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Continuity of Care to Optimize Chronic Disease Management in the Community Setting: An Evidence-Based Analysis

Health Quality Ontario

September 2013

Ontario Health Technology Assessment Series; Vol. 13: No. 6, pp. 1–41, September 2013

Suggested Citation

This report should be cited as follows: Health Quality Ontario. Continuity of care to optimize chronic disease management in the community setting: an evidence-based analysis. Ont Health Technol Assess Ser [Internet]. 2013 September;13(6):1–41. Available from: http://www.hqontario.ca/en/documents/eds/2013/full-report-OCDM-continuity-of-care.pdf

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About Health Quality Ontario

Health Quality Ontario (HQO) is an arms-length agency of the Ontario government. It is a partner and leader in transforming Ontario's health care system so that it can deliver a better experience of care, better outcomes for Ontarians and better value for money.

Health Quality Ontario strives to promote health care that is supported by the best available scientific evidence. HQO works with clinical experts, scientific collaborators and field evaluation partners to develop and publish research that evaluates the effectiveness and cost-effectiveness of health technologies and services in Ontario.

Based on the research conducted by HQO and its partners, the Ontario Health Technology Advisory Committee (OHTAC) — a standing advisory sub-committee of the HQO Board — makes recommendations about the uptake, diffusion, distribution or removal of health interventions to Ontario's Ministry of Health and Long-Term Care, clinicians, health system leaders and policy-makers.

This research is published as part of Ontario Health Technology Assessment Series, which is indexed in CINAHL, EMBASE, MEDLINE, and the Centre for Reviews and Dissemination. Corresponding OHTAC recommendations and other associated reports are also published on the HQO website. Visit http://www.hqontario.ca for more information.

About the *Ontario Health Technology Assessment Series*

To conduct its comprehensive analyses, HQO and/or its research partners reviews the available scientific literature, making every effort to consider all relevant national and international research; collaborates with partners across relevant government branches; consults with clinical and other external experts and developers of new health technologies; and solicits any necessary supplemental information.

In addition, HQO collects and analyzes information about how a health intervention fits within current practice and existing treatment alternatives. Details about the diffusion of the intervention into current health care practices in Ontario add an important dimension to the review. Information concerning the health benefits; economic and human resources; and ethical, regulatory, social, and legal issues relating to the intervention assist in making timely and relevant decisions to optimize patient outcomes.

The public consultation process is available to individuals and organizations wishing to comment on reports and recommendations prior to publication. For more information, please visit: http://www.hqontario.ca/en/mas/ohtac_public_engage_overview.html.

Disclaimer

This report was prepared by HQO or one of its research partners for the Ontario Health Technology Advisory Committee and developed from analysis, interpretation, and comparison of scientific research. It also incorporates, when available, Ontario data and information provided by experts and applicants to HQO. It is possible that relevant scientific findings may have been reported since completion of the review. This report is current to the date of the literature review specified in the methods section, if available. This analysis may be superseded by an updated publication on the same topic. Please check the HQO website for a list of all publications: http://www.hqontario.ca/en/mas/mas_ohtas_mn.html.

Abstract

Background

This evidence-based analysis reviews relational and management continuity of care. Relational continuity refers to the duration and quality of the relationship between the care provider and the patient. Management continuity ensures that patients receive coherent, complementary, and timely care. There are 4 components of continuity of care: duration, density, dispersion, and sequence.

Objective

The objective of this evidence-based analysis was to determine if continuity of care is associated with decreased health resource utilization, improved patient outcomes, and patient satisfaction.

Data Sources

MEDLINE, EMBASE, CINAHL, the Cochrane Library, and the Centre for Reviews and Dissemination database were searched for studies on continuity of care and chronic disease published from January 2002 until December 2011.

Review Methods

Systematic reviews, randomized controlled trials, and observational studies were eligible if they assessed continuity of care in adults and reported health resource utilization, patient outcomes, or patient satisfaction.

Results

Eight systematic reviews and 13 observational studies were identified. The reviews concluded that there is an association between continuity of care and outcomes; however, the literature base is weak. The observational studies found that higher continuity of care was frequently associated with fewer hospitalizations and emergency department visits. Three systematic reviews reported that higher continuity of care is associated with improved patient satisfaction, especially among patients with chronic conditions.

Limitations

Most of the studies were retrospective cross-sectional studies of large administrative databases. The databases do not capture information on trust and confidence in the provider, which is a critical component of relational continuity of care. The definitions for the selection of patients from the databases varied across studies.

Conclusions

There is low quality evidence that:

- Higher continuity of care is associated with decreased health service utilization.
- There is insufficient evidence on the relationship of continuity of care with disease-specific outcomes.
- There is an association between high continuity of care and patient satisfaction, particularly among patients with chronic diseases.

Plain Language Summary

There are 3 broad categories of continuity of care: informational, management and relational. Relational continuity is the main focus of this review. Relational continuity refers to the ongoing relationship between the care provider and the patient. This review identified several observational studies that assessed continuity of care through the use of validated indices. All of the studies identified demonstrated that higher continuity was associated with either reduced hospitalization rates or reduced emergency department visits. The limitations of this review are that the primary data source was from retrospective studies of administrative data and that all of the studies were focused on physician continuity with a patient—no studies were identified which assessed continuity with other providers such as nurses, social workers or other allied health professionals.

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List of Abbreviations

CAD	Coronary artery disease
COC	Continuity of Care Index
COPD	Chronic obstructive pulmonary disease
ED	Emergency department
FCI	Fragmentation of Care Index
HbA1c	Hemoglobin A1c
NHANES	National Health and Nutrition Examination Survey
SECON	Sequential Continuity Index
UPC	Usual Provider of Care Index

Background

In July 2011, the Evidence Development and Standards (EDS) branch of Health Quality Ontario (HQO) began developing an evidentiary framework for avoidable hospitalizations. The focus was on adults with at least 1 of the following high-burden chronic conditions: chronic obstructive pulmonary disease (COPD), coronary artery disease (CAD), atrial fibrillation, heart failure, stroke, diabetes, and chronic wounds. This project emerged from a request by the Ministry of Health and Long-Term Care for an evidentiary platform on strategies to reduce avoidable hospitalizations.

After an initial review of research on chronic disease management and hospitalization rates, consultation with experts, and presentation to the Ontario Health Technology Advisory Committee (OHTAC), the review was refocused on optimizing chronic disease management in the outpatient (community) setting to reflect the reality that much of chronic disease management occurs in the community. Inadequate or ineffective care in the outpatient setting is an important factor in adverse outcomes (including hospitalizations) for these populations. While this did not substantially alter the scope or topics for the review, it did focus the reviews on outpatient care. HQO identified the following topics for analysis: discharge planning, in-home care, continuity of care, advanced access scheduling, screening for depression/anxiety, self-management support interventions, specialized nursing practice, and electronic tools for health information exchange. Evidence-based analyses were prepared for each of these topics. In addition, this synthesis incorporates previous EDS work, including Aging in the Community (2008) and a review of recent (within the previous 5 years) EDS health technology assessments, to identify technologies that can improve chronic disease management.

HQO partnered with the Programs for Assessment of Technology in Health (PATH) Research Institute and the Toronto Health Economics and Technology Assessment (THETA) Collaborative to evaluate the cost-effectiveness of the selected interventions in Ontario populations with at least 1 of the identified chronic conditions. The economic models used administrative data to identify disease cohorts, incorporate the effect of each intervention, and estimate costs and savings where costing data were available and estimates of effect were significant. For more information on the economic analysis, please contact either Murray Krahn at murray.krahn@theta.utoronto.ca or Ron Goeree at goereer@mcmaster.ca.

HQO also partnered with the Centre for Health Economics and Policy Analysis (CHEPA) to conduct a series of reviews of the qualitative literature on “patient centredness” and “vulnerability” as these concepts relate to the included chronic conditions and interventions under review. For more information on the qualitative reviews, please contact Mita Giacomini at giacomin@mcmaster.ca.

The Optimizing Chronic Disease Management in the Outpatient (Community) Setting mega-analysis series is made up of the following reports, which can be publicly accessed at http://www.hqontario.ca/evidence/publications-and-ohtac-recommendations/ohtas-reports-and-ohtac-recommendations.

- Optimizing Chronic Disease Management in the Outpatient (Community) Setting: An Evidentiary Framework
- Discharge Planning in Chronic Conditions: An Evidence-Based Analysis
- In-Home Care for Optimizing Chronic Disease Management in the Community: An Evidence-Based Analysis
- Continuity of Care: An Evidence-Based Analysis
- Advanced (Open) Access Scheduling for Patients With Chronic Diseases: An Evidence-Based Analysis
- Screening and Management of Depression for Adults With Chronic Diseases: An Evidence-Based Analysis
- Self-Management Support Interventions for Persons With Chronic Diseases: An Evidence-Based Analysis
- Specialized Nursing Practice for Chronic Disease Management in the Primary Care Setting: An Evidence-Based Analysis
- Electronic Tools for Health Information Exchange: An Evidence-Based Analysis
- Health Technologies for the Improvement of Chronic Disease Management: A Review of the Medical Advisory Secretariat Evidence-Based Analyses Between 2006 and 2011
- Optimizing Chronic Disease Management Mega-Analysis: Economic Evaluation
- How Diet Modification Challenges Are Magnified in Vulnerable or Marginalized People With Diabetes and Heart Disease: A Systematic Review and Qualitative Meta-Synthesis
- Chronic Disease Patients’ Experiences With Accessing Health Care in Rural and Remote Areas: A Systematic Review and Qualitative Meta-Synthesis
- Patient Experiences of Depression and Anxiety With Chronic Disease: A Systematic Review and Qualitative Meta-Synthesis
- Experiences of Patient-Centredness With Specialized Community-Based Care: A Systematic Review and Qualitative Meta-Synthesis

Objective of Analysis

The objective of this analysis was to determine if continuity of care is associated with health resource utilization and patient outcomes. This evidence-based analysis on continuity of care is a part of the larger mega-analysis on Optimizing Chronic Disease Management.

Technology/Technique

There are 3 defined areas of continuity of care: informational, management, and relational or interpersonal. (1) This evidence-based analysis will address management[1] and relational continuity, but not informational continuity:

- *Informational continuity* is continuity where previous patient information is available (usually through a patient chart or an electronic medical record) and used to provide patient-appropriate care. Ideally the patient information is available to multiple health care professionals in different settings.
- *Management continuity* involves the use of standards and protocols to ensure that care is provided in an orderly, coherent, complementary, and timely fashion. Often this applies to when care is being provided my multiple providers. This also includes accessibility (availability of appointments, medical tests), flexibility to adapt to care needs, and consistency of care and transitions of care (e.g., the coordination of home care by a family physician).
- *Relational continuity (interpersonal)* refers to the ongoing relationship between the care provider and the patient. It refers to the duration of the relationship as well as the quality of the relationship, which is affected by the attentiveness, inspiration of confidence, and the medical knowledge of the health professional.

Several indices have been developed to assess the 4 primary components of relational continuity of care: (2)

- duration—length of time with a particular provider
- density—number of visits with the same provider over a defined time period
- dispersion—number of visits with distinct providers
- sequence—order in which different providers are seen

Commonly used indices are listed in Table 1.

The Usual Provider of Care (UPC) index is primarily aimed at addressing the density of care, while the Continuity of Care Index (COC) addresses density, but really focuses on the dispersion of care. In other words, the COC index measures the number of different providers seen; the more providers that are seen, the lower the continuity index. The Modified COC and Modified Modified COC indices were designed to improve the COC index; however, these indices are not reported as widely in the literature as the original COC index. The Sequential Continuity (SECON) Index is designed to assess the sequence of visits. In an ideal continuity of care scenario, a patient would be seen consecutively by one provider (provider A) for one episode of care, and then seen by another provider (provider B) consecutively for another episode of care. Thus, the sequence would be AAABBB, rather than ABABAB, which would result in a low SECON index.

[1] No studies specifically focused on management continuity were identified from the literature search.

Table 1: Measures of Continuity of Care

Name of Index	Description	Score Range	Index Measures				Strengths	Weaknesses
			Duration[a]	Density[b]	Dispersion[c]	Sequence[d]		
Usual Provider of Continuity (UPC) index	The number of visits to a usual provider in a given period over the total number of visits to similar providers	0 to 1	Yes	Yes	No	No	Since a 'usual provider' is defined, it may be useful in analyzing the role of other health providers in addition to physicians	Only assesses visits with usual provider, other providers not included in the index Not independent of utilization levels Measure decreases as number of visits increases
Continuity of Care (COC) index	Measures both the dispersion and concentration of care among all providers seen	0 to 1	Yes	Yes	Yes	No	Sensitive to shifts in the distribution of visits among providers Good mathematical performance; tends to have a mean of 0.5 and a large coefficient of variation	May mask important differences in sequencing of care Mot independent of utilization levels Measure decreases as number of visits increases Measure falls rapidly with increasing number of providers seen
Modified Continuity Index (MCI)	Measure of concentration of care in population of patients calculated by dividing the average number of visits by a group by the average number of providers in the a population	0 to 1	Yes	Yes	Yes	No	Requires summary utilization measures only (compared with COC which requires more utilization data)	Extremes of continuity not reflected in measure (i.e., 2 visits to same provider yields an intermediate result rather than perfect continuity)
Modified Modified Continuity Index (MMCI)	Measure of concentration of care with providers at the individual patient level Developed to account for problems of COC and MCI indices	0 to 1	Yes	Yes	Yes	No	Requires summary utilization measures only (compared with COC which requires more utilization data) Not overly sensitive to large number of providers	No sequential data captured
Sequential Continuity (SECON) index	Fraction of sequential visit pairs where the same provider is seen	0 to 1	Yes	Yes	No	Yes	Sensitive to shifts in sequence of visits Potentially useful as measure of amount of inter-provider communication necessary because of transfers of care	Insensitive to the distribution of visits among providers if sequencing remains constant

[a] Duration refers to the length of time with a particular provider.
[b] Density refers to the number of visits with the same provider over a defined time period.
[c] Dispersion refers to the number of visits with distinct providers.
[d] Sequence refers to the order in which different providers are seen.
Source: Reid et al, 2002. (3)

Evidence-Based Analysis

Research Question

Is higher continuity of care effective at reducing health resource utilization and improving patient outcomes?

Research Methods

Literature Search

Search Strategy

A literature search was performed on December 8, 2011 (then updated January 27, 2012) using OVID MEDLINE, OVID MEDLINE In-Process and Other Non-Indexed Citations, OVID EMBASE, EBSCO Cumulative Index to Nursing & Allied Health Literature (CINAHL), the Wiley Cochrane Library, and the Centre for Reviews and Dissemination database, for studies published from January 1, 2002, until December 8, 2011 (updated January 27, 2012). A 10-year timeframe was chosen because there was a comprehensive systematic review by Cabana and Jee published in 2004 that included studies up until 2002. (4) Abstracts were reviewed by a single reviewer and, for those studies meeting the eligibility criteria, full-text articles were obtained. Reference lists were also examined for any additional relevant studies not identified through the search. The full search strategy is listed in Appendix 1.

Inclusion Criteria

- English language full-reports
- published between January 1, 2002, and January 27, 2012
- randomized controlled trials, systematic reviews, meta-analyses, prospective observational, and retrospective studies
- studies with adult patients
- studies investigating provider level or clinic level continuity
- studies investigating interpersonal (relational) continuity or management continuity[2]
- studies with patients with diabetes, heart failure, chronic obstructive pulmonary disease (COPD), atrial fibrillation, stroke, coronary artery disease, chronic wounds or studies with patients with multiple chronic conditions
- studies reporting at least 1 outcome of interest

Exclusion Criteria

- studies of informational continuity
- studies with physicians in training, residents, fellows
- studies of patients in hospital, mental health facilities, or long-term care facilities
- studies of transitions of patients to or from inpatient setting
- studies including only a pediatric population
- studies focusing on prevention or screening for disease

[2]No studies specifically focused on management continuity were identified from the literature search.

- case series, case reports, editorials
- non-English studies

Outcomes of Interest

- health resource utilization (hospitalizations, emergency department visits [ED])[3]
- mortality
- disease-specific outcomes
- quality of life
- patient satisfaction

Quality of Evidence

The quality of the body of evidence for each outcome is examined according to the GRADE Working Group criteria. (5) The overall quality is determined to be very low, low, moderate, or high using a step-wise, structural methodology.

Study design is the first consideration; the starting assumption is that randomized controlled trials are high quality, whereas, observational studies are low quality. Five additional factors—risk of bias, inconsistency, indirectness, imprecision, and publication bias—are then taken into account. Limitations or serious limitations in these areas result in downgrading the quality of evidence. Finally, 3 main factors are considered which may raise the quality of evidence: large magnitude of effect, dose response gradient, and accounting for all residual confounding. (5) For more detailed information, please refer to the latest series of GRADE articles. (5)

As stated by the GRADE Working Group, the final quality score can be interpreted using the following definitions:

High	Very confident that the true effect lies close to the estimate of the effect
Moderate	Moderately confident in the effect estimate—the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
Low	Confidence in the effect estimate is limited—the true effect may be substantially different from the estimate of the effect
Very Low	Very little confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of effect

[3]Please note: All hospitalization and ED visit data represent all-cause hospitalizations, and do not distinguish between initial hospitalization or ED visit and rehospitalization or repeat ED visits.

Results of Evidence-Based Analysis

The database search yielded 6,462 citations published between January 1, 2002, and December 8, 2011 (with duplicates removed). Articles were excluded based on information in the title and abstract. The full texts of potentially relevant articles were obtained for further assessment. Figure 1 shows the breakdown of when and for what reason citations were excluded in the analysis. Twenty-three studies (8 systematic reviews and 15 observational studies) met the inclusion criteria.

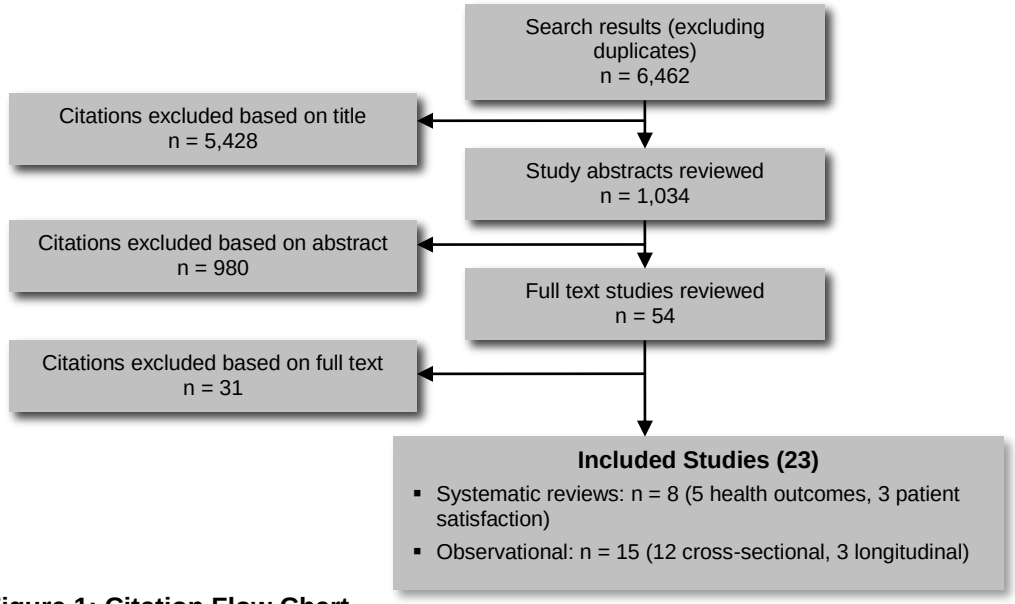

Figure 1: Citation Flow Chart

The results of the evidence-based analysis were stratified under the following subheadings:

- systematic reviews assessing the effectiveness of continuity of care (5 studies)
- studies of continuity of care in patients with any condition (5 studies)
- studies of continuity of care in patients with diabetes (10 studies [3 studies of the same trial])
- studies of continuity of care in patients with COPD (1 study)
- studies of continuity of care in patients with coronary artery disease (1 study)
- systematic reviews assessing patient satisfaction associated with continuity of care (3 studies)

For each included study, the study design was identified and is summarized below in Table 2, which is a modified version of a hierarchy of study design by Goodman. (6)

Table 2: Body of Evidence Examined According to Study Design

Study Design	Number of Eligible Studies
RCT Studies	
Systematic review of RCTs	
Large RCT	
Small RCT	
Observational Studies	
Systematic review of non-RCTs with contemporaneous controls	
Non-RCT with non-contemporaneous controls	
Systematic review of non-RCTs with historical controls	8
Non-RCT with historical controls	
Database, registry, or cross-sectional study	15
Case series	
Retrospective review, modelling	
Studies presented at an international conference	
Expert opinion	
Total	23

Abbreviation: RCT, randomized controlled trial.

Systematic Reviews Assessing the Effectiveness of Continuity of Care

Five systematic reviews were identified that assessed the effectiveness of continuity of care on health system utilization and patient outcomes (Table 3). None of the reviews specifically focused on patients with chronic conditions. With the exception of the review by Worrall and Knight, (7) the reviews included studies with any patient population. The Worrall and Knight systematic review included studies of adults 50 years or older. (7)

Unlike the other systematic reviews identified, the systematic review by Jee and Cabana (2) did not assess the effectiveness of continuity of care, but rather the intent of this review was to identify the indices to assess continuity of care. The authors only included studies with a clearly defined measure of continuity and they found that there was considerable heterogeneity across indices for measuring continuity.

The systematic review by van Walraven et al (8) assessed quality of continuity of care using 4 criteria: the representativeness of the cohort; how the continuity measure was collected; how the outcome measure was collected and; and the adequacy of follow-up. Of the 18 studies included, 16 studies met 3 or 4 of the criteria. Only 1 study met only 1 criterion, and the other met 2 criteria.

Overall, the systematic reviews found that there appears to be an association between continuity of care and improved patient outcomes; however, the literature base is weak.

Table 3: Summary of Systematic Reviews on Continuity of Care

Study	Research Question	Sources & Years Searched	Inclusion Criteria	Number of Studies Included	Conclusion
van Walraven et al, 2010 (8)	Is there an association between continuity of care and outcomes?	MEDLINE (1950–2008)	Studies measuring continuity and outcomes Accounted for relative timing of continuity and outcomes	18	"Increased provider continuity is associated with improved patient outcomes and satisfaction"
Jee & Cabana, 2006 (2)	What are the indices of continuity of care?	MEDLINE, PSYCH INFO (1966–2002)	Studies with a defined measure of continuity	44	There is variability in the continuity indices
van Servellen et al, 2006 (9)	To what extent are informational, management, and relational continuity associated with quality of care indicators?	MEDLINE (1996–2005)	Studies measuring continuity and outcomes Any patient population	32	No summary statement on literature
Worrall & Knight, 2006 (7)	How important is continuity of care for older patients in family practice?	MEDLINE, EMBASE, CINAHL (1970–2005)	Interpersonal continuity and outcomes Adults > 50 years	5	Evidence that continuity in the elderly is 'scanty'
Cabana & Jee, 2004 (4)	Does continuity of care improve patient outcomes?	MEDLINE, PSYCH INFO (1966–2002)	Primary care setting Continuity and outcomes	18	Continuity improves quality of care consistently in patients with chronic diseases

Studies of Continuity of Care in Patients With Any Condition

Five studies were identified that assessed continuity of care in patients with any condition (Tables 4, 5). There was 1 longitudinal study that tracked patient data for 7 year; (10) the others were cross-sectional studies. (11-14) Four of the studies analyzed data from administrative databases, and the other used survey data to generate results on continuity of care. (13) The studies using the larger administrative databases included from 30,000 to more than 500,000 patients. The selection of patients analysed from the databases differed across the studies. Selection criteria varied in terms of age cut-off, minimum number of visits, and the duration that data were gathered for. In each of the studies continuity with the patients' primary physicians was assessed. The literature search did not identify continuity of care assessments with other health care providers. Three of the studies are Canadian (1 from Newfoundland & Labrador, and 2 from Manitoba) and the other 2 are from Taiwan. In Taiwan, national health insurance is relatively new (mid 1990s). The system has been arranged so that patients choose their primary care physician and their specialists. They do not require a referral to see a specialist and they can choose to see any primary care physician and go back and forth to different primary care providers as they choose. Thus, the issue of continuity of care is of interest to Taiwan to see if inconsistent contact with physicians is impacting health outcomes.

The study by Cheng et al from 2011 (11) reported that across 3 indices of continuity, higher continuity was associated with lower rates of hospital admissions and ED visits. This study used data from 2005 to assess continuity using the indices, and they applied this data to 2005 and 2006 outcomes for hospitalization and ED visits. The authors noted that although still significant, the effect of high continuity in 2005 was diminished in 2006. The results were consistent across all 3 indices of continuity used.

The prospective Ontario-based study by van Walraven et al (15) from 2010 assessed the continuity of care of patients discharged to the community after a hospitalization (either elective or emergency). The authors were specifically looking at physician continuity before, during, and after hospitalization. The study reported that continuity with the preadmission physician (either family physician or specialist) was associated with a decrease in subsequent hospitalizations (adjusted hazard ratio 0.94; 95% confidence interval, 0.91–0.98). In other words, if the patient saw the preadmission physician after discharge they were less likely to be readmitted to hospital than if they had been seen by another physician post discharge. Visits with the hospital physician post discharge did not have a significant impact on readmissions or mortality.

Three of 5 studies reported hospitalization rates in relation to continuity of care. Higher continuity was associated with a statistically significant reduced hospitalization rate in 2 of the 3 studies. (10;11) The study by Menec et al (13) reported a statistically significant reduction in the rate of hospitalizations in patients being admitted for ambulatory care–sensitive conditions, but not for all admissions.

Three of 5 studies reported ED visits in relation to continuity of care. All 3 studies reported a statistically significant reduction in ED visits in patients with higher continuity, regardless of how continuity was assessed. (11;12;14)

Table 4: Characteristics of Studies Assessing Continuity of Care in Patients With Any Condition

Study	Type of Study	Research Question	Population	N	Continuity With Whom/What	Primary Outcomes
Cheng et al, 2011 (11) (Taiwan)	Cross-sectional database study	Does continuity of care matter in a health care system that lacks referral arrangements?	Patients with more than 4 physician visits within 1 year	134,422	Measurement of continuity with the same physician provider	Hospitalization and ED visits
Cheng et al, 2010 (10) (Taiwan)	Longitudinal database study	What is the effect of continuity of care on avoidable hospitalization and hospital admission for any condition in a health care system with a high level of access to care?	3 or more physician visits per year	30,830	Measurement of continuity with the same physician provider	Avoidable hospitalization and hospitalization for any condition
Ionescu-Ittu et al, 2007 (12) (Canada)	Cross-sectional database study	Is continuity of primary care associated with ED visits in elderly people in both urban and rural areas?	Adults ≥ 65 years with 3 or more physician visits over 2 year period	95,173	Measurement of continuity with the same physician provider	ED visits
Menec et al, 2006 (13) (Canada)	Retrospective analysis of survey data	Does continuity of care with a family physician reduce hospitalizations among older adults?	Adults ≥ 67 years with 4 or more physician visits in 2 year period	1,863	Measurement of continuity with the same physician provider	Hospitalization
Menec et al, 2005 (14) (Canada)	Cross-sectional database study	Does continuity of care matter in a universally insured population?	All individuals who had at least 1 physician contact in 2 year period	536,893	Measurement of continuity with the same physician provider	ED visits and preventive care (pap smears, mammograms, flu shots)

Abbreviations: ED, emergency department; N, number of patients.

Table 5: Results of Studies Assessing Continuity of Care in Patients With Any Condition

Study	N	Indices Used (How Was Continuity Measured?)	Continuity Cut-Off	Proportion of Patients in Each Continuity Category	Hospitalization	ED Visits
Cheng et al, 2011 (11) (Taiwan)	134,422	UPC, COC, SECON	3 equal tertiles for each index—UPC, COC, SECON	UPC Low: 31.9% Medium: 34.7% High: 33.4% COC Low: 30.6% Medium: 32.7% High: 28.4% SECON Low: 30.2% Medium: 28.9% High: 32.5%	Odds ratio (No CI reported): UPC Low: 1.00 Medium: 0.92 [a] High: 0.79 [a] COC Low: 1.00 Medium: 0.77 [a] High: 0.90 [a] SECON Low:1.00 Medium: 0.88 [a] High: 0.87 [a]	Odds ratio (No CI reported): UPC Low: 1.00 Medium: 0.88 [a] High: 0.70 [a] COC Low: 1.00 Medium: 0.85 [a] High: 0.68 [a] SECON Low: 1.00 Medium: 0.82 [a] High: 0.71 [a]
Cheng et al, 2010 (10) (Taiwan)	30,830	COC	0–16% low continuity 17–33% medium continuity 34–100% high continuity (equal tertiles based on study population)	NR	≥ 65 years (any hospitalization) Odds ratio (95% CI) Low: 1.00 Medium: 0.62 (0.56–0.67) [a] High: 0.32 (0.29–0.36) [a]	NR
Ionescu-Ittu et al, 2007 (12) (Canada)	95,173	UPC	≤ 50% low continuity 50–80% med continuity > 80% high continuity	Low: 21% Medium: 32% High: 30%	NR	Rate ratio (95% CI): Low: 1.00 Medium: 0.79 (0.77–0.80) [a] High: 0.68 (0.66–0.69) [a]
Menec et al, 2006 (13) (Canada)	1,863	"majority of care definition"—patients who made 75% of all visits to their family physician—high continuity	≤ 75% low continuity > 75% high continuity	Low: 35.5% High: 64.5%	Odds ratio (95% CI): All Conditions Low: 1.00 High: 0.83 (0.67–1.01) ACSC Low: 1.00 High: 0.67 (0.51–0.90) [a]	NR

Study	N	Indices Used (How Was Continuity Measured?)	Continuity Cut-Off	Proportion of Patients in Each Continuity Category	Hospitalization	ED Visits
Menec et al, 2005 (14) (Canada)	536,893	"majority of care definition"—patients who made 75% of all visits to their family physician—high continuity	≤ 75% low continuity > 75% high continuity And ≤ 50% low continuity > 50% high continuity	NR	NR	Odds ratio (99% CI): COC 75% (Adults ≥15 yrs): Low: 1.00 High: 0.85 (0.80–0.90) [a] COC 50% (Adults ≥15 yrs): Low: 1.00 High: 0.78 (0.73–0.83) [a]

Abbreviations: ACSC, ambulatory care sensitive conditions; CI, confidence interval; COC, Continuity of Care index; ED, emergency department; MMCI, Modified Modified Continuity Index; N, number of patients; NR, not reported; SECON, Sequence of Continuity index; UPC, Usual Provider of Care index.

[a] $P < 0.05$

Studies of Continuity of Care in Patients With Diabetes

Eight studies were identified that assessed continuity of care in patients with diabetes (Tables 6, 7). More studies were identified for assessing continuity with diabetes care than any other chronic disease.

Knight et al (16) hypothesized that patients with more chronic conditions had lower continuity of care because they were more likely to be seen more urgently and thus not always able to visit their usual care provider on short notice compared to those patients with fewer chronic conditions who may have not needed to see their provider as urgently.

In 2011, Chen and Cheng (17) assessed continuity of care using 3 indices: UPC, COC, and SECON. They reported consistently that higher continuity of care was associated with fewer hospitalizations and ED visits. They also conducted a sensitivity analysis of the effect of the COC index on health care utilization by tertile of physician visits. Patients were stratified into low number of visits per year (4–19 visits), medium number of visits per year (20–32 visits), or high number of visits per year (≥ 33 visits). Again, the authors reported the same results, where patients with high continuity of care were associated with fewer hospitalizations and ED visits, regardless of which tertile of number of visits the patients were assigned (Table 6). The analysis was adjusted for age, sex, low-income status, hospitalizations in previous year, and diabetes complication severity index score.

Table 6: Continuity of Care Index Results From Chen and Cheng's Sensitivity Analysis by Visit Tertiles

Variable	Hospitalization Odds Ratio (95% CI)	ED Visits Odds Ratio (95% CI)
Low visit group (4–19 visits/year)		
Low continuity	1.00	1.00
Medium continuity	0.59 (0.56–0.62)	0.66 (0.62–0.70)
High continuity	0.24 (0.23–0.26)	0.33 (0.31–0.36)
Medium visit group (20–32 visits/year)		
Low continuity	1.00	1.00
Medium continuity	0.57 (0.55–0.60)	0.66 (0.63–0.70)
High continuity	0.26 (0.24–0.27)	0.34 (0.32–0.36)
High visit group (≥ 33 visits/year)		
Low continuity	1.00	1.00
Medium continuity	0.57 (0.55–0.59)	0.62 (0.59–0.65)
High continuity	0.28 (0.27–0.30)	0.36 (0.33–0.38)

Abbreviation: CI, confidence interval.
Source: Chen and Cheng, 2011. (17)

The study by Liu et al (18) used the Fragmentation of Care Index (FCI) to assess continuity with clinic site; it did not assess individual care provider continuity. The study reported, not surprisingly, that patients with more chronic diseases had higher fragmentation scores (i.e., lower continuity) because they had more specialist appointments at different clinic sites. The study found that there was a significant association between the number of ED visits and the FCI. They calculated that for each 0.1 increase in FCI, there was an 18% increase in ED visits over the 2-year study period.

The study by Atlas et al (19) did not use a previously published index of continuity to measure continuity; instead, they assessed patients' 'connectedness' with a physician or practice using a validated algorithm developed by the study authors. The study found that being connected to a physician versus being connected to a practice significantly improved glycosylated hemogolbin (HbA1c) levels in patients with diabetes ($P = 0.004$).

The study by Mainous et al (20) used data from the National Health and Nutrition Examination Survey (NHANES) to examine if there was an association between continuity of care and diabetes control. The study assessed continuity of care using the following questions from the survey: "Is there a particular clinic, health centre, doctor's office, or other place that you usually go if you are sick, need advice about your health, or for routine care?" If they responded yes to the preceding question then they were asked "Is there one particular doctor or health professional you usually see?" Based on the responses to these questions, a continuity variable was created based on 3 categories: 1) no usual source of care; 2) usual site but no usual provider; or 3) usual site and provider. The study found that 85% of the respondents reported that they had both a usual site and a usual provider of care. Five percent reported having no usual source of care and 9% reported a usual site, but no usual provider of care. They reported a significant improvement in HbA1c levels in patients with high continuity of care (usual provider) versus low continuity (no provider), but they did not report a significant difference associated with continuity for systolic blood pressure or lipid levels.

Five studies reported hospitalization rates associated with continuity. Four studies reported that there were statistically significantly fewer hospitalizations associated with higher continuity compared to low or medium continuity. (16;17;21;22) These studies each used different indices to measure continuity. The study by Lin et al (18) reported a significant reduction in long-term complications leading to hospitalization (as defined by the International Classification of Diseases codes) in patients with high continuity of care compared to low continuity, but not compared to medium continuity. They did not report a significant difference in the relationship between continuity and short-term complications leading to hospitalization (defined by International Classification of Diseases codes). The authors attributed the nonsignificance to a low rate of events (n = 50).

Three studies reported the number of ED visits associated with continuity. All 3 studies reported a significantly reduced number of ED visits in patients with higher continuity of care. (17;22;23) Two of the studies used the COC index and the other used the FCI.

Two studies reported HbA1c levels in relation to continuity of care. Both reported that optimal glycemic control was more likely in patients with higher continuity compared to lower continuity. (19;20) The study by Mainous et al (20) also reported systolic blood pressure and lipid levels, but the study did not identify any significant differences in these outcomes in relation to continuity of care.

Table 7: Characteristics of Studies Assessing Continuity of Care in Patients With Diabetes

Study	Type of Study	Research Question	Population	N	Continuity With Whom/What	Primary Outcomes
Chen & Cheng, 2011 (17) (Taiwan)	Longitudinal database study	What is the effect of continuity of care on health care utilization and expenses for patients with diabetes?	Adult patients with diabetes (type 1 or 2) with 3 or more physician visits per year for 7 years	48,107	Measurement of continuity with the same physician provider	Healthcare utilization and healthcare expenses
Worrall & Knight, 2011 (21) (Canada)	Cross-sectional database study	What is the relationship between continuity of family physician care and all-cause mortality and hospitalizations in older people with diabetes?	Patients with diabetes over 65 years with 2 or more fee for service claims within 2 year period	305	Measurement of continuity with the same physician provider	Mortality Hospitalization
Hong et al, 2010 (22) (Korea)	Cross-sectional database study	Is there an association between continuity of care and health outcomes?	Patients with diabetes aged 65 to 84 years with 4 or more physician visits within previous 3 years	268,220	Measurement of continuity with the same physician provider	Hospitalizations, ED visits
Lin et al, 2010 (18) (Taiwan)	Cross-sectional database study	Is the discontinuity of care associated with hospitalization?	Patients with diabetes with 4 visits over 5 years	6,476	Measurement of continuity with the same physician provider	Diabetes-related admissions
Liu et al, 2010 (23) (USA)	Cross-sectional database study	What is the association between patterns of fragmented care and ED use among people with diabetes?	Patients with diabetes with 2 or more visits to a primary care practice within the previous year	3,873	Measurement of continuity by clinic site not individual providers	ED visits
Atlas et al, 2009 (19) (USA)	Cross-sectional database study	Does patient-physician connectedness affect measures of clinical performance?	Adults with 1 or more visits to primary care physician in a 3 year period	155,590	Measurement of continuity by clinic site and physician providers	HbA1c
Knight et al, 2009 (16) (Canada)	Longitudinal database study	Does higher continuity of family physician care reduce hospitalizations in elderly people with diabetes?	Elderly (> 65 years) with newly diagnosed diabetes; 6 physician visits over 3 years	1,143	Measurement of continuity with the same physician provider	Hospitalizations
Mainous et al, 2004 (20) & Koopman et al, 2003 (24) & Harvey et al, 2004 (25) (USA)	Cross-sectional database study	What is the relationship between continuity of care and diabetes control?	Patients with diabetes who participated in the 3rd NHANES	1,400	Measurement of continuity with the same physician provider	HbA1c, blood pressure, lipid control

Abbreviations: ED, emergency department; HbA1c, glycosylated hemoglobin; N, number of patients; NHANES, National Health and Nutrition Examination Survey.

Table 8: Results of Studies Assessing Continuity of Care in Patients With Diabetes

Study	N	Indices Used	Continuity Cut-Off	Proportion of Patients in Each Continuity Category	Hospitalization	ED Visits	Diabetes-Specific Outcomes
Chen & Cheng, 2011 (17) (Taiwan)	48,107	UPC, COC, SECON	< 0.47 low continuity 0.47–0.86 medium continuity ≥ 0.87 high continuity	NR	Odds ratio (95% CI) UPC Low: 1.00 Medium: 0.61 (0.59–0.62) High: 0.26 (0.25–0.27) COC Low: 1.00 Medium: 0.58 (0.56–0.59) High: 0.26 (0.25–0.27) SECON Low: 1.00 Medium: 0.67 (0.66–0.69) High: 0.30 (0.29–0.31)	Odds ratio (95% CI) UPC Low: 1.00 Medium: 0.68 (0.66–0.70) High: 0.35 (0.0.34–0.36) COC Low: 1.00 Medium: 0.64 (0.62–0.66) High: 0.34 (0.33–0.36) SECON Low: 1.00 Medium: 0.69 (0.67–0.72) High: 0.36 (0.35–0.37)	NR
Worrall & Knight, 2011 (21) (Canada)	305	UPC	≥ 0.75 high continuity < 0.75 low continuity	Low: 27.2% High: 72.8%	Percentage over 3 years: Low: 67.5% High: 54.5%[b]	NR	*Mortality (percentage over 3 years):* *Low: 18.1%* *High: 9.0%*[b]
Hong et al, 2010 (22) (Korea)	268,220	COC	Equal tertiles based on study population	NR	Odds ratio (95% CI) Low: 1.00 Medium: 0.75 (0.72–0.78)[a] High: 0.68 (0.66–0.71)[a]	Odds ratio (95% CI) Low: 1.00 Medium: 0.77 (0.69–0.85)[a] High: 0.71 (0.64–0.79)[a]	NR
Lin et al, 2010 (18) (Taiwan)	6,476	UPC	< 0.47 low continuity 0.47–0.75 medium continuity ≥ 0.75 high continuity	NR	Odds ratio (95% CI) Long-term complications leading to admissions: Low: 1.00 Medium: 0.76 (0.58–1.00) High: 0.75 (0.58–0.98) a Short-term complications leading to admissions: Low: 1.12 (0.55–2.31) Medium: 0.78 (0.38–1.59) High: 0.89 (0.43–1.82)	NR	NR
Liu et al, 2010 (23) (USA)	3,873	FCI (0–1) (low score, higher continuity)	Divided into quintiles	NR	NR	IRR: 0.87 (95% CI, 0.83–0.92; *P* < 0.01)	NR

Study	N	Indices Used	Continuity Cut-Off	Proportion of Patients in Each Continuity Category	Hospitalization	ED Visits	Diabetes-Specific Outcomes
Atlas et al, 2009 (19) (USA)	155,590 (~10,000 with diabetes)	Created algorithm to define connectedness to physician, practice, or neither.	Equal tertiles based on study population	NR	NR	NR	HbA1c < 8% Physician connectedness: 74.7% (95% CI, 73.4–76.0) Practice connectedness: 70.5% (95% CI, 67.8–73.0) *P* = 0.004
Knight et al, 2009 (16) (Canada)	1,143	UPC, COC, SECON	≥ 0.75 high continuity < 0.75 low continuity	COC Low: 36.6% High: 63.4% UPC Low: 23.7% High: 76.3% SECON Low: 18.5% High: 81.4%	Odds Ratio (95% CI) High COC 0.82 (0.69–0.97) High UPC 0.82 (0.68–0.98) High SECON 0.75 (0.61–0.91)	NR	NR

Study	N	Indices Used	Continuity Cut-Off	Proportion of Patients in Each Continuity Category	Hospitalization	ED Visits	Diabetes-Specific Outcomes
Mainous et al, 2004 (20) & Koopman et al, 2003 (24) & Harvey et al, 2004 (25) (USA)	1400	Based on responses to questions on NHANES[a]	3 categories: no usual source of care usual site, but no usual provider usual site and provider	NR	NR	NR	[c] Odds ratio, 95% CI HbA1c ≤ 7% No usual source: 1.00 Usual site: 11.81 (4.02–34.71) Usual provider: 6.69 (2.61–17.18) HbA1c ≤ 8% No usual source: 1.00 Usual site: 6.13 (2.08–18.04) Usual provider: 4.62 (2.02–10.60) SBP ≤ 130mmHg No usual source: 1.00 Usual site: 2.76 (0.70–10.93) Usual provider: 1.78 (0.55–5.72) SBP ≤ 140mmHg No usual source: 1.00 Usual site: 1.02 (0.28–3.78) Usual provider: 0.87 (0.36–2.13) Lipids ≤ 100mg/dL No usual source: 1.00 Usual site: 1.93 (0.71–5.24) Usual provider 1.10 (0.44–2.73) Lipids ≤ 130mg/dL No usual source: 1.00 Usual site: 2.37 (0.82–6.79) Usual provider: 1.59 (0.55–4.57)

Abbreviations: CI, confidence interval; HbA1c, glycosylated haemoglobin; IRR, incidence rate ratio; N, number of patients; NHANES, National Health and Nutrition Examination Survey; NR, not reported.

[a] Based on responses to the following questions on the NHANES:

- Is there a particular clinic, health center, doctor's office, or other place that you usually go if you are sick, need advice about your health, or for routine care?
- If yes, is there one particular doctor or health professional you usually see?

[b] $P < 0.05$

[C] Results for all outcomes adjusted for age, gender, education, insurance coverage, health status, income, length of time with diabetes

Studies of Continuity of Care in Patients With COPD

One cross-sectional study was identified that assessed continuity of care in patients with COPD (Tables 8, 9). This study by Hong et al (22) also included elderly patients (aged 65–84 years) with diabetes, hypertension, and asthma, in addition to COPD. The authors stratified the results by chronic disease. They used a Korean health administrative database to gather information of continuity on 131,512 patients with COPD. They reported a statistically significant increase in hospitalizations and ED visits in patients with low or medium continuity compared to patients with high continuity of care ($P < 0.001$).

Table 9: Characteristics of Studies Assessing Continuity of Care in Patients With COPD

Study	Type of Study	Research Question	Population	N	Continuity With Whom/What	Primary Outcomes
Hong et al, 2010 (22) (Korea)	Cross-sectional database study	Is there an association between continuity of care and health outcomes?	Patients with COPD aged 65 to 84 years with 4 or more physician visits within previous 3 years	131,512	Measurement of continuity with the same clinic site	Hospitalizations, ED visits

Abbreviations: COPD, chronic obstructive pulmonary disease; ED, emergency department; N, number of patients.

Table 10: Results of Studies Assessing Continuity of Care in Patients With COPD

Study	Indices Used	Continuity Cut-Off	Proportion of Patients in Each Continuity Category	Hospitalization	ED visits
Hong et al, 2010 (22) (Korea)	COC	Equal tertiles based on study population	NR	Odds ratio (95% CI) Low 1.00 Medium 0.67 (0.62–0.71) [a] High 0.50 (0.47–0.69)[a]	Odds ratio (95% CI) Low 1.00 Medium 0.77 (0.63–0.94) [a] High 0.56 0.46–0.69) [a]

Abbreviations: CI, confidence interval; COC, continuity of care; COPD, chronic obstructive pulmonary disease; ED, emergency department; NR, not reported.

[a] $P < 0.05$

Studies of Continuity of Care in Patients With Coronary Artery Disease

One cross-sectional study was identified that reported continuity of care in patients with coronary artery disease (CAD) (Tables 10, 11). This study also reported outcomes for patients with diabetes. They did not use a previously published index of continuity to measure continuity. Instead, Atlas et al (19) assessed patients' 'connectedness' with a physician or practice using a validated algorithm developed by the study authors. They found that being connected to a physician versus being connected to a practice did not significantly influence cholesterol levels in patients with CAD.

Table 11: Characteristics of Studies Assessing Continuity of Care in Patients With CAD

Study	Type of Study	Research Question	Population	N	Continuity With Whom/What	Primary Outcome
Atlas et al, 2009 (19) (USA)	Cross-sectional database study	Does patient-physician connectedness affect measures of clinical performance?	Adults with 1 or more visits to primary care physician in a 3 year period.	155,590 (~7,000 with CAD)	Measurement of continuity by clinic site and physician providers	LDL cholesterol

Abbreviations: CAD, coronary artery disease; LDL, low density lipoprotein; N, number of patients.

Table 12: Results of Studies Assessing Continuity of Care in Patients With CAD

Study	Indices Used	Continuity Cut-Off	Proportion of Patients in Each Continuity Category	Hospitalization	ED Visits	CAD-Specific Outcomes
Atlas et al, 2009 (19) (USA)	Created algorithm to define connectedness to physician, practice, or neither	Equal tertiles based on study population	NR	NR	NR	LDL level < 2.59 mmol/L Physician connectedness: 77.0% (95% CI, 75.7–78.4) Practice connectedness: 77.6% (95% CI, 74.4–80.5) *P* = 0.74

Abbreviations: CAD, coronary artery disease; CI, confidence interval; ED, emergency department; LDL, low density lipoprotein; NR, not reported.

Limitations

The studies identified for this review were designed to assess the continuity of care, and not the most appropriate care. The continuity indices have been designed to measure continuity by implying that dispersion (i.e., seeing many different providers) is not optimal. However, there are situations in which this reasoning does not apply, especially for patients with chronic diseases that require some dispersion and need to see various specialists to optimally manage their care. Therefore, there are circumstances where dispersion is good and important for quality care. The continuity indices are not able to distinguish the 'good' dispersion from the 'inappropriate' dispersion.

Another limitation of this body of literature is that all of the studies were assessing physician continuity. There were no studies identified which assessed continuity of care among other health care providers (nurses, social workers, diabetes educators, etc.).

The majority of studies assessing continuity of care were large cross-sectional studies based on data from health administrative databases. There are some limitations associated with using large administrative datasets, including the accuracy of diagnosis. Often the databases are not used for research purposes; rather, the data is used for insurance claims which question the validity of the diagnosis. Many studies required that patients had multiple visits in order to be included in the study sample, thus trying to minimize the risk of error. Another limitation is the heterogeneity in the methods for choosing patients for the sample. For instance, some studies required 4 visits over a defined time period, while others required only 2 visits to be eligible for the study. Also, using large datasets allows for a large sample size, but the amount of data that can be gathered is limited. These large datasets do not capture information on trust and confidence in a patient's provider or measures of patient and provider satisfaction.

Also, results from studies from countries where there is not a formal referral system, such as Taiwan, may not be generalizable to Ontario where most patients seek care first through primary care physicians.

Systematic Reviews Assessing Patient Satisfaction Associated With Continuity of Care

Three systematic reviews were identified that examined the relationship between continuity of care and patient satisfaction (Table 12). (1;26;27)

In 2012, Waibel et al (1) published a synthesis of qualitative studies assessing patients' perspectives on continuity of care. This meta-synthesis was thorough in describing the methods of identifying studies, selecting studies for inclusion, extracting data, and in defining themes. As is common with many search strategies for qualitative studies, their literature search may have missed some studies due to the inconsistency of terminology used in studies and the terms indexed in the literature search databases. To mitigate some of this bias, they hand-searched references of selected studies for any studies missed in the original literature search. Waibel et al (1) identified 25 studies to include in their analysis and stratified the studies into 3 groups: relational continuity, management continuity, and informational continuity. The majority of the studies were focused on relational continuity. In other words, they were interested in the patient-provider interaction and relationship. Based on the meta-synthesis of the qualitative studies, Waibel et al (1) concluded that chronically ill patients valued continuity with one provider over time, compared to younger patients who valued both continuity with the provider and convenient access.

In 2010, Adler et al (26) published a systematic review on continuity of care focused specifically on relational continuity. The authors reported that patient satisfaction was described in several different ways in the 12 studies included in their review. This heterogeneity did not permit them to make strong conclusions as to whether there was an association between continuity and patient satisfaction.

Saultz and Albedaiwi (27) also reviewed the association between relational continuity of care and patient satisfaction. Like Adler et al, (26) Saultz and Albedaiwi (27) also identified a lot of heterogeneity in the literature on continuity of care and patient satisfaction. Nonetheless, they concluded that patient satisfaction was improved with higher continuity of care because of the consistency of results in the studies they identified.

Overall, there does appear to be a positive relationship between high continuity of care and patient satisfaction.

Table 13: Summary of Systematic Reviews of Patient Satisfaction

Study	Research Question	Sources & Years Searched	Inclusion Criteria	Number of Studies Included	Conclusions
Waibel et al, 2012 (1)	What do we know about patients' perceptions of continuity of care?	MEDLINE, Social Sciences Citation Index (up to 2009)	Explicit or implicit analysis of continuity Qualitative study design patient's perspective	25	Continuity is valued more in patients with chronic illnesses compared with younger, healthier patients
Adler et al, 2010 (26)	What is the evidence on the relationship between continuity and patient satisfaction?	MEDLINE, CINAHL (1984–2007)	Reported measures of relational continuity and patient satisfaction	12	Inconsistent results across studies
Saultz & Albedaiwi, 2004 (27)	What is the association between interpersonal continuity and the level of patient satisfaction?	MEDLINE (1996–2002)	Reported measures of relational continuity and patient satisfaction	22	"A consistent and significant positive relationship exists between interpersonal continuity and patient satisfaction"

Conclusions

There is low quality evidence that:

- Despite heterogeneity in how continuity is measured, higher continuity of care appears to decrease health service utilization (hospitalizations and ED visits).
- There is insufficient evidence to comment on the relationship of continuity of care with disease-specific outcomes.
- There appears to be a positive association between high continuity and patient satisfaction, particularly among patients with chronic disease.

Table 14: Summary of Findings

Outcome	Number of Studies (N)	Results	GRADE
Hospitalizations	9 (622,573)	9/9 studies reported fewer hospitalizations with higher continuity	LOW
ED visits	7 (1,218,200)	7/7 studies reported fewer ED visits with higher continuity	LOW
HbA1c (Diabetes)	2 (11,400)	2/2 studies reported greater HbA1c control with higher continuity	LOW
LDL cholesterol (CAD)	1 (7,000)	No difference	VERY LOW
Patient satisfaction	3 systematic reviews	Positive association between high continuity and patient satisfaction	LOW[a]

Abbreviations: CAD, coronary artery disease; ED, emergency department; HbA1c, glycosylated hemoglobin; LDL, low density lipoprotein; n, number of patients.

[a] Grading is based on the most recent systematic review by Waibel et al. (1)

Acknowledgements

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Expert Panel for Health Quality Ontario: Optimizing Chronic Disease Management in the Community (Outpatient) Setting

Name	Title	Organization
Shirlee Sharkey (chair)	President & CEO	Saint Elizabeth Health Care
Theresa Agnew	Executive Director	Nurse Practitioners' Association of Ontario
Onil Bhattacharrya	Clinician Scientist	Li Ka Shing Knowledge Institute, St. Michael's Hospital, University of Toronto
Arlene Bierman	Ontario Women's Health Council Chair in Women's Health	Department of Medicine, Keenan Research Centre in the Li Ka Shing Knowledge Institute, St. Michael's Hospital, University of Toronto
Susan Bronskill	Scientist	Institute for Clinical Evaluative Sciences
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Alba Dicenso	Professor	School of Nursing, McMaster University
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Moira Stewart	Director	Centre for Studies in Family Medicine, University of Western Ontario
Walter Wodchis	Associate Professor	Institute of Health Management Policy and Evaluation, University of Toronto

Appendices

Appendix 1: Literature Search Strategies

Search date: December 8-9th, 2011
Databases searched: OVID MEDLINE, OVID MEDLINE In-Process and Other Non-Indexed Citations, OVID EMBASE, Wiley Cochrane, EBSCO CINAHL, Centre for Reviews and Dissemination.

Limits: 2002-present; English; NOT comments, editorials, letters (conference abstracts in Embase)

Database: Ovid MEDLINE(R) <1948 to November Week 3 2011>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <December 8, 2011>, Embase <1980 to 2011 Week 48>
Search Strategy:

#	Searches	Results
1	Continuity of Patient Care/ use mesz	12501
2	"Referral and Consultation"/ use mesz	46299
3	(((continuity or continuum) adj5 (care or health care or healthcare or in-patient? or inpatient? or patient? or physician? or provider? or out-patient? or outpatient? or visit?)) or continuity-of-care or continuous care or continuous health care or continuous healthcare).ti,ab.	16244
4	((patient-physician relation* or physician-patient relation* or patient relation?) and (continuous* or length or time)).mp.	15553
5	*Patient Care/ use emez	35993
6	*Patient Referral/ use emez	11041
7	or/1-6	130862
8	exp Coronary Artery Disease/	210163
9	exp Myocardial Infarction/ use mesz	136258
10	exp heart infarction/ use emez	213996
11	(coronary artery disease or cad or heart attack).ti.	44510
12	((myocardi* or heart or cardiac or coronary) adj2 (atheroscleros* or arterioscleros* or infarct*)).ti.	150312
13	or/8-12	538832
14	exp Atrial Fibrillation/ use mesz	28533
15	exp heart atrium fibrillation/ use emez	53857
16	((atrial or atrium or auricular) adj1 fibrillation*).ti,ab.	72761
17	or/14-16	98450
18	exp heart failure/	299162
19	((myocardi* or heart or cardiac) adj2 (failure or decompensation or insufficiency)).ti,ab.	236085
20	18 or 19	381647
21	exp Stroke/	177440
22	exp Ischemic Attack, Transient/ use mesz	16615
23	exp transient ischemic attack/ use emez	19389
24	exp stroke patient/ use emez	5349
25	exp brain infarction/ or exp cerebrovascular accident/ use emez	101283
26	(stroke or tia or transient ischemic attack or cerebrovascular apoplexy or cerebrovascular accident or cerebrovascular infarct* or brain infarct* or CVA).ti,ab.	280877
27	or/21-26	391325
28	exp Diabetes Mellitus, Type 2/ use mesz	70333
29	exp non insulin dependent diabetes mellitus/ use emez	100079
30	exp diabetic patient/ use emez	11998
31	(diabetes or diabetic* or niddm or t2dm).ti,ab.	767609
32	or/28-31	792582
33	exp Skin Ulcer/	72332
34	((pressure or bed or skin) adj2 (ulcer* or sore* or wound*)).ti,ab.	29008
35	(decubitus or bedsore*).ti,ab.	8583
36	or/33-35	91251
37	exp Pulmonary Disease, Chronic Obstructive/ use mesz	17237
38	exp chronic obstructive lung disease/ use emez	53936
39	(chronic obstructive adj2 (lung* or pulmonary or airway* or airflow or respiratory) adj (disease* or disorder*)).ti,ab.	54470
40	(copd or coad).ti,ab.	45341
41	chronic airflow obstruction.ti,ab.	1067
42	exp Emphysema/	37319

43	exp chronic bronchitis/ use emez	6930
44	((chronic adj2 bronchitis) or emphysema).ti,ab.	51113
45	or/37-44	159066
46	exp Chronic Disease/	344492
47	(chronic*adj2 disease* or (chronic* adj2 ill*)).ti,ab.	32477
48	46 or 47	363168
49	Comorbidity/	143490
50	(comorbid* or co-morbid* or multimorbid* or multi-morbid* or (complex* adj patient*) or (multiple adj2 (condition* or disease* or patient*))).ti,ab.	228158
51	49 or 50	309127
52	13 or 17 or 20 or 27 or 32 or 36 or 45 or 48 or 51	2739149
53	7 and 52	13143
54	limit 53 to yr="2002 - 2012"	8443
55	limit 54 to english language	7414
56	Case Reports/ or Comment.pt. or Editorial.pt. or Letter.pt. use mesz	2943299
57	Case Report/ or Editorial/ or Letter/ or Conference Abstract.pt. use emez	5773844
58	55 not (56 or 57)	6462
59	remove duplicates from 58 [Sets larger than 6000 cannot be de-duped]	6462

Appendix 2: GRADE Tables

Table A1: GRADE Evidence Profile for Continuity of Care

Number of Studies (Design)	Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication Bias	Upgrade Considerations	Quality
Hospitalization							
8 (observational)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕ Low
ED Visits							
6 (observational)	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕ Low
Patient Satisfaction							
25 (observational) *from Waibel et al (1) systematic review*	No serious limitations	No serious limitations	No serious limitations	No serious limitations	Undetected	None	⊕⊕ Low

Abbreviation: ED, emergency department.

Table A2: Risk of Bias Among Observational Trials on the Effectiveness of Continuity of Care on Health Resource Utilization

Author, Year	Appropriate Eligibility Criteria	Appropriate Measurement of Exposure	Appropriate Measurement of Outcome	Adequate Control for Confounding	Complete Follow-Up
Chen & Cheng, 2011 (17)	No limitations	No limitations	No limitations	No limitations	No limitations
Cheng et al, 2011 (11)	No limitations	No limitations	No limitations	No limitations	No limitations
Worrall & Knight, 2011 (21)	No limitations	No limitations	No limitations	No limitations	No limitations
Cheng et al, 2010 (10)	No limitations	No limitations	No limitations	No limitations	No limitations
Hong et al, 2010 (22)	No limitations	No limitations	No limitations	No limitations	No limitations
Lin et al, 2010 (18)	No limitations	No limitations	No limitations	No limitations	No limitations
Liu et al, 2010 (23)	No limitations	No limitations	No limitations	No limitations	No limitations
Atlas et al, 2009 (19)	No limitations	No limitations	No limitations	No limitations	No limitations
Knight et al, 2009 (16)	No limitations	No limitations	No limitations	No limitations	No limitations
Ionescu-Ittu et al, 2007 (12)	No limitations	No limitations	No limitations	No limitations	No limitations
Menec et al, 2006 (13)	No limitations	No limitations	No limitations	No limitations	No limitations
Menec et al, 2005 (14)	No limitations	No limitations	No limitations	No limitations	No limitations
Mainous et al, 2004 (20)	No limitations	No limitations	No limitations	No limitations	No limitations
Harvey et al, 2004 (25)	No limitations	No limitations	No limitations	No limitations	No limitations
Koopman et al, 2003 (24)	No limitations	No limitations	No limitations	No limitations	No limitations

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ISSN 1915-7398 (online)
ISBN 978-1-4606-1239-2 (PDF)

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