



# Comorbidity patterns and the quality of diabetes care in Ontario

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# Overview

## Agenda

- Background
- Rationale
- Study methods
- Results
- Strengths/Limitations
- Summary

# Background

- Diabetes mellitus (DM) accounts for an increasing proportion of the global burden of disease, being one of the leading causes of death and disability in Canada.<sup>1</sup>
- Over **1 million** Ontarians are living with diabetes (ICES, 2012).
- About **75%** - at least one comorbid condition (CC);
- About **40%** - three and more.<sup>2</sup>

1. Pelletier C, Dai S, Roberts KC, Bienek A, Onysko J, Pelletier L. Report summary. *Diabetes in Canada: facts and figures from a public health perspective. Chronic Dis Inj Can* 2012;33(1):53-4..
2. Maddigan SL, Feeny DH, Johnson JA. Health-related quality of life deficits associated with diabetes and comorbidities in a Canadian National Population Health Survey. *Quality of Life Research* 2005;14:1314-20.

# Rationale

- Appropriate monitoring and treatment can significantly reduce the incidence of diabetes complications.<sup>3</sup>
- Challenges to address multiple treatment needs in DM patients with comorbid conditions.<sup>3</sup>
- Patients with multiple chronic conditions are less likely to receive continuity of care compared to those with single conditions.<sup>4</sup>

3. Woodard LD, Urech T, Landrum CP, et al. The impact of comorbidity type on measures of quality for diabetes care. *Med Care*, 2011, 49 (6): 605-61.

4. Salisbury C, Johnson L, Purdy S, Valderas JM, Montgomery AA. Epidemiology and impact of multimorbidity in primary care: a retrospective cohort study. *Br J Gen Pract* 2011;61(582):e12-21.

# Rationale (cont.)

- Numerous studies, both globally and in Canada, that examined the impact of CC on the quality of DM care present mixed results.<sup>5</sup>
- No population-based studies in Canada.

5. Bae SJ, Rosenthal MB. Patients with multiple chronic conditions do not receive lower quality of preventive care. *J Gen Intern Med* 2008;23:1933–1939.

# Study objectives

- To investigate the quality of DM care for DM alone compared to DM with comorbid conditions in Ontario:
  - HbA1c testing, LDL-C testing, eye exam;
  - Composite of the 3 measures.
- To examine the association between the quality of DM care and presence of different types of comorbidities:
  - Vascular, non-vascular and both types of comorbidities.
- To test whether the association between the quality of DM care and comorbidity patterns is modified by continuity of care.

# Study methods

## Design

- Population-based cross-sectional study

## Source of data - Administrative & Clinical databases at ICES:

- *Ontario Diabetes Database (ODD);*
- *Ontario Health Insurance Plan claims database (OHIP);*
- *Registered Persons Database (RPDB);*
- *Ontario Drug Benefits claims database (ODB);*
- *Discharge Abstract Database (CIHI DAD);*
- *Client Agency Program Enrolment (CAPE) table.*

# Study methods (cont.)

## Study population

- All eligible Ontarians with DM type I and II, alive on April 1, 2007;
- Aged 18 or older;
- Diagnosed 2 years prior to the index date:
  - at least 2 outpatient, or
  - at least 1 inpatient diagnosis code.
- Registered with OHIP.



# Study methods - Measures

## Outcome variables - comprehensive diabetes care measures <sup>6,7</sup>

- HbA1c testing: DM patients who received at least 4 HbA1c tests in the period 2007-2009.
- LDL-C testing: DM patients who received at least 2 LDL-C tests in the period 2007-2009.
- Eye exam: DM patients who received at least one dilated eye exam by an eye care professional in the period 2007-2009.
- The composite measure called “diabetes care quality” is identified as receipt of all 3 measures in the period 2007-2009.

6. Blumer I. Canadian Diabetes Association 2008. Clinical practice guidelines for the prevention and management of diabetes in Canada: executive summary. 2008.

7. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2003 clinical practice guidelines for the prevention and management of diabetes in Canada. Can J Diabetes 2003;27(Supple.2):S22,S60,S77.

# Study methods - Measures

## Independent variables: Piette and Kerr's Framework <sup>8</sup>

- Vascular CC – cardiovascular conditions and stroke;
- Non-vascular CC– musculoskeletal, respiratory and mental conditions, renal failure and cancer;
- Both types of CC.
  
- Continuity of care (COC) index:  $\leq 0.75$  or  $> 0.75$ .<sup>10</sup>
  
- **Other variables:** age, sex, primary care models, duration of diabetes, rurality index, income quintile.

8. Piette JD, Kerr EA. The impact of comorbid chronic conditions on diabetes care. *Diabetes Care* 2006;29(3).

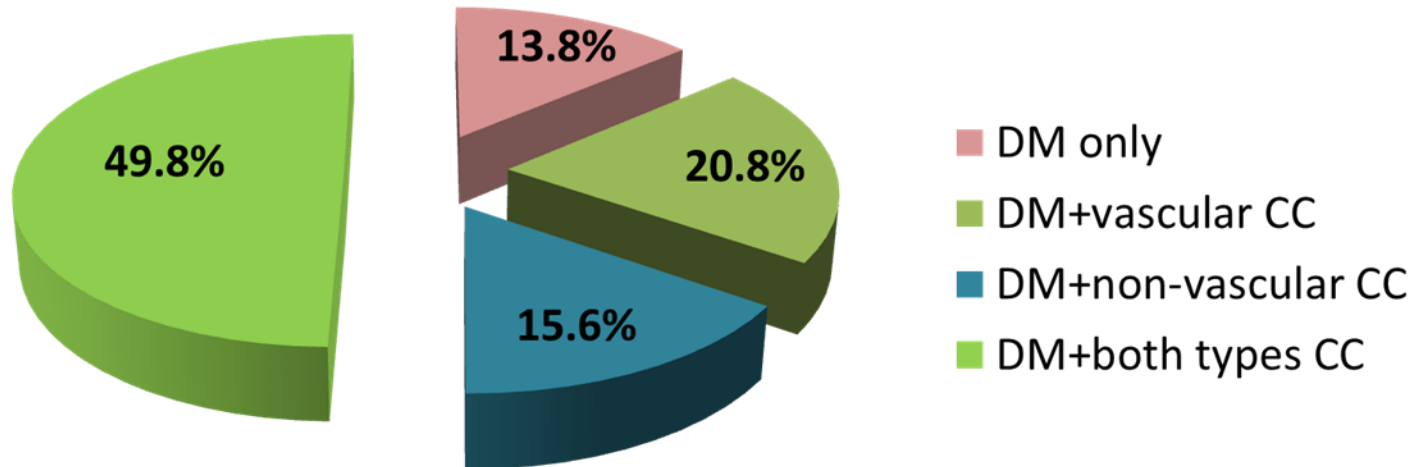
10. Bice TW, Boxerman SB. A quantitative measure of continuity of care. *Med Care* 1977;15(4):347-9.

# Analytical approach

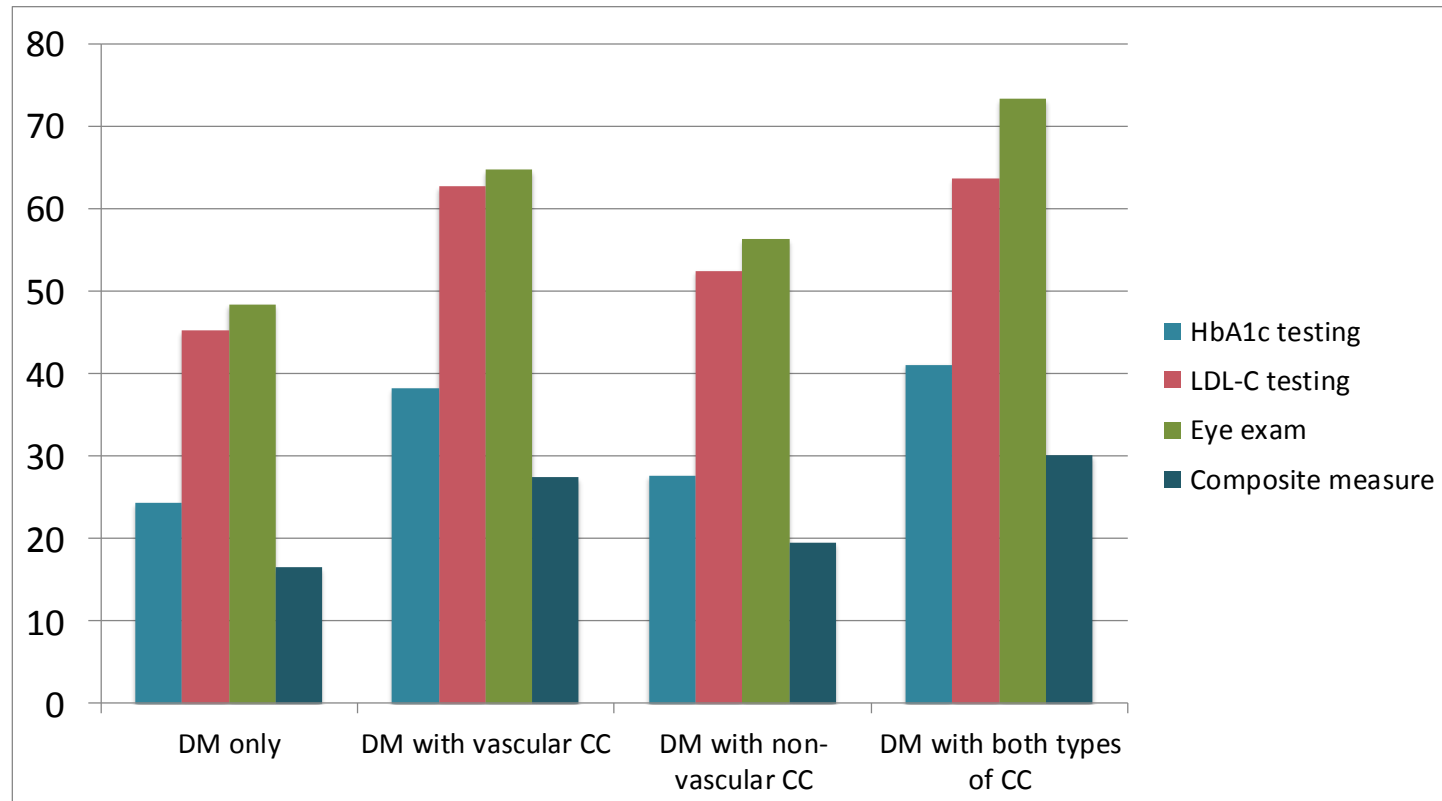
- Descriptive statistics was performed to examine the % of receipt of guideline-recommended diabetes measures for DM alone vs. DM with CC;
- Multiple logistic regression analysis was performed to examine the association between receipt of diabetes measures and different types of CC;
- Interaction terms were created to test whether the association between the quality of DM care and comorbidity types is modified by continuity of care.

# Results: Distribution of DM patients, by number and types of CC

- **861,354** Ontarians with diabetes were included in our study, from 2007 to 2009.



# Results: Quality of diabetes care among people with DM alone vs. with selected CC



# Results: Association between the quality of DM care and types of CC

Parameter	HbA1c testing AOR* (95% CI)	LDL-C testing AOR* (95% CI)	Eye exam AOR* (95% CI)	Composite measure AOR* (95% CI)
DM with no CC	Ref.	Ref.	Ref.	Ref.
DM with vascular CC	1.67 (1.65, 1.71)	1.98 (1.95, 2.01)	1.44 (1.42, 1.47)	1.64 (1.61, 1.68)
DM with non-vascular CC	1.15 (1.13, 1.17)	1.33 (1.31, 1.35)	1.28 (1.26, 1.30)	1.18(1.16, 1.21)
DM with both types of CC	1.84 (1.81, 1.86)	2.05 (2.02, 2.08)	1.92 (1.89, 1.95)	1.80(1.77, 1.83)
COC index $\leq$ 0.75	Ref.	Ref.	Ref.	Ref.
COC index $>$ 0.75	1.38 (1.37, 1.39)	1.34 (1.33, 1.35)	1.12 (1.10, 1.13)	1.24(1.23, 1.25)

\*Adjusted for age, sex, primary care models, duration of diabetes, rurality index, income quintile.

# Results: Continuity of care (COC) as an effect modifier on diabetes care quality

## Outcome is Composite Measure

Parameter	AOR* (95% CI) for Parameter with COC $\leq$ 0.75	AOR* (95% CI) for Parameter with COC $>$ 0.75
DM only	Ref.	1.77 (1.71, 1.82)
DM with vascular CC	1.86 (1.81, 1.91)	2.49 (2.43, 2.56)
DM with non-vascular CC	1.34 (1.30, 1.37)	1.81 (1.76, 1.87)
DM with both types of CC	2.23 (2.18, 2.29)	2.47 (2.41, 2.53)

\*Adjusted for age, sex, primary care models, duration of diabetes, rurality index, income quintile.

# Strengths

- Representative sample of people with diabetes in Ontario;
- Administrative database has been validated and used in many studies;
- Using valid and reliable measures of comprehensive diabetes care.

# Limitations

- Our study was limited to measures available in administrative data;
- Selected CC may not reflect all existing comorbidities in diabetes patients;
- Lack of accuracy of some diagnostic codes.



# Summary

- Overall quality of diabetes care in Ontario was low.
- Presence of CC in DM patients was associated with superior DM care, regardless of comorbidity type:
  - As compared to DM patients without CC, patients with both vascular and non-vascular CC were significantly more likely to meet guideline-recommended diabetes care measures.
  - The presence of both types of CC in DM patients was associated with highest odds of meeting DM care measures compared with those with no comorbidity.
- Concentration of care among all providers seen was strongly associated with better DM care, regardless of comorbidity type.



***Thank you!***

***Questions?***



# Continuity of care (COC) index

Standardized measure of continuity of care

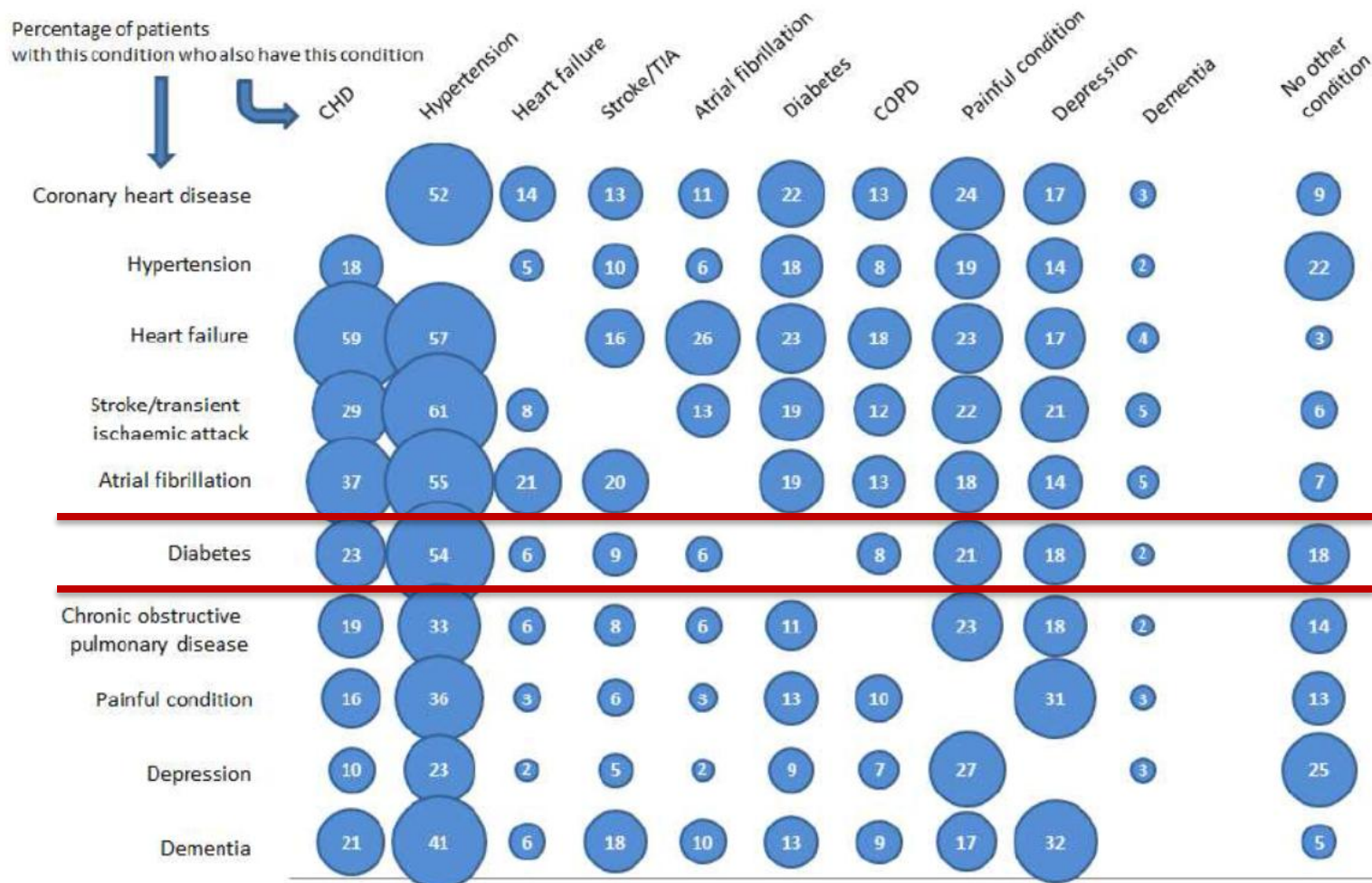
$$\text{COC} = \frac{\sum_{i=1}^k n_i^2 - N}{N(N-1)}$$

where  $n_j$  - number of visits to provider  $j$ ,  
 $N$  - total number of visits in a defined period,  
 $K$  - number of unreferred providers.

If  $K=1$ , there is no dispersion or maximum concentration (continuity) of care, since all visits were referred by the same provider.

$\text{COC} \leq 0.75$  – dispersion of care;  
 $\text{COC} > 0.75$  – concentration of care.

# How often co-morbid?



Barnett K et al *Lancet* 2012; Guthrie B et al *BMJ* 2012