Institute of Health Policy, Management & Evaluation
UNIVERSITY OF TORONTO

Evaluating quality of care among older adults with diabetes with comorbid chronic conditions: a retrospective cohort study

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CAHSPR
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Background

- Multimorbidity (MMB) – simultaneous co-existence of two or more conditions

- MMB issues/challenges[1,2,3,4]
  - Single condition focus in clinical care and research
  - Difficulty in applying disease-specific guidelines
  - Lack of continuity/coordination of care
  - Polypharmacy and adverse drug events
  - High healthcare utilization and costs

1. Fortin M, Contant E, Savard C, Hudon C, Poitras ME, Almirall J. Canadian guidelines for clinical practice: an analysis of their quality and relevance to the care of adults with comorbidity. BMC Fam Pract 2011;12:74
2. Guiding principles for the care of older adults with multimorbidity: an approach for clinicians: American Geriatrics Society Expert Panel on the Care of Older Adults with Multimorbidity. J Am Geriatr Soc 2012;60(10):E1-E25
3. Hajjar ER, Cafiero AC, Hanlon JT. Polypharmacy in elderly patients. American Journal of Geriatric Pharmacotherapy 2007;5(4).
4. Glynn LG, Valderas JM, Healy P, Burke E, Newell J, Gillespie P, et al. The prevalence of multimorbidity in primary care and its effect on health care utilization and cost. Fam Pract 2011;28(5):516-23

Background (cont.)

- Diabetes mellitus (DM) - leading causes of death and disability in Canada.[5]

- Over **90%** of older adults with DM - at least one comorbid condition (CC)[6]
- About **40%** - five or more[6]

- Types of CCs in people with DM[7]
  - **Concordant**, such as CVD
  - **Discordant**, such as osteoarthritis or mental conditions

5. Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract 2011;94(3):311-21.
6. Gruneir A, Markle-Reid M, Fisher K, Reimer H, Ma X, Ploeg J. Comorbidity Burden and Health Services Use in Community-Living Older Adults with Diabetes Mellitus: A Retrospective Cohort Study. Can J Diabetes 2016;40 (1):35-42.
7. Piette JD, Kerr EA. The impact of comorbid chronic conditions on diabetes care. Diabetes Care 2006;29(3).

Selected disease combinations

Comorbidity type	Disease combination
Diabetes-concordant	DM + hypertension
	DM + hypertension + chronic ischemic heart disease
Diabetes-discordant	DM + osteoarthritis
	DM + osteoarthritis + major depression/dysthymia

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Study Objectives

- To examine the quality of care among older adults with selected disease combination in ambulatory care settings in Ontario
- To examine the difference between the quality of care among older adults with 2 vs. 1 selected concordant/discordant conditions
- To examine associations between the quality of care measures and all-cause hospitalizations, among older adults with selected disease combinations

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Methods: Source of data

Design

- Population-based retrospective cohort 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)*
- *National Ambulatory Care Reporting System (NACRS)*
- *Discharge Abstract Database (CIHI DAD)*
- *Client Agency Program Enrolment (CAPE) table*

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Methods: Study participants

- Study period – April 1, 2010 to March 31, 2014
- All eligible Ontarians with DM having at least one selected CC
  - Diagnosed within a 2-year period prior to the index date:
    - at least 2 diagnoses recorded in ambulatory care records , or
    - at least 1 diagnosis recorded in acute care records
- Aged 65 or older
- Registered with OHIP

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Selected disease combinations

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Diabetes-concordant	DM + hypertension
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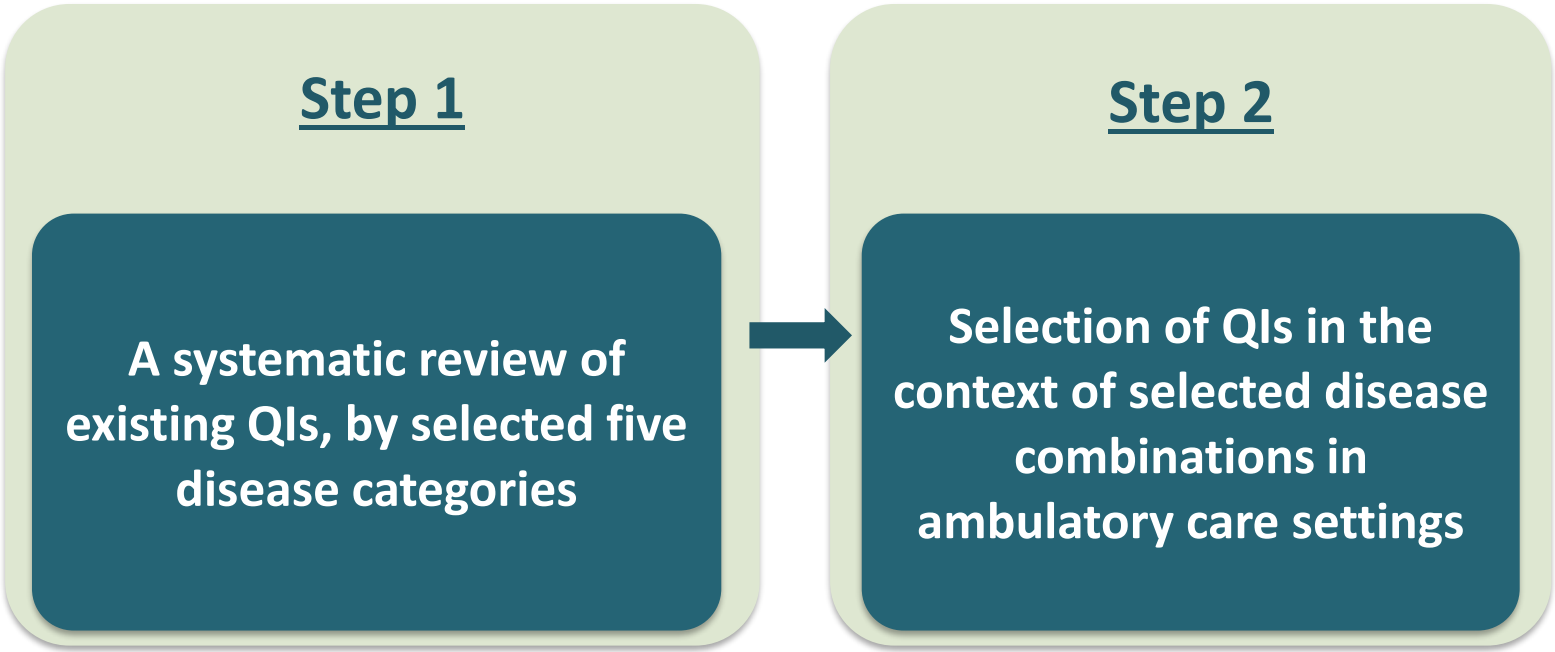
Methods: Development of quality measures



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Methods: Study measures

Measure	DM with HTN	DM with HTN and IHD	DM with OA	DM with OA and Depr
Process				
HbA1c testing	X	X	X	X
Eye examination	X	X	X	X
Use of oral hypoglycemic drugs	X	X	X	X
Use of ACE inhibitors	X	X		
Use of statins		X		
Use of NSAIDs (negative)			X	X
Use of tetracyclic antidepressant (negative)				X
Use of MAO inhibitors (negative)				X
Use of benzodiazepines (negative)				X
COC index	X	X	X	X
Number of prescribed drugs	X	X	X	X
Outcome				
All-cause hospitalizations	X	X	X	X

Methods: Statistical analysis

- Univariate analysis
  - To estimate the processes of care measures and all-cause hospitalizations, in each fiscal year, from April 1, 2010 to March 31, 2014

- Generalized estimating equations approach (GEE)
  - To examine associations between the processes of care measures, from 2010 to 2013, and the likelihood of all-cause hospitalisations during the follow-up period, from 2011 to 2014

Results

- We identified:
  - 273,592 patients with DM and HTN
  - 141,947 patients with DM, HTN and IHD
  - 255,214 patients with DM and OA
  - 2,444 patients with DM, OA and Depr.

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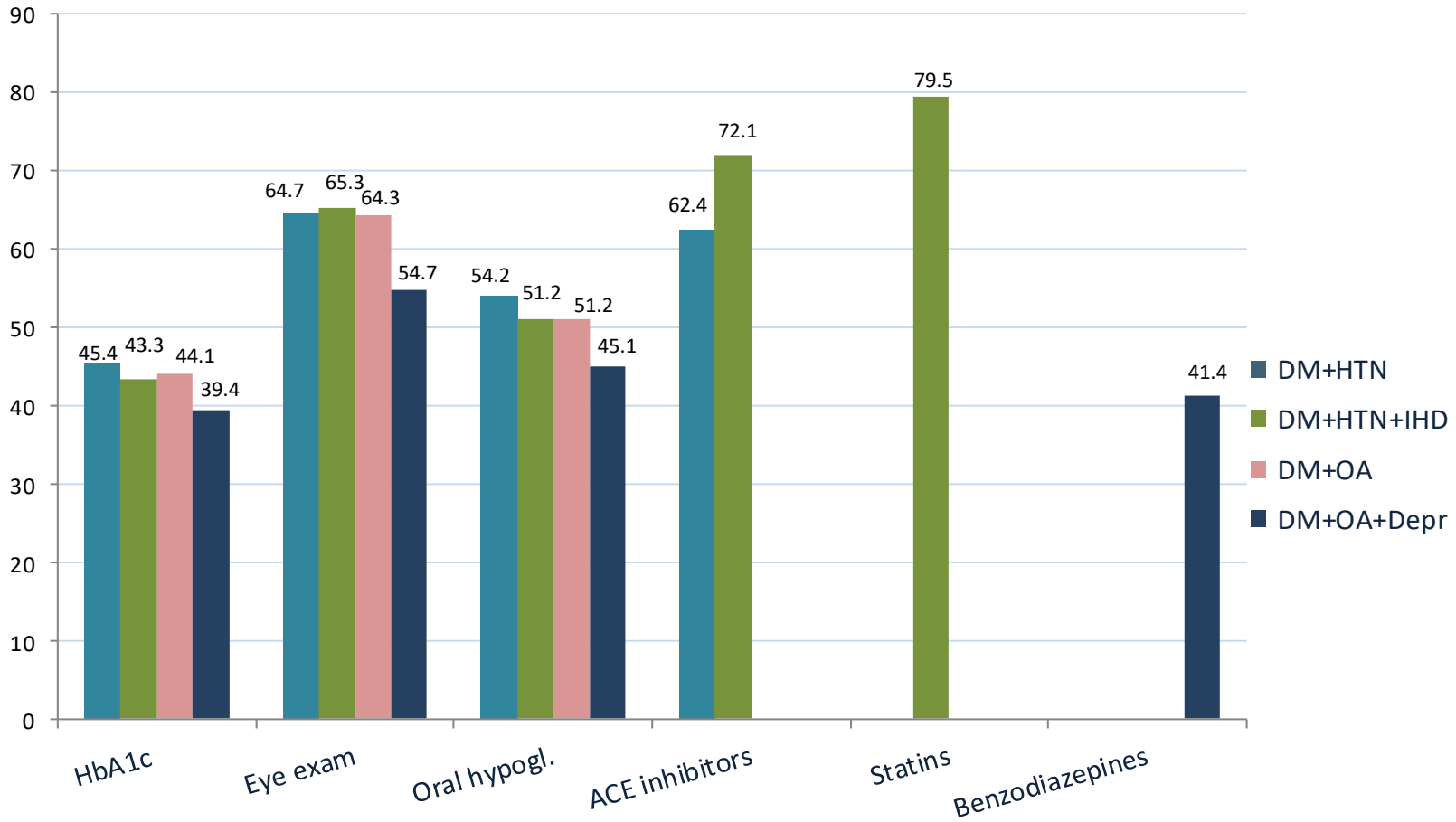
Results (cont.)



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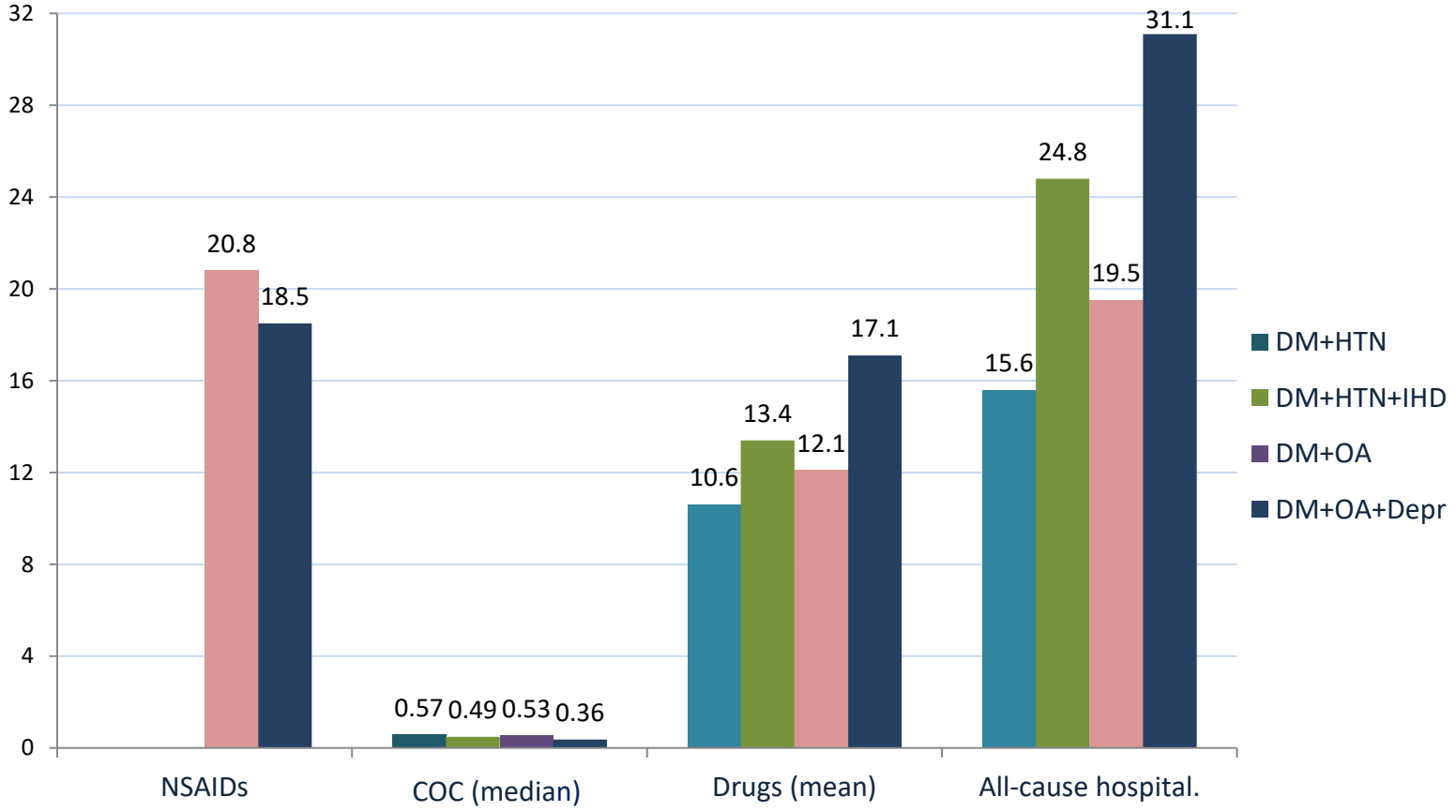
Results (cont.)



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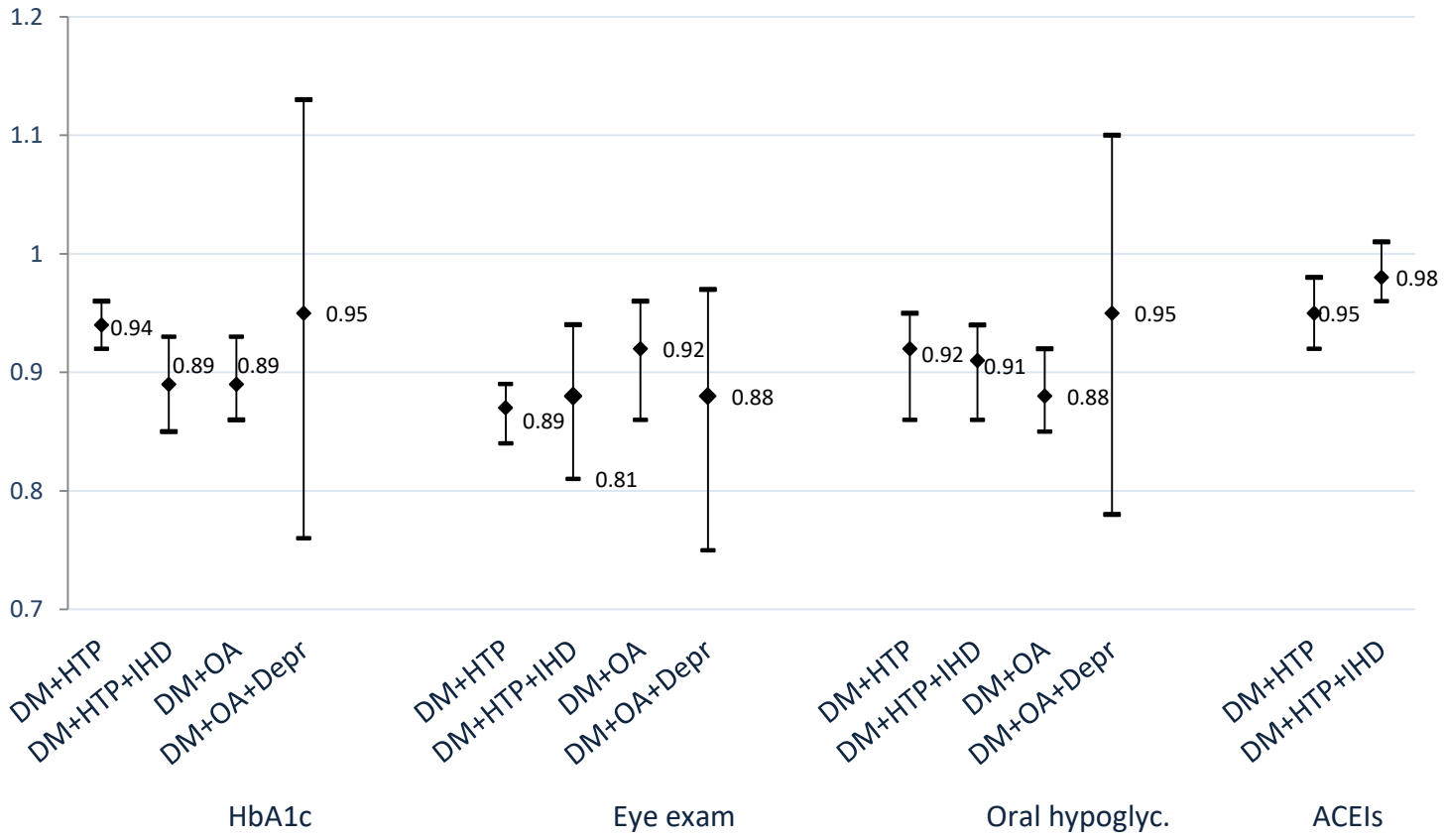
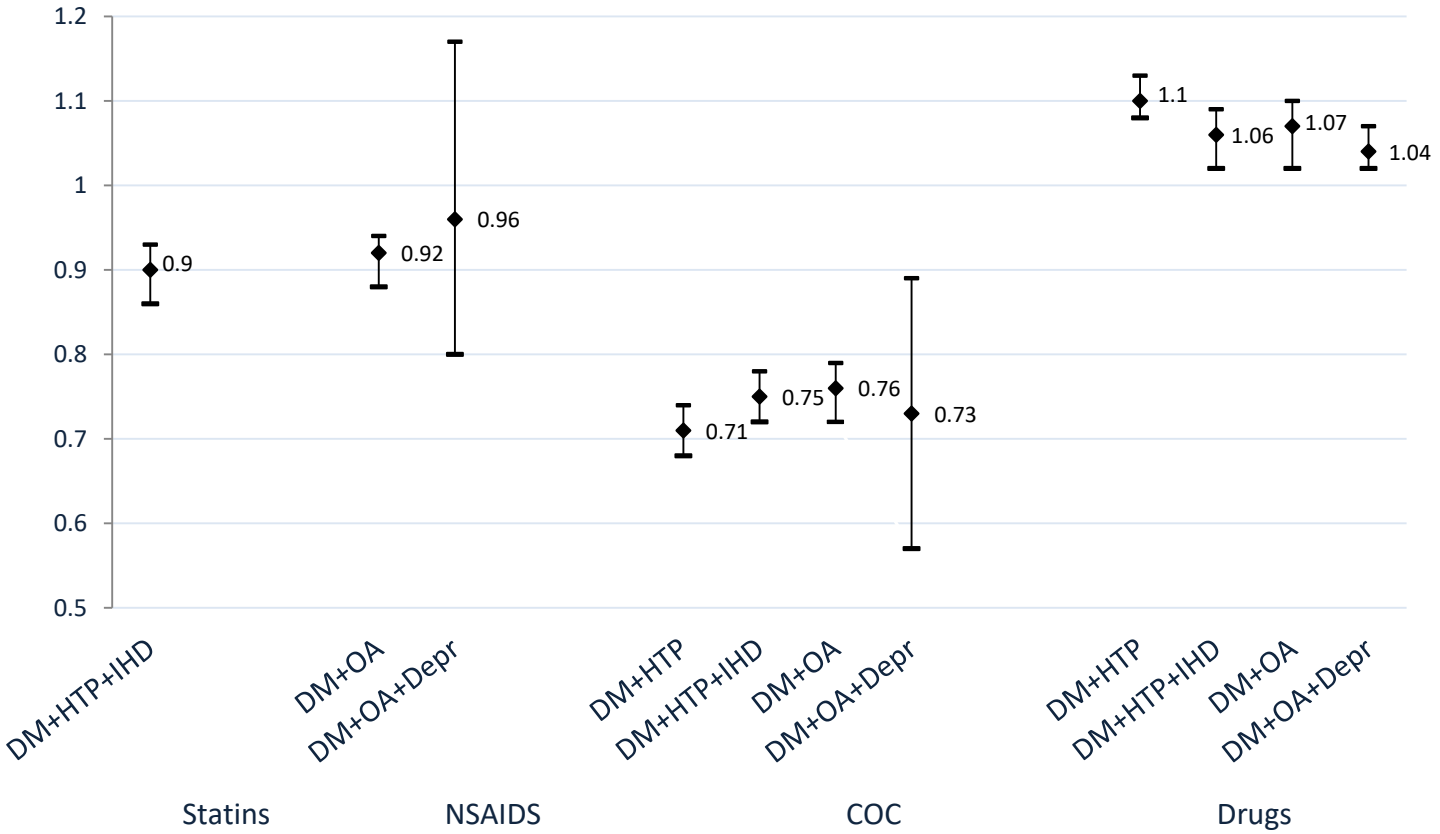
Results (cont.)



Results (cont.)



Limitations

- Measures were limited to admin data
- No patient-reported data
  - Patient preferences and goals, self-management ability, coordination of care, health care access barriers
- No information on severity of CCs
- Potential for underestimating hospitalization rates

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Study implications

- Holistic approach in education and clinical care
- More targeted intervention/collaboration between healthcare providers
- Regular review of therapeutic regimens
- Foster interaction across multiple providers
- Determining specific MMB clusters
- Integration of DM program with other CCs care programs

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Future research

- Developing QIs that reflect various aspects of care
- Developing specific outcome/composite measures for MMB
- Measuring the quality of care by different stratifications
  - Age
  - Sex
  - Primary care models

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Thank you!

Additional slides

QIs for DM and HTN

HbA_{1c} testing every 6 months
Eye examination every 1-2 years
Microalbumin testing once per year
Serum creatinine test (with eGFR)
Use of hypoglycemic drugs
Use of ACE inhibitors or ARBs
Hospital admission rate for diabetes long-term complications
Hospital admission rate for diabetes short-term complications
Lower-extremity amputation rate
Cardiovascular mortality rate

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QIs for DM, HTN and IHD

HbA_{1c} testing every 6 months
Eye examination every 1-2 years
Microalbumin testing once per year
Antiplatelet therapy
Use of ACE inhibitors or ARBs therapy
Statin therapy
Hospital admission rate for diabetes long-term complications
Hospital admission rate for diabetes short-term complications
Lower-extremity amputation rate
Cardiovascular mortality rate
Ocular complications due to diabetes
Hospital admission for heart failure
ED visits for diabetes short-term complications

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QIs for DM and OA

HbA_{1c} testing every 6 months
Eye examination every 1-2 years
Microalbumin testing once per year
NSAID therapy “negative indicator”
Hospital admission rate for diabetes short-term complications
Lower-extremity amputation rate
Cardiovascular mortality rate

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QIs for DM, OA and Depr

HbA_{1c} testing every 6 months
Eye examination every 1-2 years
Microalbumin testing once per year
Interval between SSRIs and monoamine oxidase therapy
**Non-selective NSAIDs therapy - “negative indicator”
Use of tetracyclic antidepressants, benzodiazepines, gaba receptor agonists, or monoamine oxidase inhibitors - “negative indicator”
Hospital admission rate for diabetes long-term complications
Hospital admission rate for diabetes short-term complications
Cardiovascular mortality rate

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QIs not measurable using admin data

Smoking status
Microalbumin testing
Serum creatinine testing
BP measured in past 6 or 12 months
Body mass index
Self-management teaching
Medical adherence assessed
Exercise assessed
Percentage of patients with most recent HbA1c level >9.0% (poor control)
Percentage of patients with most recent blood pressure <140/90 mmHg
Quality of life

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“Do not include” QIs

MRI of head/heart
Bariatric surgery rate
Use of SSRI or SNRI
Beta-blocker therapy

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Continuity of care (COC) index

Standardized measure of continuity of care

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

where nj - number of visits to provider j
N - total number of visits in a defined period
K – number of unreferred providers (All visits to either a usual provider or a referred provider are viewed as having been to a single provider)

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

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

Comorbidities codes

- Diabetes ICD 10 codes - E10 to E14
- Hypertension (ICD 10) codes of I10 to I15, or ICD 9 code of 401 to 405
- Chronic ischemic heart disease - (ICD 10) code of I25, or ICD 9 code of 412 and 414
- Osteoarthritis - ICD 10 code of M15 to M19, or ICD 9 code of 715
- Major depression/dysthymia - ICD 10 code F32.0- F32.3, F32.9- F33.4, F33.9, F34.1, or ICD 9 code of 296

Comorbidities codes

Condition	ICD 9 / OHIP	ICD 10
Rheumatoid arthritis	714	M05-M06
Osteoporosis	733	M81 M82
Other mood disorders	300, 309	F38—F42, F431, F432, F438, F44, F450, F451, F452, F48, F530, F680, F930, F99
Psychiatric conditions other than mood disorders and dementia	291 292 295 297 298 299 301 302 303 304 305 306 307 313 314 315 319	F04 F050 F058 F059 F060 F061 F062 F063 F064 F07 F08 F10 F11 F12 F13 F14 F15 F16 F17 F18 F19 F20 F21 F22 F23 F24 F25 F26 F27 F28 F29 F340 F35 F36 F37 F430 F439 F453 F454 F458 F46 F47 F49 F50 F51 F52 F531 F538 F539 F54 F55 F56 F57 F58 F59 F60 F61 F62 F63 F64 F65 F66 F67 F681 F688 F69 F70 F71 F72 F73 F74 F75 F76 F77 F78 F79 F80 F81 F82 F83 F84 F85 F86 F87 F88 F89 F90 F91 F92 F931 F932 F933 F938 F939 F94 F95 F96 F97 F98
Dementia	290, 331 (OHIP) / (DAD: 046.1, 290, 294, 331.0, 331.1, 331.5, 331.82)	F00, F01, F02, F03, G30
Renal failure	403,404,584,585,586,v451	N17, N18, N19, T82.4, Z49.2, Z99.2
Asthma	493	J45
Cancer	140-239	C00-C26, C30-C44, C45-C97
Cardiac Arrythmia	427.3 (DAD) / 427 (OHIP)	I48.0, I48.1
CHF	428	I500, I501, I509
COPD	491, 492, 496	J41-J44
Stroke	430, 431, 432, 434, 436	I60-I64

Methods: Covariates

- Age
- Sex
- Rurality Index for Ontario (RIO)
- Income quintile
- Primary care models
- Multimorbidity burden
- Number of primary care visits
- Duration of conditions
- Hospitalizations for diabetes-related complications

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