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3 **Specialist Physicians Paid Salary Are More Likely to Manage Sicker Outpatients than**  
4 **Those Paid Fee-For-Service: A descriptive study**  
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**Abstract:**

**Background:** This study compared demographic characteristics and illness severity between patients with diabetes newly referred to fee-for-service (FFS) and salary-based specialists to determine if there is an association between specialist physician payment model and patients seen.

**Methods:** Using Alberta administrative health data, we compared characteristics of patients newly referred between April 2011 and September 2014 for diabetes care to specialist physicians paid either FFS or salary.

**Results:** We found patients managed by salary-based physicians were sicker than those managed by FFS physicians. A higher proportion of patients managed by salary-based specialists had five or more comorbidities (23.0% vs. 18.1%), and were more likely to have been admitted to a hospital or emergency room for an ambulatory care sensitive condition in the year before their index visit, likely reflecting worse disease control, or lower access to optimal outpatient care. A higher proportion of visits to salary-based physicians were for appropriate indications (65.2% vs 55.6%; risk ratio 1.17(1.09 to 1.27;  $p < 0.001$ ). Physicians reimbursed under FFS were more likely to see patients for whom management could have continued in primary care.

**Interpretation:** Our work suggests salary-based specialist physicians were more likely to see patients with a clear indication for a specialist visit, while specialists reimbursed under FFS were more likely to see healthier individuals, some of whom may not require specialist care. Physician payment model can increase the likelihood of referrals having a clear indication for their visit and may offer an opportunity to improve the quality and value of chronic disease care.

## Introduction

As the number of people with chronic disease increases, determining optimal models to improve the quality and value of chronic disease care is critical. Chronic disease management models have focused on the role of primary care[1], although specialists are also key members of the chronic care team, providing additional support and care to patients with more complex health care needs.[2]

Unlike many developed countries,[3] fee-for-service is the dominant physician compensation model in the US and Canada: 94.7% of physician office visits in the US[4] and 72.1% of physician payments in Canada[5] are reimbursed under fee-for-service. The way physicians are paid can affect their behavior. For instance, fee-for-service financially rewards physicians who have more patient visits, and more clinical activity. In so far as physicians can select who they choose to provide care to, this might incentivize specialists to select more complex patients who need more health care[6], or it might induce selection of patients with less complexity (since they can see patients in less time) though the clinical value of such visits might be uncertain. Understanding the impact of payment model on the types of patients seen by specialists is important, since health care payers presumably want to prioritize care for patients with the highest needs, who are at highest risk of complications and hospital admissions, and therefore have the highest chance of benefit through specialist care.

In this study, we used administrative health data to compare the demographic characteristics and illness severity between new patients with diabetes seen by fee-for-service and salary-based specialists. We used diabetes as an exemplar chronic disease requiring management by specialists in some cases, and defined case scenarios requiring specialty consultation a priori

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3 based on indications for specialist care in people with diabetes provided within clinical practice  
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5 guidelines and by an expert panel including diabetes specialists from across Alberta.  
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## 10 **Methods**

### 11 **Overview:**

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15 We aimed to compare the types of newly referred patients with diabetes seen by  
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17 specialists reimbursed by fee-for-service and those within an alternate payment model called an  
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19 academic alternative relationship plans (AARP). AARPs in Alberta were started in 2004 with the  
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21 goal of promoting innovative ways to provide patient care in a more efficient and accessible  
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23 manner (for instance, outreach clinics to First Nations and other rural communities), and are  
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25 currently used by over 700 specialist physicians (one quarter of all medicine specialist physicians  
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27 in Alberta). AARPs pay physicians on a contractual basis and provide a mechanism to  
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29 compensate physicians for clinical, administrative, teaching, and research contributions[7].  
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33 While physicians remain independent contractors, the AARP model is most similar to a salary.

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35 When specialist physicians in both groups receive consultation requests, they can choose to:  
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37 provide written feedback to the referring physician (not reimbursed by fee-for-service) but not  
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39 see the patient formally, book a phone call to discuss the patient with the referring physician (a  
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41 reimbursable fee-for-service service), or book an in person visit for the patient (reimbursable at a  
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43 higher fee-for-service rate).  
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### 48 **Data sources:**

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51 We used data from the Interdisciplinary Chronic Disease Collaboration Chronic Disease  
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53 Repository in Alberta, Canada,[8] which links laboratory and administrative health data for all  
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55 Albertans. The study cohort included newly referred adults with diabetes, identified using a  
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3 validated algorithm[9,10] based on two or more physician claims for diabetes (ICD-9 code 250)  
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5 in 2 years, or 1 or more hospitalizations with an ICD-9 code of 250, selected from all available  
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7 diagnostic codes on the Hospital Discharge Abstract between 1994 and March 31 2002, or  
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9 equivalent ICD-10 codes (E10-14) after March 31 2002. Compared with chart confirmed  
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11 diagnoses in primary care, this definition is relatively accurate (sensitivity and specificity of 86%  
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13 and 97%) [10]. All patients with diabetes who were seen by internal medicine or endocrinology  
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15 specialist physicians (with no visits in the prior 4 years[11]) for a diabetes-specific indication  
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17 between April 1, 2011 and September 30, 2014 were included. Patients were excluded if they  
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19 had gestational diabetes or were on dialysis (since in both cases their needs are different than an  
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21 average patient with diabetes), an islet cell or kidney transplant before the index visit (since these  
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23 patients are infrequently cared for by FFS physicians); or if their visit was a pre-operative  
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25 assessment (since these visits were not aimed at optimizing management of chronic disease).  
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### 32 33 **Statistical analysis:**

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36 The explanatory variable was specialist physician payment model (AARP vs. FFS),  
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38 identified from Alberta Health administrative data. Patient covariates included age, sex, First  
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40 Nations status, neighbourhood income quintile (determined from the National Household Survey  
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42 by linkage with residential postal code), rural/urban status, primary care physician attachment  
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44 (using the Usual Provider of Care index[14] categorized as in previous studies[15]), illness  
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46 characteristics, and comorbidities defined using validated algorithms[16].  
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51 We compared demographic characteristics and illness severity between patients seen by  
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53 fee-for-service and salary-based specialists to determine whether there were differences in the  
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3 types of patients seen for a visit. We used a 10% standardized difference as a marker of  
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5 meaningful differences between the groups.[17]  
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8 We also sought to determine whether there was a clear indication for the visit for the  
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10 subset of patients seen by diabetes specialists. Since many endocrinologists bill as internal  
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12 medicine specialists, and many internal medicine physicians focus on diabetes management, we  
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14 defined diabetes specialists as those who see >50 patients with diabetes each year, with at least  
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16 30% of their outpatient claims being for outpatient diabetes treatment. As we did not have  
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18 information on the reason for referral provided at the time of the consultation request, we used  
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20 health administrative data (including laboratory, medication, and clinical data) to infer the  
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22 indication for the visit. A specialist visit with a clear indication was defined *a priori* based on  
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24 indications for specialist care in people with diabetes provided within clinical practice guidelines  
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26 [18]and by an expert panel including diabetes specialists from across Alberta (Table 1). Since  
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28 specialist visits may still be indicated for some visits falling outside these categories, our focus  
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30 was on defining visits for people with diabetes with a clear indication, rather than inappropriate  
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32 visits.  
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39 We assessed the association between payment model and indication for the visit using a  
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41 risk ratio (RR). RRs were estimated using a Poisson model.  
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## 46 **Results**

### 47 48 49 **Salary-based specialists are seeing different types of patients, and managing them with** 50 51 **fewer in-person visits** 52 53 54 55 56 57 58 59 60

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3 Patients with a first visit to either fee-for-service or salary-based physicians had different  
4 demographic and illness severity characteristics (Table 2). Salary-based physicians saw a larger  
5 proportion of patients aged 18-29 years (15.3% vs. 5.1%), who were assumed to predominantly  
6 have Type 1, rather than Type 2, diabetes. Salary-based physicians were also more likely than  
7 fee-for-service physicians to see patients who were female (52.9% vs 44.4%), First Nations  
8 (7.1% vs. 3.3%), and from rural areas (12.4% vs 6.7%) (Table 2) - even though all specialists in  
9 this cohort were located in the two major urban centers in Alberta.  
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20 Salary-based specialists were also more likely to see patients who were sicker or in  
21 greater need of care than fee-for-service specialists. A higher proportion of patients seeing  
22 salary-based specialists had five or more comorbidities (23.0% vs. 18.1%). In addition, salary-  
23 based specialists were more likely to see patients who had been admitted to a hospital or  
24 emergency room for an ambulatory care sensitive condition[19,20] in the year before their visit  
25 to a specialist, indicating their diabetes was more difficult to control, or they had lower access to  
26 optimal outpatient care. Other variables with less than a 10% standardized difference also  
27 suggested a significantly higher complexity and severity of illness among patients seen by  
28 salary-based specialists, such as lower primary care attachment, a higher proportion with  
29 sustained A1c>9%, and a higher proportion with chronic conditions, including advanced kidney  
30 disease, asthma, cancer, chronic heart failure, depression and stroke.  
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46 While nearly all visits were in person, salary-based specialists were more likely to talk  
47 with the consulting physician by phone to provide consultative care (rather than see the patient in  
48 person) compared to fee-for-service (5.3% vs. 2.5%;  $p<0.001$ ).  
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53 **Visits to salary-based diabetes specialists are more likely to have a clear indication**  
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3 Overall, 46.5% of visits were to diabetes specialists. Of these visits, 56.6% had a clear  
4 indication for a specialist visit (Table 3). Patients with diabetes seen for the first time by salary-  
5 based diabetes specialists were more likely to have a clear indication for their visit compared to  
6 patients seen by FFS diabetes specialists (65.2% vs. 55.6%; risk ratio (95% CI) = 1.17 (1.09-  
7 1.27), with more visits to salary-based specialists having a clear indication across three of the  
8 four visit types (A1C>8.5%; A1C>7.5% on insulin; or a hospital admission/ER visit for a  
9 diabetes-specific ambulatory care sensitive condition in the prior year) (Figure 1 and Table 3).  
10 The exception was for visits among people with elevated A1c on 3 or more (non-insulin)  
11 diabetes medications (i.e., with Type 2 diabetes since all who have Type 1 receive insulin),  
12 among the full cohort and those 30 years and older (Table 3).  
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### 29 **Interpretation**

30 We found important differences in the types of new patients being seen for a first visit by  
31 fee-for-service and salary-based specialists across a range of demographic and clinical  
32 characteristics as well as severity of illness. We also noted that patients with diabetes seen for the  
33 first time by salary-based diabetes specialists were more likely to have a clear indication for their  
34 visit compared to patients seen by fee-for-service diabetes specialists, indicating fee-for-service  
35 specialists are seeing healthier patients, some of whom may not have required specialist care. We  
36 observed this increase for salary-based diabetes specialists across three of the four indicators of  
37 the need for specialist care.  
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50 Compared to fee-for-service specialists, salary-based specialists were more likely to see  
51 female patients, younger patients (who were presumed to have type 1 diabetes), those with a  
52 greater burden of disease, and those with poorly controlled diabetes. More patients seen by  
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3 salary-based specialists were First Nations and from rural communities, possibly relating to  
4 outreach clinics to First Nations and other rural communities by salary-based specialists, or  
5 relating to historical referral patterns between primary and specialist care. Finally, salary-based  
6 specialists also were more likely to consult with another physician by video / phone about a  
7 patient than fee-for-service specialists, which may be related to goals of the salary-based  
8 payment program to change the model of care, including increasing the use of telehealth. While  
9 it remains uncertain why salary-based specialists are seeing a higher proportion of sicker  
10 patients, it is possible they are more likely to decline to see patients not meeting local criteria for  
11 a specialist visit, or they may be more likely to provide written feedback for referrals felt to be  
12 less appropriate (i.e., those deemed to be healthier) rather than see the patient in person, whereas  
13 fee-for-service specialists may be reluctant to do so for fear of losing their referral base.  
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29 Because a variety of patient needs could lead to primary care referring to specialists, we  
30 examined a range of indications for which patients with diabetes might see a specialist. Salary-  
31 based specialists were more likely to see patients who had a clear indication across three of the  
32 four visit types, the exception being for poorly controlled patients on three non-insulin  
33 antihyperglycemic agents, who presumably need to start insulin. This suggests that fee-for-  
34 service specialists may see a higher proportion of patients who need to start insulin, possibly  
35 because salary-based specialists in the two urban centers can redirect uncomplicated insulin  
36 starts to allied health care professionals. Alternatively, salary-based specialists were more likely  
37 to see patients not controlled on insulin, and those with type 1 diabetes. Whether this reflects  
38 decisions of referring physicians directing more complex cases to salary-based specialists or an  
39 increased likelihood of “simpler cases” to be accepted by fee-for-service specialists is not clear.  
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3 We observed striking differences between patients seeing fee-for-service and salary-  
4 based specialists, though it is unclear if these results are applicable outside of Alberta. It is  
5 possible that the differences we observed are not solely due to the payment model but instead to  
6 the type of specialists who self-select into salary-based payment models or differences in the  
7 settings in which fee-for-service and salary-based specialists operate. For example, because  
8 nearly three-quarters of the salary-based specialists work in university hospitals, where a portion  
9 of their work relates to teaching and research, we may be capturing differences in academic vs.  
10 community physicians. As noted above, academic physicians may also have greater access to  
11 allied health multi-disciplinary teams, making it easier to see patients with more complex needs.  
12 Finally, some of these differences may be related to differences in referral patterns from primary  
13 care, with referrals based on characteristics of the specialists or the primary care practices, such  
14 as their interpretation of patient needs, location, or personal relationships.  
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31 Our study suggests that salary-based specialists are seeing sicker patients and that a  
32 higher proportion of visits to salary-based specialists are for a clear indication. Specialists  
33 reimbursed under fee-for-service were more likely to see patients for whom management could  
34 have continued in primary care, suggesting that physician payment policy may offer an  
35 opportunity to improve the quality and value of chronic disease care.  
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## References

1. Rothman A, Wagner EH. Chronic illness management: What is the role of primary care? *Ann Intern Med.* 2003;138(3):256-261.
2. Katon W, Von Korff M, Lin E, Simon G. Rethinking practitioner roles in chronic illness: the specialist, primary care physician, and the practice nurse. *General Hospital Psychiatry.* 2001;23(3):138-144.
3. *2014 International Profiles Of Health Care Systems; Australia, Canada, Denmark, England, France, Germany, Italy, Japan, The Netherlands, New Zealand, Norway, Singapore, Sweden.* 2014.
4. Zuvekas SH, Cohen JW. Fee-For-Service, While Much Maligned, Remains The Dominant Payment Method For Physician Visits. *Health Affairs.* 2016;35(3):411-414.
5. Canadian Institutes for Health Information (CIHI). *Physicians in Canada, 2016: Summary Report.* Ottawa, ON: CIHI;2017.
6. Robinson JC. Theory and practice in the design of physician payment incentives. *Milbank Q.* 2001;79(2):149-177, III.
7. Bichel A, Bacchus M, Meddings J, Conly J. Academic Alternate Relationship Plans for internal medicine: a lever for health care transformation. *Open Medicine.* 2011;5(1):e28.
8. Hemmelgarn BR, Clement F, Manns BJ, et al. Overview of the Alberta Kidney Disease Network. *BMC nephrology.* 2009;10:30.
9. Blanchard JF, Ludwig S, Wajda A, et al. Incidence and prevalence of diabetes in Manitoba, 1986–1991. *Diabetes care.* 1996;19(8):807-811.
10. Hux JE, Ivis F, Flintoft V, Bica A. Diabetes in Ontario: determination of prevalence and incidence using a validated administrative data algorithm. *Diabetes Care.* 2002;25.
11. Hemmelgarn BR, Zhang JG, Manns BJ, et al. Nephrology Visits and Health Care Resource Use Before and After Reporting Estimated Glomerular Filtration Rate. *JAMA.* 2010;303(12):1151-1158.
12. Bugar JM, Ghali WA, Quan H. Utilization of a preoperative assessment clinic in a tertiary care centre. *Clinical and investigative medicine.* 2002;25(1/2):11.
13. van Diepen S, Bakal JA, McAlister FA, Ezekowitz JA. Mortality and Readmission of Patients With Heart Failure, Atrial Fibrillation, or Coronary Artery Disease Undergoing Noncardiac Surgery. *Circulation.* 2011;124(3):289.
14. Jee SH, Cabana MD. Indices for continuity of care: a systematic review of the literature. *Medical care research and review : MCRR.* 2006;63(2):158-188.
15. Knight JC, Dowden JJ, Worrall GJ, Gadag VG, Murphy MM. Does higher continuity of family physician care reduce hospitalizations in elderly people with diabetes? *Population health management.* 2009;12(2):81-86.
16. Tonelli M, Wiebe N, Fortin M, et al. Methods for identifying 30 chronic conditions: application to administrative data. *BMC medical informatics and decision making.* 2015;15:31.
17. Austin Peter C. Type I Error Rates, Coverage of Confidence Intervals, and Variance Estimation in Propensity-Score Matched Analyses. In: *The International Journal of Biostatistics.* Vol 52009.
18. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2013 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. *Can J Diabetes* 2013;37:S1-S212.
19. Gao S, Manns BJ, Culleton BF, et al. Access to health care among status Aboriginal people with chronic kidney disease. *Cmaj.* 2008;179(10):1007-1012.

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20. Canadian Institute for Health Information (CIHI). Technical note: ambulatory care sensitive conditions (ACSC) *Health Indicators 2010 Definitions, Data Sources and Rationale* 2010; [www.cihi.ca/CIHI-extportal/pdf/internet/DEFINITIONS\\_052010\\_EN](http://www.cihi.ca/CIHI-extportal/pdf/internet/DEFINITIONS_052010_EN).
21. Canadian Institute for Health Information (CIHI). Technical note: ambulatory care sensitive conditions (ACSC). 2010; [www.cihi.ca/CIHI-extportal/pdf/internet/DEFINITIONS\\_052010\\_EN](http://www.cihi.ca/CIHI-extportal/pdf/internet/DEFINITIONS_052010_EN). Accessed January 31, 2018, 2018.

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Figure 1. Forest plot of the unadjusted risk ratio comparing the proportion of patients having a visit with a clear indication with salary-based versus fee-for-service specialist physicians

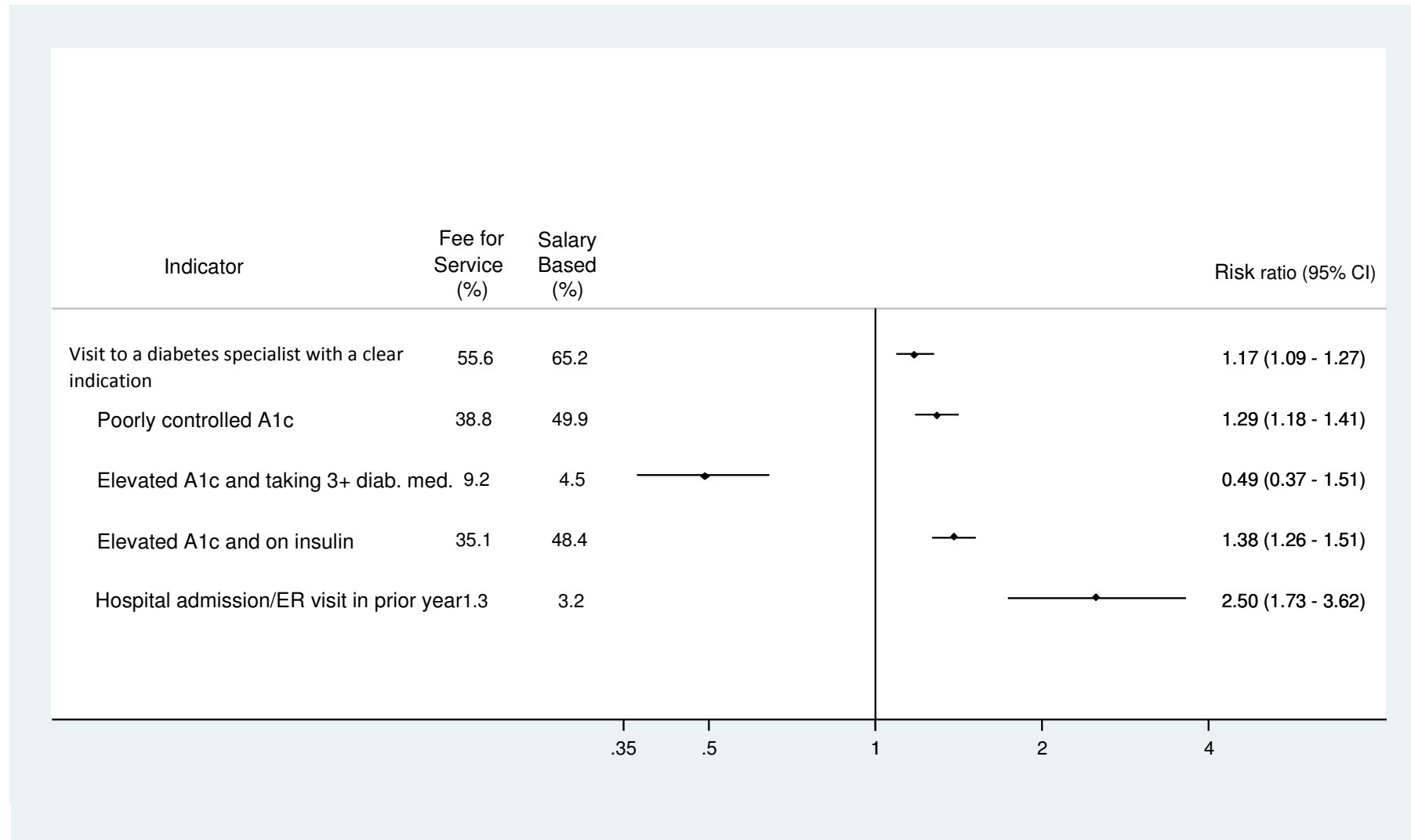


Table 1. Definitions of visit types to diabetes specialists with a clear indication supported by guidelines and an expert committee

Description	Definition	Why the referral was clearly indicated
Poorly controlled A1c	A1c $\geq$ 8.5%. A1c test reflects the percentage of hemoglobin (protein in red blood cells) coated in sugar. Higher A1c indicates poorer blood sugar control and higher risk of complications.	Diabetes control is sufficiently poor that improvement is unlikely without substantial changes to therapy which often requires a diabetes specialist and multidisciplinary team.
Elevated A1c and taking 3 or more non-insulin antihyperglycemic agents (AHA)	A1c $\geq$ 7.5% and taking three or more antihyperglycemic agents	Type 2 diabetes patients who need to start insulin. Traditionally initiation of insulin in T2D has been an activity for specialists. While this can be done safely and effectively in primary care it is not yet standard of care in all places.
Elevated A1c and on insulin	A1c $\geq$ 7.5% and taking insulin (regardless of use of antihyperglycemic agents)	Type 1 diabetes or Type 2 diabetes requiring further intensification.
Hospital admission/ER visit for a diabetes-specific ambulatory care sensitive condition in prior year	A hospital admission or ER visit with one of the following ICD-10 codes indicating hyperglycemic or hypoglycemic events for Type 1, Type 2, and other diabetes in the year prior to specialist visit: <ul style="list-style-type: none"> <li>• E10.0 (Type 1 with coma)</li> <li>• E10.63 (Type 1 with hypoglycemia)</li> <li>• E11.0 (Type 2 with coma)</li> <li>• E11.63 (Type 2 with hypoglycemia)</li> <li>• E13.0 (Other specified with coma)</li> <li>• E13.63 (Other specified with hypoglycemia)</li> <li>• E14.0 (Unspecified with coma)</li> <li>• E14.63 (Unspecified with hypoglycemia)</li> </ul>	These represent potentially life threatening events due to significant gaps in, or adverse effects of, diabetes therapy which may require substantial changes to therapy by a specialist and multidisciplinary team.

Table 2. Characteristics of Patients with Diabetes with Specialist Physician Visit for Diabetes by Physician Payment Model

	Total	Fee-for-service	Salary-based	Std diff
	N=23954	N=21218	N=2736	
	%*	%*	%*	
Age, mean, yrs (SD)	56.3 (15.4)	56.9 (14.8)	52.3 (18.5)	27.2
18-29 years old	6.24	5.07	15.31	
>29 years old	93.76	94.93	84.69	
Female	45.4	44.44	52.92	17.0
First Nations Status	3.7	3.26	7.13	17.5
Socioeconomic Status				
Quintile 1 (Lowest)	24.06	24.26	22.51	5.7
Quintile 2	23.84	24.02	22.4	5.4
Quintile 3	18.71	18.72	18.58	1.8
Quintile 4	17.32	17.21	18.23	1.3
Quintile 5 (Highest)	16.06	15.79	18.27	5.1
Rural	7.38	6.73	12.42	19.4
<b>Primary care attachment (eg. relational continuity)**</b>				
Infrequent	11.07	10.74	13.6	8.7
Low	13.3	13.19	14.11	2.7
Medium	29.31	29.27	29.61	0.7
High	46.33	46.8	42.69	8.3
<b>Diabetes illness severity</b>				
Baseline A1c, mean (SD)	8.4 (2.0)	8.4 (1.9)	8.5 (2.1)	7.6
Proportion with Sustained A1c>9%	22.6	22.36	24.45	4.9
Duration of diabetes, mean, yr (SD)	8.9 (6.1)	8.9 (6.0)	9.1 (6.2)	2.4
Admissions to hospital or visits to emergency departments for diabetes-specific ambulatory care sensitive conditions (ACSC) in year before visit, mean (SD)***	0.35 (0.97)	0.32 (0.86)	0.53 (1.5)	13.2
Proportion of people with one hospital or emergency department visit for a diabetes-specific ACSC in year before visit***	16.23	15.81	19.52	5.8
Proportion with 2 or more hospital or emergency department visits for a diabetes-specific ACSC in year before visit***	6.06	5.50	10.42	5.8
<b>Comorbidities</b>				
CKD	37.54	37.22	40.06	5.8
Proportion with more advanced CKD****	14.96	14.66	17.06	6.6
One comorbidity only (including diabetes)*****	16.06	15.76	18.46	13.2
Two comorbidities*****	25.31	25.8	21.53	10.1
Three or four comorbidities*****	39.96	40.33	37.06	6.7
5 or more comorbidities*****	18.66	18.11	22.95	12.0

\*Unless otherwise noted; \*\* Primary care attachment (also called relational continuity) categories are defined as infrequent (1 to 2 primary care visits), high (>75% of patients' 3 or more primary care visits made to the same physician), medium (50-75% of 3 or more visits made to the same physician), and low (<50% of visits made to any one primary care physician); \*\*\* Diabetes-specific ambulatory care sensitive conditions include coma, acidosis, hypoglycemia, and no mention of complications for type 1, type 2, other specified, and unspecified diabetes[21].;\*\*\*\* More advanced CKD is defined as eGFR < 30 mL/min/1.73 m<sup>2</sup>, eGFR <45 mL/min/1.73 m<sup>2</sup> and moderate or severe albuminuria, or eGFR < 60 mL/min/1.73 m<sup>2</sup> with severe albuminuria. Moderate albuminuria is defined as ACR 30-300 mg/g, PCR 150-500 mg/g, UDIP 1+ and severe albuminuria is defined as ACR >300 mg/g, PCR >500 mg/g, UDIP ≥ 2+ ; \*\*\*\*\*Comorbidities included diabetes and chronic kidney disease and 28 other chronic conditions with validated administrative data algorithms (See Tonelli et al, BMC Medical Informatics and Decision Making; 15(1)31. Available: <https://doi.org/10.1186/s12911-015-0155-5>)

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Table 3. Proportion of patients with a clearly indicated visit to diabetes specialists, by age of patient and physician payment model

	Total	Fee-for-service	Salary-based	Comparison of patients seen by salary-based physicians to patients seen by fee-for-service physicians (Risk ratio)	p value
	%	%	%		
	N=11,130	N=9,988	N=1,142		
Visit with a Clear Indication to Diabetes Specialist <sup>a</sup>	56.6	55.6 (54.1 to 57.1)	65.2 (60.7 to 70.1)	1.17 (1.09 to 1.27)	<0.001
Poorly controlled A1c <sup>b</sup>	39.91	38.8 (37.6 to 40.0)	49.9 (46.0 to 54.2)	1.29 (1.18 to 1.41)	<0.001
Elevated A1c and on 3 or more diabetes medications <sup>c</sup>	8.72	9.2 (8.6 to 9.8)	4.5 (3.4 to 5.9)	0.49 (0.37 to 0.64)	<0.001
Elevated A1c and on insulin <sup>d</sup>	36.46	35.1 (34.0 to 36.3)	48.4 (44.6 to 52.6)	1.38 (1.26 to 1.51)	<0.001
Hospital or emergency department visits for a diabetes-specific ACSC in the year before the specialist visit <sup>e</sup>	1.46	1.3 (1.1 to 1.5)	3.2 (2.3 to 4.4)	2.50 (1.73 to 3.62)	<0.001
<b>18-29 years old</b>	<b>N=906</b>	<b>N=610</b>	<b>N=296</b>		
Visit with a Clear Indication to Diabetes Specialist <sup>a</sup>	61.81	61.0 (55.1 to 67.5)	63.5 (55.1 to 73.3)	1.04 (0.87 to 1.24)	0.650
Poorly controlled A1c <sup>b</sup>	48.45	47.7 (42.5 to 53.5)	50.0 (42.6 to 58.7)	1.05 (0.86 to 1.28)	0.641
Elevated A1c and on 3 or more diabetes medications <sup>c</sup>	0.33	0.33 (0.08 to 1.3)	0.34 (0.05 to 2.4)	1.03 (0.09 to 11.4)	0.980
Elevated A1c and on insulin <sup>d</sup>	50.22	47.9 (42.7 to 53.7)	55.1 (47.2 to 64.2)	1.15 (0.95 to 1.39)	0.152
Hospital or emergency department visits for a diabetes-specific ACSC in the year before the specialist visit <sup>e</sup>	2.43	2.5 (1.5 to 4.1)	2.4 (1.1 to 5.0)	0.96 (0.39 to 2.4)	0.932
<b>&gt;29 years old</b>	<b>N=10,224</b>	<b>N=9378</b>	<b>N=846</b>		
Visit with a Clear Indication to Diabetes Specialist <sup>a</sup>	56.11	55.2 (53.8 to 56.8)	65.8 (60.6 to 71.5)	1.19 (1.09 to 1.30)	<0.001
Poorly controlled A1c <sup>b</sup>	39.15	38.2 (37.0 to 39.5)	49.9 (45.3 to 54.9)	1.31 (1.18 to 1.45)	<0.001
Elevated A1c and on 3 or more diabetes medications <sup>c</sup>	9.46	9.8 (9.2 to 10.4)	5.9 (4.5 to 7.8)	0.60 (0.45 to 0.80)	<0.001
Elevated A1c and on insulin <sup>d</sup>	35.24	34.3 (33.1 to 35.5)	46.1 (41.7 to 50.9)	1.35 (1.21 to 1.49)	<0.001
Hospital or emergency department visits for a diabetes-specific ACSC in the year before the specialist visit <sup>e</sup>	1.37	1.18 (0.98 to 1.43)	3.4 (2.4 to 4.9)	2.90 (1.92 to 4.36)	<0.001

<sup>a</sup> Diabetes Specialists defined as seeing >50 patients with diabetes each year and >30% of claims for outpatient diabetes treatment; <sup>b</sup> A1c > 8.5; <sup>c</sup> A1c > 7.5 and taking three or more non-insulin antihyperglycemic agents; <sup>d</sup> A1c > 7.5 and on insulin; <sup>e</sup> hypoglycemic- or hyperglycemic-related incidents (ICD-10 codes E10.0 (Type 1 with coma), E10.63



(Type 1 with hypoglycemia), E11.0 (Type 2 with coma), E11.63 (Type 2 with hypoglycemia), E13.0 (Other specified with coma), E13.63 (Other specified with hypoglycemia), E14.0 (Unspecified with coma), E14.63 (Unspecified with hypoglycemia)

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