-5] Secondly, this service must be provided to an individual or group that has the capacity to improve. This viewpoint, however, has major ethical implications. Finally, a desired outcome must be realized. In this context, an operational definition of the quality of care is "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes that are consistent with current knowledge."[6]

Donabedian[7] conceptualized that quality of care in terms of the information needed for making assessments and from which inferences can be drawn. He classified this information under three categories: structure, process and outcomes. Structure is defined as the attributes of the settings in which care occurs, including facilities, equipment, number and qualifications of personnel, medical staff organization, methods of peer review and reimbursement. Process denotes what is actually done in giving and receiving care, including patient's activities in seeking care and carrying it out, and the practitioner's activities in making a diagnosis and recommending or implementing the treatment. Outcomes are the measurable result of an episode of care[8,9] referring to the effects of care on the health status of patients and populations. Improvement in the patient's knowledge, salutary changes in their behaviour and the degree of patient satisfaction with care are included under a broad definition of health status.

Shroyer et al[8,9] provide a useful illustration of how Donabedian's model may be used to investigate the relationships between patient-related risk factors, process, structures and outcomes of care. Donabedian's premise is that there may be causal relationships between structure and process, and between process and outcomes. If one accepts health outcomes as a valid measure of the quality of care, then understanding the relationship of health outcomes to both structure and process may provide an effective approach to measuring quality of care.

A major debate in quality of care research is whether processes of care should be measured as indicators of quality of care.[2,10,11] Davies and Crombie[11] describe weaknesses of health outcomes as a barometer of care: they are difficult to interpret because comparisons are bedevilled by differences in case mix; important prognostic factors and nonfatal outcomes are often difficult to measure; outcomes may not be measurable for an extended period of time after the care episode, making linkage to quality inefficient; patients often desire good processes of care as well as

favourable outcomes; and the scarcity of some outcomes, such as mortality, require lengthy followup to detect deficiencies in care.[12]

Other limitations to the use of outcomes to assess quality of care are that the "sole reliance on outcomes has a tendency to yield a unidimensional view of quality that ignores the possibility that the consumers of health care desire many different attributes in addition to the best possible outcomes,"[12] and that outcomes "lie too far down the stream of production of care to be efficient detectors of quality."[13]

From the perspective of policy development and programming, due to the inability of health outcomes to directly indicate how care may be changed to improve quality, use of such outcomes as indicators of quality of care may be potentially useful as screens.[8,9] As well, there is an increasing acknowledgement of patient perceptions of health outcomes. For example, patients may not consider longer life or other physiological measures to be more important than functional ability.

This leads to another issue in the realm of 'quality of care'–that of patient satisfaction, a relatively new concept in health outcome measurement. However, is its role in quality of care that of an attribute or an indicator? As an attribute, Vuori[14] argued that "care cannot be of high quality unless the patient is satisfied." As an indicator, patient satisfaction reflects on the care received. Many reasons have been presented for not using patient satisfaction as a measurement of quality of care including: physical or mental incapability of assessing the quality of care received; lack of scientific and/or technical knowledge necessary for such an assessment; the rapid pace of events making it difficult for the patient to comprehensively or objectively view the quality of care he or she is receiving; different goals for care of the patient versus the physician; and difficulty in defining quality from the perspective of the patient (dependent on patient's culture, characteristics and on changes within patients).[14]

Davies and Crombie[11] reported that many researchers consider process measures to circumvent many of the problems of outcomes data when the process in question are well supported by research evidence. They also point out that much of health care lacks this support. Another caveat regarding the problems associated with the use of process outcomes is that appropriate processes of care that can be clearly defined for specific patient groups are required. Mant and Hicks[15] comment that measuring processes also becomes unwieldy if there are many aspects of process that have been shown to affect outcome. Brook and Cleary[2] proposed that process data may be a more sensitive measure of quality than outcome data. As an example, a poor outcome does not occur every time there is an error in the provision of care.

## Systematic Review

One approach to summarizing the existing evidence regarding the effects of distinct health care systems on the health outcomes of Canadian and American citizens is to perform a systematic review. This approach uses explicit and reproducible methods for identifying and selecting studies, and assesses each eligible study with respect to the strength of evidence it contains. Information from each study is then extracted. Because of the rigorous, explicit and reproducible way in which the systematic review is conducted, it provides a reliable method for synthesizing research

evidence. This approach enables the collection of high quality data that can allow for the separation of dogma and mythology from fact. The systematic review has gained wide acceptance within health care and the social sciences as one of the most valid ways to synthesize accumulated evidence.[16]

Within the last ten years, the number of published reviews has increased 500-fold.[17] Although most experience with systematic reviews has been with reviews of randomized controlled trials (RCTs), the same principles may apply to reviews of areas of research or inquiry where few, if any, RCTs have been done.

Comparisons of the Canadian and United States health care delivery systems have historically been marked by studies that are predominantly descriptive in nature. More recently, there has been a shift to increased use of analytical research, such as cohort and case-control designs, to discern associations between quality of care and health outcomes between the two countries. By suggesting associations and relationships, these studies may provide the basis for decision making related to policies and individual programs.

A systematic review of published Canadian and international studies is reported here. This review explored the measures of health outcomes used in comparative studies and the evidence available regarding the relationship between the health outcomes of Canadian and American citizens and their respective health care delivery. Use of the systematic review framework in this study was exploratory in that the focus was an area of research composed primarily of studies that were nonexperimental in design.

# Goals and Objectives

## Goal

The goal of this project is to synthesize the research evidence regarding the relationship, if any, between the differences in the Canadian and the United States health care delivery systems and health care outcomes, and to determine potential implications for future health care programming and policy relevant to the Canadian context.

## Objectives

The specific objectives of the project are:

1. To identify qualitative and/or quantitative differences in health outcomes between comparable subjects from Canada and the United States who have been given or offered the same health care intervention or group of interventions.

2. To identify factors specific to the study population, health care setting, intervention, and/or delivery of the intervention that may modify the health outcomes identified in objective 1.

# Methods

The methods used in this review, as with other systematic reviews, are modeled on those used in conducting primary research.[18] Comprehensiveness and detailed accounting of the conduct of the review were emphasized to ensure that it could be replicated. The team conducting the review included representation from the Thomas C. Chalmers Centre for Systematic Reviews at the Children's Hospital of Eastern Ontario, the Clinical Epidemiology Unit and the Loeb Health Research Institute, and the Masters of Health Administration Program at the University of Ottawa. The Centre's mandate is to teach, conduct and research systematic reviews. Collectively, the team provided a combination of health services, clinical and health policy, and health economic expertise.

## Systematic Review

### Search to identify published literature

To systematically identify relevant literature, the following computerized databases were searched: MEDLINE (1966–1997), AIDSLine (1980–1997), CancerLit (1980–1997), the PDQ database of the National Cancer Institute, and the Cochrane Library. A search strategy using a series of relevant key words was developed with the aid of an experienced information specialist (Appendix 1). Other methods of identifying potentially relevant documents included searching selected journals, reviewing reference lists from relevant articles and communicating with experts in the field.

### Selection of eligible documents

Two reviewers from the project team assessed potentially eligible published and unpublished documents to determine which documents should be included. The two reviewers reviewed the documents independently in order to decrease reviewer bias. Reviewer agreement was measured using the kappa statistic. Disagreements were resolved by discussion. A set of eligibility criteria was used to determine inclusion and exclusion of documents in the review. A document was included if it:

1. was written and/or published in any language in or after 1966
2. was a primary research report assessing the relationship between a health intervention and health outcome among human participants residing in Canada or the United States
3. included in its report measures of health outcomes (differentiates process, i.e. length of hospital stay and health outcomes)
4. included a control group

References were downloaded from computer database searches and automatically imported into a database. Copies of potentially relevant studies were obtained and screened by two independent reviewers to determine eligibility using a relevance form (Appendix 2).

A log of eligible studies was maintained using the keywords to identify studies. Descriptive information on language, publication type, study design and methods were also contained in keyword fields. Every effort was made to identify duplicate publications and/or publications which reported on the same or overlapping data.

#### Data extraction and quality assessment of included studies

Two independent reviewers using a Data Extraction Assessment Form (Appendix 3) abstracted information from included documents. The extraction profile collected descriptive data about each study, such as the year of publication, countries in which the study was conducted, procedure, treatment or diagnosis studied, study time period, study aim, study design, primary outcome measures, outcome collection method, intervention studied, sample size and key study results. Any disagreements were resolved by a third reviewer, and fourth if necessary.

Eligible studies were assessed for their strength of evidence using a set of criteria for grading the quality of the study methods. A study design of high quality avoids most sources of bias. The quality assessment portion of the form was dependent on the study design. Two independent reviewers from the project team assessed the study quality. A third reviewer resolved any disagreements.

# Results

## Results of Searches for Documents

Our combined search identified 1,715 documents that were included in our "U.S. and Canada" database. Eighty-six per cent [n=1,475] of the articles were found in MEDLINE. Our initial screen identified 146 documents of potential relevance to our review. These manuscripts were read to determine inclusion in the review.

## Synthesis

Of the 146 original articles deemed potentially relevant, 29 were included in the review. Of the 29 included in the review, 11 articles were excluded after further analysis: one was an editorial and 10 failed to make comparisons between Canadian and U.S. health outcomes.

### Study Characteristics

Of the 18 studies included, all were analytical studies (five cohorts [two retrospective and three prospective] and 13 secondary analyses). The majority of the included studies were published between 1990 and 1997 (n=16, 89%) and had study centres only in Canada and the United States (n=17). Only one had a study centre in a third country in addition to the Canadian and U.S. centres. All were published in English. The majority of studies focused on specific diagnostic categories (n=15) with eight (47%) concentrating on acute myocardial infarction and heart disease. Other diagnostic categories included end-stage renal disease, peritoneal disease, kidney transplantation, hip fracture repair, adult motor vehicle crash victims, ovarian cancer and large cell lymphoma. Only two (12%) examined health outcomes for nondiagnostic-specific surgical interventions. One study examined the rate of intensive care unit utilization and the effect on health outcome, specifically mortality rate.

Several of these studies (n=11) specifically addressed the influence of health care delivery variables, such as aggressiveness of treatment, practice patterns and accessability to health services, on health outcomes of Canadian and U.S. patients. While seven of the included studies did not address the impact of a specific intervention on health outcomes, four suggested relationships between the health care delivery systems and the outcome results of their respective studies. One study did not link differences in the health outcomes between the two countries to health care factors, but rather to demographic factors.

### Cohort studies

Five cohort studies were included in the review (see Exhibits 1 to 4). Two did not evaluate a specific intervention(s), one examined a health services intervention and two looked at medical and/or surgical interventions. These studies attempted to relate care processes (e.g. treatments and utilization) with outcomes, such as mortality, morbidity and functional status. One study looked at the possible effects of different acceptance rates for dialysis, which is higher in the United States than in Canada. The investigators were able to establish a potential association to increased cardiovascular morbidity and better survival in Canada. Similarly, in a study that attempted to determine if differences in treatment and outcomes exist for patients with ovarian

cancer, no differences in outcome were established despite significant differences in treatment aggressiveness.

In summary, four studies did not conclude significant differences in outcomes, (mortality or recurrent disease event) despite differences in aggressiveness or timing of treatment between Canada and the United States. Further investigation is needed in one study to establish the reason for increased functional status of American acute myocardial infarction patients.

**Secondary analyses**

Thirteen secondary analyses were included in the review (see Exhibits 1 to 4). Surgical and/or medical interventions were the focus of 50 per cent of these studies. Two of the studies examined health services interventions while five did not specify an intervention. The majority of the secondary analyses (n=15) were comparisons of health outcomes or process outcomes between Canada and the United States. The aim of only one study was to determine a relationship between health care structure (expenditures) and health outcomes in the two countries being examined.

Six studies (46%) focused on cardiovascular conditions or treatments. Of these, four found no differences in survival or mortality, of which two were unable to conclusively link mortality to treatment variables. The outcomes of interest of one study were quality of life and functional status of patients in the United States in comparison to those in Canada. No difference was identified in quality of life, but the functional status of American patients was greater than that of their Canadian counterparts. Survival rates, quality of life and use of cardiac procedures were found to be greater in the United States than in Canada in another study focusing on acute myocardial infarction (AMI) patients.

Of the two studies investigating non-specific surgical populations, investigators of one study concluded that although health care expenditures are higher in the United States, there was no difference in mortality rates of surgical patients in the United States compared to those in Canada. Although the study concluded that there are differences in mortality rates of surgical patients in both countries, these differences could not definitely be attributed to differences in the health care systems.

One study attempted to compare hospital admission, mortality and cost of medical care for patients with end-stage renal disease. Despite the higher mortality rates found in the United States, investigators could not fully explain these differences by adjusting for case mix and treatment variables. Costs and resource utilization associated with adult motor vehicle crash victims were the focus of one secondary analysis. Again, despite higher costs and resource utilization in the United States, no differences were found in health outcomes between the two countries. A comparison of intensive care utilization in one Canadian province and a specific area of the United States concluded that although length of ICU stays was higher in the United States, no difference in mortality rates were noted between the two countries. One study noted a higher mortality rate for hip fracture repair patients in the United States in comparison with their cohorts in Canada. One last study attempted to identify differences in mortality rates of black and white kidney transplant recipients in the United States. Graft survival rates were lower in blacks than in whites in the United States. Although short- and long-term survival for blacks and whites in

Canada were similar to each other, this is only suggestive of long-term influences of the health care systems and socioeconomic factors between the United States and Canada.

# Discussion

This systematic review posed several methodological challenges. Despite the team's extensive cumulative research background, great difficulty was encountered in extracting data from the included studies, specifically in trying to determine the category of study design used for several of the studies. Some studies had aspects of cohort and secondary analyses combined. In these cases, third, and in some instances, fourth reviewers assisted in determining the study design used.

## Quality of Care

Quality of care is a concept that is difficult to define and therefore even more difficult to measure and compare. The most widely used definition is that conceptualized by Donabedian[7] in which he categorized quality of care in terms of the information needed for making assessments and from which assessments can be drawn: structure, process and outcomes. Donabedian's premise is that there may be causal relationships between structure and process, and between process and outcomes. However, many investigators have debated the issue of whether processes of care should be measured as indicators of quality of care.[2,10,11,15]

In this review, all of the cohort studies attempted to relate processes of care with outcomes. No significant differences in outcomes (mortality or recurrent disease event) between Canada and the United States were identified in any of these studies despite differences in aggressiveness or timing of treatment. Further investigation is needed in one study to establish the reason for increased functional status of American acute myocardial infarction patients over their Canadian counterparts. Of the secondary analyses included in this review, only one did not attempt to link processes and outcomes of care. This study focused solely on the comparison of mortality rates between Canadian and American AMI patients; no difference was found. Three studies found differences in health outcomes that were suggestive of differences in health care system; however, further investigation is required to confirm any such relationship. Five of the secondary analyses examined in this review concluded no difference in outcomes despite differences in processes of care, while only one found differences in processes and in outcomes.

In summary, of the 18 studies (five cohort and 13 secondary analyses) included in this review, 67 per cent found no differences in health outcomes between patients in Canada and their cohorts in the United States. Investigators of one study indicated that nonsignificant differences may be the result of similar changes between Canada and the United States as opposed to differences between the countries. Further investigation is needed in five studies to more conclusively determine the cause of outcome differences between the two North American countries.

## Methodological Quality

When conducting analytic studies to identify differences in health outcomes, experimental studies provide the strongest evidence. However, the use of this study design is difficult in comparisons of health outcomes between Canada and the United States because individuals cannot be randomly allocated to exposure of one country's health care system or the other. As a result, this review was left with less rigorous study designs, such as cohort, case-control, cross-sectional, and secondary analysis study designs. In this review, included studies were either cohort (28%) or

secondary analysis (725). Even when well-designed, these types of studies are open to several forms of bias or systematic error.[19] Overall, we found the quality of reporting of the cohort studies to be quite inadequate, suggesting that either the designs were not as strong as the could have been or that authors failed to report information to allow us to adequately assess quality. No evidence-based criteria, such as the Jadad Scale for randomized controlled trials, exist for analysis of the quality of observational studies and those of secondary analyses.

The design of the secondary analyses seemed adequate with the exception of one study for which the research question was not clear. One study did not include enough information to draw definitive conclusions. As was the case for the cohort studies, the quality of reporting of the secondary analysis needs to be taken with caution.[20,21] For example, the publications did not report whether these analyses were ones considered *a priori* or *post hoc*.

As a result of the weak quality of reporting, specific synthesis of the study results was done with caution and most of our recommendations are related to the design and reporting of this type of research. This finding is not unique to the area of outcome comparison research, and quality of reporting has been found to be a major issue in most systematic reviews.

## Limitations of this Review

There are several limitations of this review that should be considered. The first is that establishment of an accepted, operational definition of 'quality' is necessary prior to comparing quality of care, inclusive of relating processes of care and outcomes, between Canada and the United States. Quality of care may be defined from the perspective of individuals, providers or the system. That is, it changes for different individuals and groups of patients. Outcomes of interest need to be carefully and completely defined in advance of their comparison between countries.

Another limitation of this review was the groups of patients being compared between the two countries. A large proportion of the studies attempted to make generalizations of Canadian versus American health outcomes using subjects drawn from limited populations. For example, one study drew their subjects from the United States as a whole, the comparison sample was drawn from a single province in Canada. Given that each province is responsible for their own management and delivery of health care, generalizations to Canada as a whole are inappropriate. With respect to the populations compared, the diagnostic conditions considered and outcomes evaluated were too heterogeneous to allow calculation of a single summary statistic. Also, the appropriateness of systematic review method and process to review and evaluate nonexperimental designs, such as cohort and secondary analyses, is questionable.

Identifying relevant studies is an important part in the process of conducting a systematic review. Even for randomized trials, where indexing to identify such studies is well-developed, as are electronic filters to find them, only about half of relevant studies can be identified.[22] For other study designs, such as the ones included in this review, there are no established filters to identify them. It is possible that we did not identify relevant studies to include in this systematic review. However, we did contact content experts in the field in an attempt to be as broad as possible in our search for relevant evidence.

The randomized trial is usually the design of choice when trying to minimize or avoid bias. However, this design is most appropriately used for evaluating intervention studies, such as pharmacological and community-based ones. It is difficult to imagine the merits of using such study design when trying to explore differences in the quality of care between countries. Perhaps the strongest design to use here is the prospective cohort. Unfortunately, as our extensive search indicated, there are few such studies.

# Conclusions and Recommendations

Following an extensive search, this systematic review found 18 relevant studies that compared health outcomes between the United States and Canada. None of these studies proved that differences in health outcomes were due solely to differences in the health care systems of these two countries. As a result, formulation of a distinct hypothesis regarding the relationship(s) between quality of care of each distinct health care system and outcomes in comparison to each other is unlikely.

This area of research is of interest to policymakers and health care programmers in their quest to maximize the effectiveness, efficiency and quality of the care being delivered within each health care system. This review has made apparent the need for more conclusive research in this area that specifically addresses the nature and causes of any relationships between processes and outcomes of care and comparisons of these relationships and outcomes between Canada and the United States. Our specific recommendations are:

- An objective and operational definition of 'quality' is necessary.
- Development of a standard or structured criteria for analysis of the quality of nonexperimental designed studies is necessary.
- The applicability and appropriateness of systematic reviews to make comparisons between health outcomes in Canada with those in the United States needs to be examined (i.e. it may not be the ideal way to compare international health systems/policy). Alteration of the systematic review process specific and useful to non-RCT type studies should be considered.
- Since there is likely little to be gained by conducting a more refined systematic review based on a larger sample size, a comprehensive comparison of primary data is needed.
- In order to compare health outcomes between the United States and Canada, samples need to be drawn from similar time periods and types of insurance coverage (e.g. U.S. managed care versus the Canadian Ministry of Health) and of similar diagnoses. As well, adjustments must be made for risk (severity of illness), and the interventions received must be well-defined and similar.

# Acknowledgements and Affiliations

This review represents an initial step in an attempt to synthesize and understand the differences, if any, in health outcomes between Canadian and American citizens resulting from differences in the health care delivery systems between these countries. It would not have been possible without the support of several individuals including Jesse McGowan, Alison Jones, Leah LePage and Ellen Zeiss.

## Partners

- Thomas C. Chalmers Centre for Systematic Reviews, Children's Hospital of Eastern Ontario (CHEO)
- Masters of Health Administration (MHA) Program, Faculty of Administration, University of Ottawa
- Clinical Epidemiology Unit, Loeb Health Research Institute at the Ottawa Hospital, Civic Campus

# Exhibits and Appendices

## Exhibit 1: Characteristics of Comparative Studies

| Ref # | First Author | Publication Year | Country | Group Studied | Study Time Period |
|---|---|---|---|---|---|
| 27 | Gilpin | 1983 | Canada, United States & Denmark | Acute myocardial infarction | Cda: Nov/77-Jan/80<br>US: Aug/68-Jun/79 |
| 28 | Pilote | 1995 | Canada & United States | Heart disease | Aug/88-Aug/91 |
| 29 | Mark | 1994 | Canada & United States | Acute myocardial infarction | 1990-1993 |
| 30 | Hornberger | 1997 | Canada & United States | End-stage renal disease | USRDS: 1986-1992<br>US: 1983-1989<br>Cda: 1983-1989 |
| 31 | Churchill | 1996 | Canada & United States | Continuous ambulatory peritoneal dialysis | Sept/90-Dec 93 |
| 1 | Boulanger | 1993 | Canada & United States | Adult motor vehicle crash | Jul/86-Jul/90 |
| 32 | Anderson | 1997 | Canada & United States | Unstable angina pectoris & non-Q-wave acute myocardial infarction | Oct/90-Apr/93 |
| 33 | Grumbach | 1995 | Canada & United States | Coronary artery bypass surgery | 1987-1989 |
| 34 | LoCoco | 1995 | Canada & United States | Suboptimal stage IIIc/IV ovarian cancer | Jan/87-Oct/93 |
| 35 | Koyama | 1994 | Canada & United States | Kidney transplantation | Oct/87-Dec/91 |
| 36 | Pilote | 1994 | Canada & United States | Myocardial infarction | Jan/89-Dec/90 |
| 37 | Rapoport | 1995 | Canada & United States | ICU utilization | 1990-1991 |
| 38 | Roos | 1990 | Canada & United States | Various surgical procedures | Cda: 1980-1986<br>US: 1984-1985 |
| 39 | Tu | 1997 | Canada & United States | Acute myocardial infarction | US: Jan/91-Dec/91<br>Cda: Apr/91-Mar/92 |
| 40 | Roos | 1996 | Canada & United States | Hip fracture repair | Cda: 1979-1992<br>US: 1984-1985 |
| 41 | Roos | 1992 | Canada & United States | Common surgical procedures | US: 1980-1986<br>Cda: 1984-1985 |
| 42 | Jones | 1989 | Canada & United States | Large cell lymphoma | Cda: May/80-Apr/88<br>US: 1971-1988 |
| 43 | Rouleau | 1993 | Canada & United States | Acute myocardial infarction | Jan 27/87-Jan 28/90 |

## Exhibit 2: Study Design of Comparative Studies

| Ref # | Study Aim | Study Design | Primary Outcome Measure | Outcome Collection Method | Intervention, Setting & Study Area | Inclusion/Exclusion Criteria |
|---|---|---|---|---|---|---|
| 27 | To determine whether mortalityrate is exponential for AMI patients | Secondary analysis | 1 year mortality | Database | No intervention<br>San Diego, Vancouver, Copenhagen<br>Urban | I: Within 24 hrs of symptom onset; 2 of: chest pain, enzyme rise, ECG changes<br>E: Death within 24hrs post hospital admission; death from non-cardiac or unknown causes |
| 28 | To compare functional status in Americans & Canadians with & without prior symptoms of heart disease | Secondary analysis | Functional status;<br>Quality of life | Self-report questionnaire; medical records; personal interview | Surgical and medical interventions<br>7 US hospitals,<br>Montreal Heart Institute<br>Study area unclear | I: severe angina or objective evidence of myocardial ischema; coronary stenosis 50% or more in 2 or more vessels; no previous coronary angioplasty of CABG<br>E: age less than 17 yrs, or 80 years or older; pregnancy; concomitant surgery; other life threatening conditions; congenital, valvular or primary myocardial heart disease; single vessel or significant left main coronary artery disease; inability to understand protocol or cooperate with its requirements |
| 29 | To compare use of medical resources and quality of life outcomes between US and Canadian patients | Secondary Analysis | Quality of life; use of medical resources; medical outcomes (stroke, reinfarct, survival) | Telephone interview; personal interview; medical records; database | No intervention<br>US and Cdn specialty centres<br>Study area unclear | I: As per criteria for GUSTO trial; presented to participating hospital within 6 hrs of onset of acute myocardial infarction symptoms; electrocardio-graphic ST segment elevation<br>E: previous stroke; actively bleeding; standard exclusion criteria for thrombolysis |
| 30 | To compare hospital admission, mortality and cost of medical care for patients with end-stage renal disease in the US and Canada | Secondary analysis | Mortality; hospital admission, cost of medical care | Database | No intervention<br>US and Manitoba<br>Study area unclear | I: Patients with end-stage renal disease |
| 31 | To evaluate various factors that explain previously reported US vs. Canadian differences in mortality with dialysis | Prospective cohort | Mortality; technique failure; non-fatal cardiovascular event; peritonitis | Unclear data collection method | No intervention<br>US and Cdn dialysis centres<br>Study area unclear | I: Began dialysis between September 1, 1990 and December 31, 1992<br>E: Unlikely to survive 6 months; live donor transplantation; move from study centre planned within 6 months; hepatitis B or HIV; active systemic inflammatory disease |
| 1 | To compare trauma care and outcome among motor vehicle crash victims in Canada and US trauma centres and to examine resource utilization and costs at both centres | Secondary analysis | Trauma care; acute trauma care costs; mortality | Database | Health care/services intervention<br>Toronto and Baltimore trauma centres<br>Urban, suburban and rural | I: Adult (>14 years); MVC victim (driver or passenger); admitted to study centre between July 1986 and July 1990<br>E: Former trauma victims readmitted to each centre for elective reasons |

| Ref # | Study Aim | Study Design | Primary Outcome Measure | Outcome Collection Method | Intervention, Setting & Study Area | Inclusion/Exclusion Criteria |
|---|---|---|---|---|---|---|
| 32 | To compare treatments and outcomes for unstable angina or non-Q-wave acute myocardial infarction between US and Canadian tertiary care centres | Secondary Analysis | Mortality; nonfatal infarction | Medical records; personal interview | Health care/service Intervention<br>US and Cdn tertiary care hospitals<br>Study are unclear | I: Episode of either rest or exertional (new onset or increasing in frequency or duration or provoked by progressively less activity) pain ischemic in origin, lasting ~5 min. and occurring within 96 hrs before enrollment<br>E: Persistent electrocardiographic ST segment elevation ≥1mm for >30 min; Q-wave AMI within 48 hrs of enrollment; constant pain of > 6 hrs duration; pain suggestive of aortic dissection or pericarditis; admitted for planned revascularization |
| 33 | To determine how regionalization facilities for CABS affects geographic access to CABG and outcomes | Secondary analysis | Mortality | Discharge records | No intervention<br>New York, California, Ontario, Manitoba, British Columbia<br>Study area unclear | I: Adult residents of 5 jurisdictions; CABG in hospital in their jurisdiction<br>E: CABS at hospital performing 5 or less CABS procedures per year or not licensed to perform CABS |
| 34 | To determine if differences exist in treatment and outcomes of patients with suboptimally debulked stage IIIc/IV epithelial ovarian cancer between 2 tertiary care cancer centres in the US and Canada | Retro-spective Cohort<br>Secondary Analysis | Debulking rate; survival | Medical records | Health care/services intervention<br>Toronto and Durham, North Carolina<br>Study area unclear | I: Stage IIIc or IV suboptimally debulked disease; epithelial ovarian cancer treated at either of the 2 study centres from 1987-1989 |
| 35 | To examine factors other than medical related to poorer survival rates of blacks undergoing kidney transplants | Secondary analysis | Survival | Database | Surgical interventions<br>US and Cdn transplant centres<br>Study area unclear | I: 1st cadaveric kidney transplants performed between Oct. 1987 and Dec. 1991 reported to United Network for Organ Sharing Scientific Renal Transplant Registry; >50 transplants/yr (US centres) |
| 36 | To compare practice patterns and clinical outcomes for acute myocardial infarction | Retro-spective cohort | Rates of diagnostic and therapeutic procedures; mortality; reinfarction; level of functional status | Self-report questionnaire; medical records; telephone interview | No intervention<br>Stanford and McGill University hospitals<br>Urban | I: Acute myocardial infarction diagnosis (2 of: elevated serum creatine kinase or oxaloacetic transaminase level; history of prolonged chest pain consistent with MI; appearance of new Q waves or evolutionary ST-T changes); admitted to cardiac care unit through ER or output department<br>E: patients transferred from another hospital for treatment of AMI or its complications |
| 37 | To analyze differences in ICU utilization between Canada and the US | Secondary analysis | Length of stay in ICU; mortality | Medical records; database | No intervention<br>Alberta and Western Massachusetts and 25 other US hospitals<br>Unclear | I: Admitted to ICU during study dates with primary diagnosis included in one of 11 predetermined diagnostic-related groups<br>E: Children, patients with mental disease, patients not in major disease category |

| Ref # | Study Aim | Study Design | Primary Outcome Measure | Outcome Collection Method | Intervention, Setting & Study Area | Inclusion/Exclusion Criteria |
|---|---|---|---|---|---|---|
| 38 | To determine whether higher health care expenditures in US than in Canada are associated with improved health outcomes | Secondary analysis | Short- and long-term mortality | Database | Surgical interventions<br>New England and Manitoba<br>Urban, suburban, and rural | I: Age 65 yrs or older, in Manitoba or New England having one of the 11 most frequent and costly surgeries<br>E: Prostatectomies and cholecystectemies associated with cancer |
| 39 | To compare use of cardiac procedures and outcomes after acute myocardial infarction in elderly patients in the US and Canada | Secondary analysis<br>Retro-spective cohort | Mortality | Database | Surgical interventions<br>US and Ontario<br>Urban, suburban, rural | I: Elderly with primary diagnosis of AMI; new AMI<br>E: Patients age < 65 years; discharged from within 5 days, transferred to another hospital within 2 days after admission when admitting diagnosis at receiving hospital not MI; patients with MI in preceding 365 days; HMO enrollees |
| 40 | To compare US and Cdn postoperative mortality rates for hip fracture repair | Secondary analysis | 30-day mortality | Medical records | Surgical intervention<br>New England and Manitoba<br>Study area unclear | I: Age 65 years or over; surgical repair of femoral neck fracture<br>E: Patients whose hospital abstracts could not be assigned an operation date or contained another procedure; low volume hospitals |
| 41 | To report 3 year mortality rates following common surgical procedures undergone by patients age 65 years or over | Secondary analysis | Mortality | Database | Surgical intervention<br>New England and Manitoba<br>Rural, urban and suburban | I: Aged 65 years or over, undergoing relatively common surgical procedures<br>E: Prostatectomy with cancer of bladder or prostate; cholecystectomy with cancer of gallbladder |
| 42 | To assess long-term outcome of patients with localized (stage I or II) diffuse large-cell lymphoma treated with initial combination chemotherapy with CHOP with or without involved-field radiotherapy following chemotherapy | Prospective cohort | Relapse free survival | Unclear | Medical Interventions<br>Arizona and British Columbia tertiary academic health centres<br>Study area unclear | I: Localized disease<br>E: Bulky disease (Vancouver) |
| 43 | To test the hypothesis that major differences in the organization of US and Cdn. Health care systems may be accompanied by differences in care of AMI patients | Prospective cohort | Survival; recurrent MI; activity-limiting angina | Database and original study's log book | Medical (pharmaceutical) & surgical interventions | I: Randomization: 3 & 16 days after AMI or after re-vascularization; left ventricular dysfunction (radio-nuclide ejection fraction ≤40%) measured between 3 & 16 days post AMI; informed consent<br>E: overt heart failure; chest pain; positive exercise stress test; contraindications to use of captopril; presence of concurrent medical problems |

## Exhibit 3: Outcomes of Comparative Studies

| Ref # | Sample Size | # with Outcome/ Control Sample Size | Follow up Period | Key Study Results / Summary of Results |
|---|---|---|---|---|
| 27 | Cda: 346<br>US: 704<br>Denmark: 1140 | Cda: 92<br>US: 179<br>Denmark: 364 | 1 year | No significant difference in survival between Canada & United States.<br>Mortality curves after AMI to 1 yr. are not exponential; change point at 21 days. |
| 28 | Cda: 934<br>US: 278 | | None | Similar quality of life in American & Canadian patients with no prior symptoms of heart disease.<br>Lower functional status in Canadian patients with previous history of heart disease or post MI more likely related to differences in medical care than to differences in non-medical factors (eg. Climate) |
| 29 | Cda: 400<br>US: 2600 | | 1 month, 6 months, 1 year | Higher survival rate in US; higher in hospital MI in Cdns; higher recurrent myocardial ischema in-hospital in Cdns.; higher in hospital stroke in US.; greater likelihood of Cdns visiting physician in year after MI.; greater likelihood of Americans visiting specialist in year after MI.; greater participation in cardiac rehabilitation programs in US.<br>US patients had substantially better quality of life 1 year post AMI<br>Greater use of cardiac procedures in US than in Cda. |
| 30 | Cda: 549<br>US: 5192 + 1578 | | | After adjustment for casemix and treatment variables, mortality was 47% higher in US; hospitalization rate was 41% lower in Detroit than in Manitoba; adjusted monthly costs were $503 higher in Detroit than in Manitoba; Manitoba patients >2X as likely to receive kidney transplants than US patients.<br>Higher mortality rates in US cannot be fully explained by adjustments for casemix and treatment variables. |
| 31 | Cda: 578<br>US: 102 | | 1 year (every 6 months for nutritional status) | Higher probability of non fatal CV event in US; 2 year survival probabilities in Canada (79.7%) and US (63.2%) not explainable by demographic variables, baseline clinical variables, nutritional status or adequacy and interaction between these variables.<br>Exclusion of patients with comorbidity and cognitive dysfunction in Canada may, in part, explain the better survival and decreased CV morbidity in Canada.<br>Higher acceptance rate for dialysis in the US may explain, in part, the greater CV morbidity and decreased survival. |
| 1 | Cda: 1263<br>US: 4632 | Cda: 40<br>US: 265 | None | Equivalent mortality rates discharge dispositions in the Cdn and US trauma centres; acute hospital-based costs and professional charges were significantly lower at Cdn centre; ICU utilization significantly lower in Canada.<br>While MVC victims in Canada and US have similar outcomes, health care system costs and utilization patterns differ significantly between the two countries. Trauma care costs and resource utilization are markedly lower in Canada. |

| Ref # | Sample Size | # with Outcome/ Control Sample Size | Follow up Period | Key Study Results / Summary of Results |
|---|---|---|---|---|
| 32 | Cda: 642<br>US: 1733 | 6 weeks:<br>Cda: 2.3% death, 2.8% AMI, 13.9% death, AMI or RI<br>US: 2.5% death, 3% AMI, 18.4% death, AMI, or RI<br>1 year:<br>Cda: 7.5% death, 4.2% AMI, 27.3% death, AMI, or RI<br>US: 6.8% death, 5% AMI, 30.3% death, AMI or RI | None | No significant difference in death or MI at 6 weeks or at 1 yr between Canada & United States.<br>US physicians and hospitals did not consistently utilize more resources and were not more aggressive than Cdn physicians when treating acute coronary syndromes. |
| 33 | Cda (Manitoba, Ontario, British Columbia): 18,278<br>US (New York + California): 98,315 | Cda: 2.9% mortality rate<br>US: 3.1% mortality rate | None | Most of CABS' performed in Canada and New York were in hospitals performing >499/yr.; less Cdns. than Americans live within 25 miles of a hospital doing CABS; highest mortality rates in California hospitals performing <100 CABS/yr.<br>Regionalization of CABS facilities: largely avoids problem of low volume outlier hospitals with high post-operative mortality rates; narrows choice of facilities but doesn't disproportionately affect access for populations living remote distances from CABS facilities.<br>No US/Canadian difference. |
| 34 | Cda: 61<br>US: 68 | Cda: 19% optimal debulking; 1.7 laparotomies/pt; 8.8 chemotherapy regimens/pt; 21 months median survival; 10% 5 year survival<br>US: 20% optimal debulking; 2.5 laparotomies/pt; 12.6 chemotherapy regimens/pt; 20 months median survival; 11%- 5 year survival | To death or 1993 (4-5 years) | Higher average number of laparotomies per patient in US; higher mean number of different chemotherapy regimens and total number of courses of chemotherapy during course of disease in US; 5-year survival 10% in Canada and 11% in US; surgeons specialty and treatment centres not prognostic for survival.<br>Despite significant differences in aggressiveness of treatment between US and Canada, no differences in patient survival (outcome). |
| 35 | Cda: blacks-63; whites-2494<br>US: blacks-5622; whites-17125 | Cda: 1 yr survival- blacks (~85%), whites (~80%); 3 yr survival- blacks (~75%), white (~73%)<br>US: 1 yr survival- blacks (~73%), whites (~80%); 3 yr survival- blacks (~53%), white (~67%) | 1 and 3 years | Graft survival rates were significantly lower in blacks than whites in the US with differences increasing over time; while in Canada, graft survival rates were relatively similar; HLA matching was significantly better among whites than black; blacks consistently had poorer early graft function than whites.<br>Similar short- & long-term graft survival for blacks & whites in Canada *suggests* important long-term influence of health care system & socioeconomic factors. |

| Ref # | Sample Size | # with Outcome/ Control Sample Size | Follow up Period | Key Study Results / Summary of Results |
|---|---|---|---|---|
| 36 | Cda: 285<br>US: 233 | Cda: 8% reinfarction; 27% mortality; 40% angina<br>US: 13% reinfarction; 28% mortality; 33% angina | Median = 20 months | Non-invasive tests more common in Cdn centre; invasive tests more common in US centre; functional status better in US patients.<br>Aggressive treatment in US patients with MI did not improve reinfarction and mortality rates compared to more conservative treatment of Canadian patients.<br>Superior functional status of American patients requires further investigation. |
| 37 | Cda: 325<br>US (Mass.): 319<br>US-other: 3,446 | | No follow up | ICU days/million population – 2-3 X as great in W. Massachusetts than Alberta. Higher ICU incidence in W. Massachusetts. Hospital mortality rate higher in W. Massachusetts than in Alberta. Higher proportion of Alberta ICU patients received mechanical ventilation. ICU severity of illness of elective surgical patients lower in W. Massachusetts and other US hospitals than in Alberta.<br>Western Massachusetts hospital patients more likely to be treated in ICU than are similar Alberta patients. No evidence this leads to lower mortality rate. |
| 38 | Cda: 18,945<br>US: 64,300 | | 30 day & 6 month | For low- and moderate-risk surgical procedures, 30-day mortality rates were similar in Manitoba and New England; 6 month rates were lower in Manitoba; for 30-day and 6 month mortality rates were lower for high-risk procedures in New England.<br>The lack of significant differences in short-term mortality for the low- and moderate risk procedures *suggests* that the increased hospital expenditures within the US may not lead to substantially improved outcomes for these procedures. |
| 39 | Cda: 9,444<br>US: 224,258 | Cda: 22.3% 30-day mortality; 34.4% 365-day mortality<br>US: 21.4% 30-day mortality; 34.3% 365-day mortality | 30 days and 1 year | Substantial difference in rates of use of invasive cardiac procedures (favouring US), especially 30 days post AMI. Substantial differences in 30-day mortality (favouring US). No difference in outcomes at 1 year.<br>1-year mortality rate for elderly patients with AMI were similar in US and Ontario in 1991 in spite of a small short-term survival difference favouring the US. Higher rates of use of cardiac procedures in US did not appear to result in better long-term survival rates for elderly US patients with AMI. |
| 40 | Cda: 10,007<br>US: 16,206 | Cda: 7.7% observed 30 day mortality; 6.6% expected 30 day mortality<br>US: 5.5% observed 30 day mortality: 6.1% expected mortality | Not reported | Significantly higher 30-day mortality in Cda not apparently due to comorbidities, age, type or severity of fracture, timing of surgery or surgical approach; US patients with relatively short waits before hip fracture repair had significantly lower mortality rates than Cdn patients with similar waits. |
| 41 | Cda: 17,358<br>US: 59,720 | | Not reported | For low- and moderate-risk procedures, short-term outcomes differed little; 3 year survival substantially better in Cda; for certain high-risk procedures, short-term outcomes better in US; 3 year survival was similar.<br>Overall population mortality among elderly was lower in Cda. A number of factors could explain this, including health care system differences, but this study is only suggestive of the relationship among the factors. |

| Ref # | Sample Size | # with Outcome/ Control Sample Size | Follow up Period | Key Study Results / Summary of Results |
|---|---|---|---|---|
| 42 | Cda: 78<br>US: 64 | Cda: 76% 5 year relapse-free survival; 80% 5 year survival<br>US: 84% 5 year relapse-free survival; 84% 5 year survival | Cda: mean 4.2 yrs<br>US: mean 4.5 yrs | No significant difference in survival or disease-free survival between US and Canada; although trend favoured Cdn patients, Cdn patients were treated more recently than US patients.<br>Non-significant differences may reflect similar changes rather than differences between countries. |
| 43 | Cda: 658<br>US: 1573 | Cda: 22% deaths, 14% recurrent MI<br>US: 23% deaths, 13% recurrent MI | Cda: mean 39 months<br>US: mean 43 months | Greater use of invasive diagnostic and revascularization procedures and medications in US not associated with either survival or rate of recurrent MI; US-based intervention showed lower risk of activity-limiting angina in US and lower risk of having at least one of: activity-limiting angina, recurrent MI or death.<br>The more significant use of invasive diagnostic and therapeutic interventions (including drugs) was not associated with significant differences in rate of recurrent MI or death between Canada & United States. |

## Exhibit 4: Quality of Cohort Studies

| Ref # | Subjects obtain using random method of sampling? | Data collectors trained? | Ascertainment of exposure same for all cohort members? | Ascertainment of outcome same for all cohort members? | Outcome assessors blind to intervention status? | Number & reasons for withdrawals reported? |
|---|---|---|---|---|---|---|
| 31 | No | Not reported | No | Yes | Not reported | No |
| 34 | No | Not reported | Yes | Yes | Not reported | No |
| 36 | No | Yes | No | Yes | Not reported | No |
| 42 | Not clear | Not reported | Yes | Yes | Not reported | No |
| 43 | Yes | Not reported | Yes | Yes | Not reported | No |

## Exhibit 5: Quality of Secondary Analyses

| Ref # | Secondary analysis design appropriate for research question? | Variables appropriate for outcomes of interest? | Eligibility criteria appropriate? | Comments |
|---|---|---|---|---|
| 27 | Yes | Yes | Yes | |
| 28 | Yes | Yes | Yes | |
| 29 | Yes | Yes | Yes | |
| 30 | Yes | Yes | Unsure | |
| 1 | Yes | Yes | Yes | |
| 32 | Yes | Yes | Yes | |
| 33 | Yes | No | Yes | Very limited question |
| 35 | Research question not clear | No | No | Article not very good |
| 37 | Yes | Yes | Unsure | |
| 38 | Yes | Yes | Yes | Without ability to control/account for other factors, this is best being done to show differences between US and Canada |
| 39 | Yes | Yes | Yes | |
| 40 | Yes | Yes | Yes | |
| 41 | Yes | Yes | Yes | Not enough information to draw definitive conclusions for survival rate differences between US and Canadian elderly |

## Exhibit 6: Quality of Care Definitions

| | |
|---|---|
| Vanbelle G, Vanherpe C | Revue Belge de Medecine Dentaire. 1990; 45(1): 79-83. |
| - the property of a service when it is an adequate response to a good defined need at an effort all parties are satisfied with | |
| Shroyer AL, London MJ, VillaNueva CB et al | Medical Care. 1995; 33(10): OS17-OS25, Supplement |
| Patient risk factors: the patient's characteristics present before entry into the health care system<br>Processes of care: the set of procedures and skills with which health care technology of proven or accepted efficacy is delivered to individual patients<br>Structures of care: the overall context in which care to a group of patients is delivered (eg. Facilities, equipment, services, personnel, credentials & qualifications of professionals involved)<br>Outcomes of care: the measurable result of a health care episode. | |
| Hammermeister KE, Shroyer AL, Sethi GK & Grover FL | Medical Care. 1995; 33(10): OS5-OS16, Supplement |
| Quality of care: the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge (Lohr and Shroeder, 1990)<br>Process: content of care, i.e. How the patient was moved into, through, and out of the health care system and the services that were provided during the care episode (Council on Medical Service. Quality of care. JAMA 1986; 256: 1032)<br>Structures of care: the facilities, equipment, services, and manpower available for care and the credentials and qualifications of the health care professionals involved (Council on Medical Service, 1986)<br>Outcomes of care: the results of care which can encompass biologic changes in disease, comfort, ability for self-care, physical function and mobility, emotional and intellectual performance, patient satisfaction and self-perception of health, health knowledge and compliance with medical care, and viability of family, job and social role functioning. (Council on Medical Service, 1986) | |
| Barbour G. | Annals of Thoracic Surgery. 1994; 58: 1881-1884 |
| Quality health care: care that is needed; care that is delivered in a manner that is competent, caring, cost-effective, timely, and at minimal risk to the patient and to the providers; and care which achieves achievable benefits<br>-needed: doing the right thing<br>-manner that is competent: that rendered in compliance with standards of practice or guidelines<br>-caring: reflection from the patient; not just caring for them but also about them<br>-cost-effective: demonstrate an efficient use of resources<br>-timely: therapy given at the right time and in a manner that satisfies the patient's desire for timeliness<br>-minimal risk: what was usually the goal of risk management programs<br>-achieving achievable benefits: way we measure and reflect quality | |
| Donaldson MS, Field MJ | Archives of Internal Medicine. 1998; 158: 121-128 |

Quality of care: the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.

| Donabedian A | JAMA. 1988; 260(12): 1743-1748 |
|---|---|

Structure: the attributes of the settings in which care occurs, including facilities, equipment, number and qualifications of personnel, medical staff organization, methods of peer review and reimbursement

Process: what is actually done in giving and receiving care, including patient's activities in seeking care and carrying it out, and the practitioner's activities in making a diagnosis and recommending or implementing treatment

Outcome: the effects of care on the health status of patients and populations. Improvement in the patient's knowledge and salutary changes in their behaviour are included under a broad definition of health status, and the degree of patient satisfaction with care

| Marder RJ | Cancer 1991; 67(suppl): 1753-1758 |
|---|---|

- Outcome is a product of multiple causes (team interaction, other care-givers, nurse care, physician care, governance, management, plant & equipment, support services, social policy, community, patient)
- Dimensions in definition of quality: scale of quality, nature of entity being evaluated, goal-oriented, aspects of outcomes specified, risk versus benefit trade-offs, type of recipient identified, role and responsibility of recipient asserted, constrained by technology and state of scientific knowledge, continuity, management, coordination, standards of care, technical competency of provider, interpersonal skills of provider, acceptability, accessibility, statements about use, constrained by resources, constrained by consumer and patient circumstances, documentation required

| Rhee KJ, Donabedian A, Burney RE | Quality Review Board. 1987; January: 4-16 |
|---|---|

Quality: the highest level of quality is represented by the strategy of care that achieves the greatest improvement in health, within the limits of current knowledge and the patient's capacity to improve; within these same limits, lesser degrees of improvement represent proportionately lower levels of quality

Defining quality:

- health is exceedingly difficult to define and quantify – it has many components or manifestations
- the definition and assessment of quality is influenced by who determines the value to be placed on the manifestations and quantities of health that alternative strategies of care are likely to produce
- health care is a complex of components making it necessary to decide whether the assessments will be confined to the technical process of care or will also include the amenities of care and the personal interaction between the patient and practitioner
- monetary cost also influences the definition and assessment of quality

| Brook RH, Cleary PD | NEJM 1996; 335(13): 966-970 |
|---|---|

- structural data: characteristics of physicians and hospitals
- process data: components of the encounter between a physician or another health care professional and a patient
- outcome data: the patient's subsequent health status

## *Outcomes*

| Mant J, Hicks N | BMJ. 1995; 311: 793-796. |
|---|---|

-study analysis restricted to consideration of aspects of care that have been shown to have an effect on mortality…there are other features of care that have an impact that have not been included in the analysis.

-measures of process easier to interpret…if a difference in mortality is found between 2 groups of patients, then to improve the care in the group with the worse results it would be necessary to identify what it is that is different about the process of care that led to the difference in outcome

-plausible explanations that have nothing to do with quality of care can always be given about mortality differences between groups

-limitations of monitoring process: inappropriate if no evidence exists that a process leads to better outcome; problems in analysis if many aspects of process that have been shown to affect outcome

* if one of the aims of monitoring (hospitals) is to promote clinical effectiveness then measuring aspects of process of care that have been shown by RCTs to influence outcomes is an attractive alternative

| Shroyer AL, London MJ, VillaNueva CB et al. | Medical Care. 1995; 33(10): OS17-OS25, Supplement |
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- Although outcome measures may be used as potential quality of care screens, outcomes cannot indicate directly how care might be improved
- Use of outcomes 'appropriately' adjusted for patient risk may identify outliers on the quality spectrum…but how then how is determined where to redirect resources to improve quality
- The most efficient and efficacious way to redirect resources would be toward those processes and structure of care demonstrated to affect patient outcomes … knowledge of the processes and structures of care predictive of patient outcomes, rather than the use of patient outcomes alone, could lead to more efficient mechanisms for monitoring quality of care
- Traditional outcomes measures: mortality and morbidity, including disease-related health status, general health status, physical functioning capacity, mental health status.
- Non-traditional outcome measures: patient self-report measures of changes in health-related quality of life, patient satisfaction scales

| Hammermeister KE, Shroyer AL, Sethi GK & Grover FL | Medical Care. 1995; 33(10): Os5-OS16, Supplement |
|---|---|

- health outcomes are intrinsic to the definition of quality of care and should be relatively free of preconceived biases about how care should be provided
- limitations to outcomes-directed quality improvement: 1. Mortality – the most commonly used outcome is usually sufficiently rare, resulting in inadequate statistical power; 2. Nonfatal outcomes are much more difficult to measure reliably; 3. Outcomes may not be measurable for an extended period of time after the care episode, making linkage to quality inefficient; 4. Patients often desire good processes of care as well as favourable outcomes.
- Outcomes-based quality assessment-processes and structures chosen must have been demonstrated to be associated with the desired outcomes of care.
- Outcomes are at the centre of the commonly used definitions of quality of care
- Limitations to use of outcomes to assess quality of care: 1. Sole reliance on outcomes has tendency to yield a unidimensional view of quality that ignores the possibility that the consumers of health care desire many different attributes in addition to the best possible outcomes (eg. Reliable and considered processes, ease of accessibility, respectful and caring providers, responsiveness to individual preferences, dignified and private ambiance, well-integrated and coordinated care) 2. Outcomes "lie too far down the stream of production of care to efficient detectors of quality" (Berwick DM, Toward an applied technology for quality measurement in health care. Med Decis Making 1988; 8: 253.)
- Types of outcomes: death, symptoms, functional status, role activities, social functioning, emotional status, cognition, sleep and rest, energy and vitality, health perceptions, general life satisfaction
- Increasing recognition that patients desire more than added years of life as a result of their health encounter (for both patients and society, functional ability is often the most important outcome of medical care, although physicians may be preoccupied with physiologic measures. The latter have little inherent social value, except as they influence symptoms, functioning and prognosis, Deyo RA, Patrick DL. Barriers to the use of health status measures in clinical investigation, patient care, and policy research. Medical Care 1989; 27 (suppl): S254).
- Using death as the sole outcome has major disadvantages: 1. death soon after care is rare…this measure is insensitive to differences in quality of care; 2.for many chronic diseases, no cure is known, therefore, death may be related neither to the care episode nor the disease being studied; 3. in some diseases, death is an expected outcome
- Advantages to use of health care outcomes to assess quality: 1. They are intrinsic to the definition of quality of care; 2. They are relatively free of preconceived biases about how care should be provided; 3. There is a close relation between outcome directed quality of care assessment and technology assessment by observational data analyses
- Limitations: 1. Major assumption underlying the use of health care outcomes is that care providers know which processes and structures of care to change produce better outcomes (proof for this assumption is limited); 2. Demographic characteristics; 3. Severity of illness; 4. Comorbidity; 5. Access to care; 6. Patient attitudes toward health maintenance; 7. Other psychological factors; 8. Chance
- Significant relationships between processes of care and outcomes have been reported for several medical conditions when the patient has been the unit of analysis.

| Davies HT, Crombie IK | BMJ. 1995; 311: 766. |
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- the hope: data on outcomes will provide a barometer for health care, indicating the effectiveness and efficiency of service delivery

- outcome measures have a major weakness: interpretation – which is difficult enough for unambiguous outcomes, such as death (death rates are largely inappropriate for many specialties, since even under ideal conditions, death rates are insensitive to quite wide variations in the quality of care)
- process measures to detect failures in quality lies in their ability to overcome or sidestep many of the problems that beset outcomes data; they identify specific shortcomings; and are valuable indicators of quality only when the processes in question are well supported by research evidence.

Donabedian A JAMA. 1988; 260(12): 1743-1748

- good structures increase the likelihood of good process, and good process increases the likelihood of a good outcome
- since a multitude of factors influence outcome, it is not possible to know for certain the extent to which an observed outcome is attributable ot an antecedent process of care
- many outcomes, by their nature, are delayed, and if they occur after care is completed, information about them is not easy to obtain.
- Outcomes reflect all contributions to care, including those of the patient, but it is not possible to say precisely what went wrong unless the antecedent process is scrutinized.

Clancy CM, Eisenberg JM Science. 1998; 282: 245-246

- associating differences in the process of care with differences in outcomes can identify areas in need of increased efficiency & effectiveness

Vuori H Quality Review Board 1987; March: 106-108

- Patient satisfaction – attribute or indicator of patient care? As an attribute (a legitimate and desired outcome), care cannot be of high quality unless the patient is satisfied. As an indicator, reflecting the views of patients on the care received. As a prerequisite, satisfied patients are more likely to cooperate effectively with their practitioner and to accept and adhere to their recommendations. Satisfaction also influences access because the satisfied patient is thought to be more likely to seek care again
- Not included because patients: 1. Scientific and technical knowledge necessary to adequately assess quality of care; 2. May be in physical or mental states that make them incapable of passing objective judgement; 3. The rapid pace of events makes it difficult for patients to have a comprehensive and objective view of what is going on; 4. Physicians and patients my have different goals for care (patient's wishes may be harmful or not in the best interest from the physician's perspective; 5. Patient satisfaction cannot be measured in a way that would yield useful results because it is difficult to define what quality means to patients – the concept is culturally dependent, dependent on patients' characteristics and on changes within an individual patient.
- Science (physician's technical management of an episode of illness) vs. art (physician's interpersonal management of an episode of illness) of medicine

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| Marder RJ | Cancer 1991; 67(suppl): 1753-1758 |
| - the importance of outcome measurement to assessing quality does not mean that measuring only outcomes will measure quality<br>- although assessment of outcomes is a key aspect in an operational definition of quality, it is not the sole means for assessment of quality<br>- outcomes worthy of measurement must be clearly linked to processes and structures that can undergo improvement | |
| Davenport RJ, Dennis MS | BMJ… |
| - measuring process as an indicator of quality is appropriate only for interventions that have been shown to be effective<br>- difficult to define appropriate processes for specific groups of patients and the influence of case mix on process | |
| Brook RH, Cleary PD | NEJM 1996; 335(13): 966-970 |
| - it will never be possible to produce an error-free measure of quality of care<br>- quality of care can be assessed at several levels, from the care provided by individual health care professionals to the care provided by a health plan<br>- for quality of care criteria based on structural or process data are to be credible, it must be demonstrated that variations in the attribute they measure lead to differences in outcome.<br>- If outcome criteria are to credible, it must be demonstrated that differences in outcome will result if the processes of care under the control of health professionals are altered.<br>- when used appropriately, both process and outcome measures can provide valid information about the quality of care – process data are usually more sensitive measure of quality than outcome data because a poor outcome does not occur every time there is an error in the provision of care<br>- scant evidence that one can generalize from the quality of care for one set of symptoms or diseases to the quality of care for another set of symptoms or diseases – such generalizations are especially problematic when different types of medical functions are evaluated<br>- must only use process measures for which we have sound scientific evidence or a formal consensus of experts that the criteria being used do lead to an improvement in health, when applied | |

| Shroyer AL, London MJ, VillaNueva CB et al. | | Medical Care. 1995; 33(10): OS26-OS34, Supplement | | | | |
|---|---|---|---|---|---|---|
| Patient risk factors | + | Process/structure group | + | Chance of unusual factors | → | Outcomes |
| Severity of disease, comorbidity, general health status, demographic and socio-economic factors | | Preoperative evaluation, surgical procedure, postoperative care, degree of supervision, patient/family comm., care provider comm., integrating system, care provider profile, facilities and equipment | | | | -short term (mortality, complications, patient satisfaction)<br>- intermdiate (mortality, complications, disease status, HRQL, patient satisfaction) |

## Appendix 1: Search Strategy and Results

Date: 06-Oct-97
Name: T23122_1276AMwB2Y
Database: Medline <1993 to October 1997>

| Set | Search | Results |
|---|---|---|
| 001 | exp united states/ | 76311 |
| 002 | (wyoming or wisconsin or virginia or washington).tw. | 3277 |
| 003 | (vermont or utah or texas or tennessee or dakota).tw. | 2081 |
| 004 | (carolina or rhode island or pennsylvania or oregon).tw. | 2130 |
| 005 | (oklahoma or ohio or new york or new mexico).tw. | 4207 |
| 006 | (new jersey or new hampshire or nevada or nebraska).tw. | 945 |
| 007 | (montana or missouri or mississippi or minnesota).tw. | 1919 |
| 008 | (michigan or massachusetts or maryland or maine or louisiana | 2898 |
| 009 | (kentucky or kansas or iowa or illinois).tw. | 1461 |
| 010 | (idaho or hawaii or georgia or florida or delaware).tw. | 2020 |
| 011 | district of columbia.tw. | 135 |
| 012 | (connecticut or colorado or california or arkansas).tw. | 3982 |
| 013 | (arizona or alabama or alaska).tw. | 947 |
| 014 | united states.tw. | 11806 |
| 015 | or/1-14 | 92452 |
| 016 | exp canada/ | 9061 |
| 017 | labrador.tw. | 91 |
| 018 | (yukon or saskatchewan or quebec or ontario).tw. | 2005 |
| 019 | prince edward island.tw. | 39 |
| 020 | (nova scotia or newfoundland or new brunswick).tw. | 237 |
| 021 | (alberta or british columbia or manitoba).tw. | 893 |
| 022 | northwest territories.tw. | 36 |
| 023 | canad$.tw. | 5541 |
| 024 | 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 | 11897 |
| 025 | 15 and 24 | 2026 |
| 026 | (contrast or collate).tw. | 87600 |
| 027 | (versus or vs).tw. | 70446 |
| 028 | comparative.hw,tw. | 215251 |
| 029 | compar$.tw. | 310616 |
| 030 | 26 or 27 or 28 or 29 | 500951 |
| 031 | 25 and 30 | 684 |
| 032 | (trial$ or random$ or placebo$).tw. | 91955 |
| 033 | (double-blind or double blind).tw. | 12241 |
| 034 | (single-blind or single blind).tw. | 1038 |
| 035 | (cross-over or crossover).tw. | 41666 |
| 036 | (multi-center or multi center or multicenter).tw | 5260 |
| 037 | (multi-centre or multi centre or multicentre).tw. | 2053 |
| 038 | international.tw. | 11149 |
| 039 | (retrospective or case-control or case control).tw. | 25311 |
| 040 | (case cohort or case-cohort).tw. | 44 |

| Set | Search | Results |
|---|---|---|
| 041 | (cohort or prospective$ or followup or follow-up).tw. | 98621 |
| 042 | longitudinal.tw. | 10558 |
| 043 | differen$.tw. | 355641 |
| 044 | exp "analytic studies (epidemiology) (non mesh)"/ | 154749 |
| 045 | exp clinical trials/ | 16247 |
| 046 | (doubleblind or singleblind).tw. | 18 |
| 047 | or/32-46 | 582987 |
| 048 | 25 and 47 | 813 |
| 049 | 48 not 31 | 394 |

Date: 03-Oct-97
Name: T48528_2562C4LzEc
Database: Medline <1966 - 1992>

| Set | Search | Results |
|---|---|---|
| 001 | exp united states/ | 290585 |
| 002 | (wyoming or wisconsin or virginia or washington).tw. | 6464 |
| 003 | (vermont or utah or texas or tennessee or dakota).tw. | 5452 |
| 004 | (carolina or rhode island or pennsylvania or oregon).tw. | 5312 |
| 005 | (oklahoma or ohio or new york or new mexico).tw. | 10046 |
| 006 | (new jersey or new hampshire or nevada or nebraska).tw. | 2727 |
| 007 | (montana or missouri or mississippi or minnesota).tw. | 5336 |
| 008 | (michigan or massachusetts or maryland or maine or louisiana | 8404 |
| 009 | (kentucky or kansas or iowa or illinois).tw. | 4405 |
| 010 | (idaho or hawaii or georgia or florida or delaware).tw. | 5469 |
| 011 | district of columbia.tw. | 257 |
| 012 | (connecticut or colorado or california or arkansas).tw. | 9190 |
| 013 | (arizona or alabama or alaska).tw. | 2795 |
| 014 | united states.tw. | 21787 |
| 015 | or/1-14 | 322736 |
| 016 | exp canada/ | 30811 |
| 017 | canad$.tw. | 10252 |
| 018 | (yukon or saskatchewan or quebec or ontario).tw. | 3915 |
| 019 | prince edward island.tw. | 57 |
| 020 | (nova scotia or newfoundland or new brunswick).tw. | 657 |
| 021 | (alberta or british columbia or manitoba).tw. | 1953 |
| 022 | northwest territories.tw. | 89 |
| 023 | 16 or 17 or 18 or 19 or 20 or 21 or 22 | 35413 |
| 024 | 15 and 23 | 5524 |
| 025 | (contrast or collate).tw. | 169406 |
| 026 | (versus or vs).tw. | 102806 |
| 027 | comparative.hw,tw. | 590338 |
| 028 | compar$.tw. | 688708 |
| 029 | 25 or 26 or 27 or 28 | 1195587 |
| 030 | 24 and 29 | 1089 |
| 031 | 24 | 5524 |
| 032 | (trial$ or random$ or placebo$).tw. | 162699 |
| 033 | (double-blind or double blind).tw. | 31127 |
| 034 | (single-blind or single blind).tw. | 2158 |

| Set | Search | Results |
|---|---|---|
| 035 | (cross-over or crossover).tw. | 86642 |
| 036 | (multi-centre or multi centre).tw. | 447 |
| 037 | (multi-center or multicenter).tw. | 6064 |
| 038 | international.tw. | 20179 |
| 039 | (retrospective or case-control or case control).tw. | 32588 |
| 040 | (case cohort or case-cohort).tw. | 23 |
| 041 | (cohort or prospective$ or followup or follow-up).tw. | 155609 |
| 042 | longitudinal.tw. | 21303 |
| 043 | differen$.tw. | 796894 |
| 044 | exp "analytic studies (epidemiology) (non mesh)"/ | 247460 |
| 045 | exp clinical trials/ | 81380 |
| 046 | or/32-45 | 1287822 |
| 047 | 31 and 46 | 1100 |
| 048 | 47 not 30 | 612 |
| 049 | limit 48 to (yr=1988 or yr=1989 or yr=1990 or yr=1991 or yr=253 | |
| 050 | | |
| | | |

Date: 10-Oct-97
Name: T18804_872lWsx4E
Database: Aidsline <1980 - September 1997>

| Set | Search | Results |
|---|---|---|
| 001 | exp united states/ | 19328 |
| 002 | (wyoming or wisconsin or virginia or washington).tw. | 499 |
| 003 | (vermont or utah or texas or tennessee or dakota).tw. | 315 |
| 004 | (carolina or rhode island or pennsylvania or oregon).tw. | 343 |
| 005 | (oklahoma or ohio or new york or new mexico).tw. | 2090 |
| 006 | (new jersey or new hampshire or nevada or nebraska).tw. | 292 |
| 007 | (montana or missouri or mississippi or minnesota).tw. | 143 |
| 008 | (michigan or massachusetts or maryland or maine or louisiana | 514 |
| 009 | (kentucky or kansas or iowa or illinois).tw. | 160 |
| 010 | (idaho or hawaii or georgia or florida or delaware).tw. | 506 |
| 011 | district of columbia.tw. | 70 |
| 012 | (connecticut or colorado or california or arkansas).tw. | 1022 |
| 013 | (arizona or alabama or alaska).tw. | 145 |
| 014 | united states.tw. | 2772 |
| 015 | or/1-14 | 21885 |
| 016 | exp canada/ | 1573 |
| 017 | canad$.tw. | 908 |
| 018 | labrador.tw. | 1 |
| 019 | (yukon or saskatchewan or quebec or ontario).tw. | 259 |
| 020 | prince edward island.tw. | 2 |
| 021 | (nova scotia or newfoundland or new brunswick).tw. | 25 |
| 022 | (alberta or british columbia or manitoba).tw. | 143 |
| 023 | northwest territories.tw. | 3 |
| 024 | 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 | 1901 |
| 025 | 15 and 24 | 176 |
| 026 | (contrast or collate).tw. | 5693 |
| 027 | compar$.tw. | 22652 |
| 028 | comparative.hw,tw. | 12055 |

| Set | Search | Results |
|---|---|---|
| 029 | (trial$ or random$ or placebo$).tw. | 9219 |
| 030 | (double-blind or double blind or doubleblind).tw. | 752 |
| 031 | (single-blind or single blind or singleblind).tw. | 25 |
| 032 | (cross-over or crossover or cross over).tw. | 3941 |
| 033 | (multi-centre or multicentre or multi centre).tw. | 198 |
| 034 | (multi-center or multicenter or multi center).tw. | 1006 |
| 035 | international.tw. | 1757 |
| 036 | (retrospective or case-control or case control).tw. | 2514 |
| 037 | (case cohort or case-cohort).tw. | 1 |
| 038 | (cohort or prospective$ or followup or follow-up).tw. | 12637 |
| 039 | longitudinal.tw. | 1370 |
| 040 | differen$.tw. | 24126 |
| 041 | exp "analytic studies (epidemiology) (non mesh)"/ | 17272 |
| 042 | exp clinical trials/ | 2924 |
| 043 | or/26-42 | 65337 |
| 044 | 25 and 43 | 92 |
| 045 | limit 44 to nonmedline | 51 |

Date: 10-Oct-97
Name: T18804_583WHsxzh
Database: CancerLit <1983 - 1992>

| Set | Search | Results |
|---|---|---|
| 001 | exp united states/ | 13638 |
| 002 | (wyoming or wisconsin or virginia or washington).tw. | 721 |
| 003 | (vermont or utah or texas or tennessee or dakota).tw. | 673 |
| 004 | (carolina or rhode island or pennsylvania or oregon).tw. | 454 |
| 005 | (oklahoma or ohio or new york or new mexico).tw. | 1174 |
| 006 | (new jersey or new hampshire or nevada or nebraska).tw. | 242 |
| 007 | (montana or missouri or mississippi or minnesota).tw. | 391 |
| 008 | (michigan or massachusetts or maryland or maine or louisiana | 980 |
| 009 | (kentucky or kansas or iowa or illinois).tw. | 356 |
| 010 | (idaho or hawaii or georgia or florida or delaware).tw. | 603 |
| 011 | district of columbia.tw. | 23 |
| 012 | (connecticut or colorado or california or arkansas).tw. | 1153 |
| 013 | (arizona or alabama or alaska).tw. | 175 |
| 014 | united states.tw. | 3194 |
| 015 | or/1-14 | 18880 |
| 016 | exp canada/ | 1297 |
| 017 | canad$.tw. | 931 |
| 018 | labrador.tw. | 11 |
| 019 | (yukon or saskatchewan or quebec or ontario).tw. | 302 |
| 020 | prince edward island.tw. | 3 |
| 021 | (nova scotia or newfoundland or new brunswick).tw. | 33 |
| 022 | (alberta or british columbia or manitoba).tw. | 225 |
| 023 | northwest territories.tw. | 10 |
| 024 | 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 | 1941 |
| 025 | 15 and 24 | 315 |
| 026 | (contrast or collate).tw. | 30839 |
| 027 | compar$.tw. | 92044 |
| 028 | comparative.hw,tw. | 58307 |
| 029 | (trial$ or random$ or placebo$).tw. | 25699 |

| Set | Search | Results |
|---|---|---|
| 030 | (double-blind or double blind or doubleblind).tw. | 1177 |
| 031 | (single-blind or single blind or singleblind).tw. | 45 |
| 032 | (cross-over or crossover or cross over).tw. | 9995 |
| 033 | (multi-centre or multicentre or multi centre).tw. | 330 |
| 034 | (multi-center or multicenter or multi center).tw. | 1249 |
| 035 | international.tw. | 6616 |
| 036 | (retrospective or case-control or case control).tw. | 9503 |
| 037 | (case cohort or case-cohort).tw. | 14 |
| 038 | (cohort or prospective$ or followup or follow-up).tw. | 33410 |
| 039 | longitudinal.tw. | 1165 |
| 040 | differen$.tw. | 125164 |
| 041 | exp "analytic studies (epidemiology) (non mesh)"/ | 42022 |
| 042 | exp clinical trials/ | 9308 |
| 043 | or/26-42 | 275545 |
| 044 | 25 and 43 | 207 |
| 045 | limit 44 to nonmedline | 37 |

Date: 10-Oct-97
Name: T18804_288WUsxu7
Database: CancerLit <1993 to September 1997>

| Set | Search | Results |
|---|---|---|
| 001 | exp united states/ | 6727 |
| 002 | (wyoming or wisconsin or virginia or washington).tw. | 790 |
| 003 | (vermont or utah or texas or tennessee or dakota).tw. | 392 |
| 004 | (carolina or rhode island or pennsylvania or oregon).tw. | 286 |
| 005 | (oklahoma or ohio or new york or new mexico).tw. | 531 |
| 006 | (new jersey or new hampshire or nevada or nebraska).tw. | 152 |
| 007 | (montana or missouri or mississippi or minnesota).tw. | 247 |
| 008 | (michigan or massachusetts or maryland or maine or louisiana | 533 |
| 009 | (kentucky or kansas or iowa or illinois).tw. | 239 |
| 010 | (idaho or hawaii or georgia or florida or delaware).tw. | 345 |
| 011 | district of columbia.tw. | 12 |
| 012 | (connecticut or colorado or california or arkansas).tw. | 620 |
| 013 | (arizona or alabama or alaska).tw. | 142 |
| 014 | united states.tw. | 2185 |
| 015 | or/1-14 | 10442 |
| 016 | exp canada/ | 876 |
| 017 | canad$.tw. | 838 |
| 018 | labrador.tw. | 11 |
| 019 | (yukon or saskatchewan or quebec or ontario).tw. | 316 |
| 020 | prince edward island.tw. | 2 |
| 021 | (nova scotia or newfoundland or new brunswick).tw. | 14 |
| 022 | (alberta or british columbia or manitoba).tw. | 162 |
| 023 | northwest territories.tw. | 5 |
| 024 | 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 | 1442 |
| 025 | 15 and 24 | 264 |
| 026 | (contrast or collate).tw. | 28901 |
| 027 | compar$.tw. | 80113 |
| 028 | comparative.hw,tw. | 45146 |
| 029 | (trial$ or random$ or placebo$).tw. | 26094 |
| 030 | (double-blind or double blind or doubleblind).tw. | 1543 |

| Set | Search | Results |
|---|---|---|
| 031 | (single-blind or single blind or singleblind).tw. | 72 |
| 032 | (cross-over or crossover or cross over).tw. | 8431 |
| 033 | (multi-centre or multicentre or multi centre).tw. | 508 |
| 034 | (multi-center or multicenter or multi center).tw. | 1745 |
| 035 | international.tw. | 4411 |
| 036 | (retrospective or case-control or case control).tw. | 8689 |
| 037 | (case cohort or case-cohort).tw. | 21 |
| 038 | (cohort or prospective$ or followup or follow-up).tw. | 30711 |
| 039 | longitudinal.tw. | 998 |
| 040 | differen$.tw. | 99348 |
| 041 | exp "analytic studies (epidemiology) (non mesh)"/ | 40362 |
| 042 | exp clinical trials/ | 5402 |
| 043 | or/26-42 | 220181 |
| 044 | 25 and 43 | 191 |
| 045 | limit 44 to nonmedline | 16 |

## Appendix 2: Relevance Form

***Systematic Review of the Relationship between Health Outcomes and Country of Origin/Delivery of Health Intervention***

***Reference #: _____*** ***Reviewer:*** ÿ ÿ ÿ ÿ

*Prior to commencement, please read and understand the directions provided*

| **Interest Areas** | **Description** | **Yes** | **No** |
|---|---|---|---|
| Research Topic | Does the document address health outcomes of human participants receiving a health intervention in Canada and the United States? | | |
| Publication/Written Date | Is the document written or published either in or after 1966? | | |
| Population | Does the document target human participants receiving a health intervention in Canada and the United States? (If one country only, is there another document that targets human participants in the alternate country receiving the same health intervention as part of the same study?) | | |
| Intervention | Does the document investigate a health care intervention or group of interventions (primary, secondary or tertiary level)? | | |
| Outcome | Is the outcome measure reported in the document the result of the reported intervention? | | |
| Methods | Does the study design include a control group? (i.e. RCT, non-randomized CT, cohort, case-control, pre-post study) | | |
| Study Inclusion | Should the study be included in the review? (Include if "Yes" to all of the above) | | |
| Consensus | If disagreement, what is the final consensus? | | |

This checklist is to be used to screen documents to determine whether they should be abstracted and included in the review. It is to be filled out for every potential document.

**Comments:**

# Appendix 3: Data Extraction Form

## Study Characteristics

| First Author | Publication Year | Country | Injury Type | Study Time Period |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

## Study Design

| Study Aim | Study Area | Target Group | Primary Outcome Measure | Outcome Collection Method | Intervention Setting |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

## Quality

| Randomization Points | Double-Blinding Points | Withdrawals & Dropouts | Total Score | Total Risk of Bias |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

## Outcomes

| Total Sample Size | # Outcome/Experimental Sample Size | # with Outcome/Control Sample Size | Key Study Results |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

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