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Research

The association between payment model and specialist physicians' selection of patients with diabetes: a descriptive study

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Abstract

Background: As the number of people with chronic diseases increases, understanding the impact of payment model on the types of patients seen by specialists has implications for improving the quality and value of care. We sought to determine if there is an association between specialist physician payment model and the types of patients seen.

Methods: In this descriptive study, we used administrative data to compare demographic characteristics, illness severity and visit indication of patients with diabetes seen by fee-for-service and salary-based internal medicine and diabetes specialists in Calgary and Edmonton between April 2011 and September 2014. The study cohort included all newly referred adults with diabetes (no appointment with a specialist in prior 4 yr). Diabetes was identified using a validated algorithm that excludes gestational diabetes.

Results: Patients managed by salary-based physicians (n = 2736) were sicker than those managed by fee-for-service physicians (n = 21 218). Patients managed by salary-based specialists were more likely to have 5 or more comorbidities (23.0% [n = 628] v. 18.1% [n = 3843]) and to have been admitted to hospital or seen in an emergency department for an ambulatory care sensitive condition in the year before their index visit, probably reflecting poorer disease control or barriers to optimal outpatient care. A higher proportion of visits to salary-based physicians were for appropriate indications (65.2% [n = 744] v. 55.6% [n = 5553]; risk ratio 1.17, 95% confidence interval 1.09–1.27).

Interpretation: Salary-based specialists were more likely to see patients with a clear indication for a specialist visit, while fee-for-service specialists were more likely to see healthier patients. Future research is needed to determine if the differences in types of patients are attributable to payment model or other provider- or system-level factors.

As the number of people with chronic diseases increases, it is critical to determine the optimal models to improve the quality and value of chronic disease care. 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] Fee for service (FFS) is the dominant physician remuneration model in Canada: 72.1% of physician payments in Canada[3] are reimbursed under FFS. FFS financially rewards physicians who have more patient visits and more clinical activity. Studies in both primary care and specialty care settings have found that FFS payment results in increased health care utilization.[4,5] Understanding the

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impact of payment model on the types of patients seen by specialists is important, because health care payers presumably want to prioritize care for patients with the highest needs who are at the highest risk of complications and hospital admissions and therefore have the highest chance of benefiting from specialist care.

Insofar as physicians can select who they provide care to, FFS payment might incentivize specialists to select more complex patients who need more health care,[6] or it might induce selection of patients with less complexity (because they can see patients in less time) although the clinical value of such visits might be uncertain. In primary care, physicians with more complex patients have been found to be less likely to select a payment model other than FFS,[7] but it is unclear how payment model might affect patient selection in specialty care. We aimed to compare demographic characteristics, illness severity and visit indication of patients with diabetes newly referred to FFS and salary-based specialists to determine if there was an association between specialist physician payment model and patients seen.

Methods

Overview

A salary-based remuneration model called Academic Alternative Relationship Plans (AARP) was implemented across Alberta in 2004 with the goal of promoting innovative ways to provide patient care in a more efficient and accessible manner (for instance, outreach clinics to First Nations and other rural communities), and it is currently used by over 700 specialist physicians (one-quarter of all medicine specialist physicians in Alberta). AARP pay physicians on a contractual basis and provide a mechanism to compensate physicians for clinical, administrative, teaching and research contributions.[8] While physicians remain independent contractors, the AARP model is most similar to a salary. When specialist physicians in both groups receive consultation requests, they can choose to provide written feedback to the referring physician (not reimbursed by FFS) but not see the patient formally, book a phone call to discuss the patient with the referring physician (a reimbursable FFS service), or book an in-person visit for the patient (reimbursable at a higher FFS rate).

Data sources

We used the Interdisciplinary Chronic Disease Collaboration Data Repository,[9] which includes laboratory and administrative health data (including vital statistics; prescription drug data; physician claims; data on hospital admissions, emergency department visits and outpatient visits; and all health care costs) for all Albertans from 1994 to 2015. This data set has been used for many observational studies[10–13] and for assessing outcomes in a randomized controlled trial of over 20 000 people.[14]

The study cohort included newly referred adults with diabetes, identified using a validated algorithm based on 2 or more physician claims for diabetes.[15,16] Compared with chartconfirmed diagnoses in primary care, this definition is relatively accurate (sensitivity and specificity of 86% and 97%).[10] All patients with diabetes who were seen by internal medicine or endocrinology specialist physicians (with no visits in the prior 4 years[12]) for a diabetes-specific indication between Apr. 1, 2011, and Sept. 30, 2014, were included. Patients were excluded if they had gestational diabetes or were on dialysis (because in both cases their needs are different than those of an average patient with diabetes), if they had an islet cell or kidney transplant before the index visit (because these patients are infrequently cared for by FFS physicians) or if their visit was a preoperative assessment (because these visits were not aimed at optimizing management of chronic disease).[17,18]

Variables

The explanatory variable was specialist physician payment model (AARP v. FFS), defined using the comprehensive physician claims data available within the Interdisciplinary Chronic Disease Collaboration Data Repository. Patient covariates included age, sex, First Nations status, neighbourhood income quintile (determined from the National Household Survey by linkage with residential postal code), rural/urban status, primary care physician attachment (using the Usual Provider of Care index categorized as in previous studies[19]), illness characteristics, and comorbidities defined using validated algorithms.[20] Only patients seen by urban specialists were included in the study population because there are no salary-based specialists in rural Alberta.

We also sought to determine whether there was a clear indication for the visit for the subset of patients seen by diabetes specialists. Given that many endocrinologists bill as internal medicine specialists, and many internal medicine physicians focus on diabetes management, we defined diabetes specialists as those who see more than 50 patients with diabetes each year, with at least 30% of their outpatient claims being for outpatient diabetes treatment. As we did not have information on the reason for referral provided at the time of the consultation request, we used laboratory, medication and clinical data to infer the indication for the visit. A specialist visit with a clear indication was defined a priori on the basis of indications for specialist care in people with diabetes provided in clinical practice guidelines[21] and by an expert panel including prior Endocrinology Division heads in Calgary and Edmonton and 3 authors (A.E., B.M., P.S.) (Table 1). Specialist visits may be indicated for some visits even if they fall outside these categories. Our focus was on defining visits for people with diabetes with a clear indication for a specialist visit rather than defining inappropriate visits.

Statistical analysis

Because this was a descriptive study, we compared demographic characteristics and illness severity between patients seen by FFS and salary-based specialists to determine whether there were differences in the types of patients seen for a visit. We used a 10% standardized difference as a marker of meaningful differences between the groups.[22]

We assessed the association between payment model and indication for the visit using a risk ratio (RR). RRs were estimated using a Poisson model.

Table 1: Definitions of visit types to diabetes specialists with a clear indication*

Description	Definition	Why the referral was clearly indicated
Poorly controlled HbA_{1C}	HbA_{1C} ≥ 8.5%. The HbA_{1C} test reflects the percentage of hemoglobin (protein in red blood cells) coated in sugar. Higher HbA_{1C} values indicate poorer blood glucose 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 HbA_{1C} and taking 3 or more non-insulin antihyperglycemic agents	HbA_{1C} ≥ 7.5% and taking 3 or more antihyperglycemic agents	Patients who fit this description have type 2 diabetes and need to start insulin. Traditionally, initiation of insulin in type 2 diabetes 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 HbA_{1C} and on insulin	HbA_{1C} ≥ 7.5% and taking insulin (regardless of use of antihyperglycemic agents)	Patients who fit this description have type 1 diabetes or type 2 diabetes requiring further intensification of therapy.
Hospital admission or ED visit for a diabetes-specific ambulatory care sensitive condition in prior year	A hospital admission or ED visit with 1 of the following ICD-10 codes indicating hyperglycemic or hypoglycemic events for type 1, type 2 and other diabetes in the year before specialist visit: • 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)	These represent potentially life-threatening events because of significant gaps in, or adverse effects of, diabetes therapy that may require substantial changes to therapy by a specialist and multidisciplinary team.

Note: ED = emergency department, HbA_{1c} = hemoglobin A_{1c}, ICD-10 = *International Statistical Classification of Diseases and Related Health Problems, 10th revision*.
*Definitions supported by the Canadian Diabetes Association's 2013 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada[21] and expert committee opinion.

Ethics approval

This study was approved by the University of Calgary's Conjoint Health Research Ethics Board.

Results

Patient and physician characteristics

A total of 23 954 adults with diabetes saw specialist physicians during the study period. FFS physicians saw 21 218 and salary-based physicians saw 2736 new patients with diabetes during the study period. Patients with a first visit to either FFS or salary-based physicians had different demographic and illness severity characteristics (Table 2). Salary-based physicians saw a larger proportion of patients aged 18–29 years (15.3% [n = 491] v. 5.1% [n = 1076]), who were assumed to have predominantly type 1, rather than type 2, diabetes. Salary-based physicians were also more likely than FFS physicians to see patients who were women (52.9% [n = 1448] v. 44.4% [n = 9430]), First Nations (7.1% [n = 195] v. 3.3% [n = 691]) and from rural areas (12.4% [n = 339] v. 6.7% [n = 1425]) (Table 2).

Salary-based specialists were more likely to see patients who were sicker or in greater need of care than FFS specialists. A higher proportion of patients seeing salary-based specialists had 5 or more comorbidities (23.0% [n = 628] v. 18.1% [n = 3843]). In addition, salary-based specialists were more likely to see patients who had been admitted to a hospital or seen in an emergency department for an ambulatory care sensitive condition[23,24] in the year before their visit to a specialist, suggesting that their diabetes was more difficult to control or that they had barriers to access optimal outpatient care. Other variables with less than a 10% standardized difference also suggested that there was a significantly higher complexity and severity of illness among patients seen by salary-based specialists, such as lower primary care attachment, a higher proportion with sustained hemoglobin A_{1C} (HbA_{1C}) greater than 9% and a higher proportion with chronic conditions, including advanced kidney disease, asthma, cancer, chronic heart failure, depression and stroke.

There were 302 specialists who saw patients with diabetes during the study period, of whom 193 were paid FFS and 109 paid a salary (Table 3). FFS physicians were more likely than salary-based physicians to be internal medicine specialists and much more likely to be in the highest clinical workload tertile. Salary-based specialists had been submitting claims in Alberta for a mean of 1 year longer than FFS physicians, indicating they may be older, and most of them primarily delivered services in clinics located in teaching hospitals.

Visit characteristics and indications

Although nearly all visits were in person, salary-based specialists were more likely than FFS physicians to talk with the consulting physician by phone to provide consultative care (rather than see the patient in person) (5.3% [n = 145] v. 2.5% [n = 537]; $p < 0.001$).

Table 2: Characteristics of patients with diabetes with a specialist physician visit for diabetes, by physician payment model

Characteristic	Total *n* = 23 954	Fee for service *n* = 21 218	Salary based *n* = 2736	Standardized difference
Age, yr, mean ± SD	56.3 ± 15.4	56.9 ± 14.8	52.3 ± 18.5	27.2
18–29 yr, no. (%)	1495 (6.2)	1076 (5.1)	419 (15.3)	
> 29 yr, no. (%)	22 459 (93.8)	20 142 (94.9)	2317 (84.7)	
Female, no. (%)	10 878 (45.4)	9430 (44.4)	1448 (52.9)	17.0
First Nations status, no. (%)	886 (3.7)	691 (3.3)	195 (7.1)	17.5
Socioeconomic status, no. (%)				
Quintile 1 (lowest)	5614 (24.1)	5030 (24.3)	584 (22.5)	5.7
Quintile 2	5563 (23.8)	4982 (24.0)	581 (22.4)	5.4
Quintile 3	4365 (18.7)	3883 (18.7)	482 (18.6)	1.8
Quintile 4	4041 (17.3)	3568 (17.2)	473 (18.2)	1.3
Quintile 5 (highest)	3748 (16.1)	3274 (15.8)	474 (18.3)	5.1
Rural (community < 1000 people), no. (%)	1764 (7.4)	1425 (6.7)	339 (12.4)	19.4
Primary care attachment (relational continuity),* no. (%)				
Infrequent	2651 (11.1)	2279 (10.7)	372 (13.6)	8.7
Low	3185 (13.3)	2799 (13.2)	386 (14.1)	2.7
Medium	7021 (29.3)	6211 (29.3)	810 (29.6)	0.7
High	11 097 (46.3)	9929 (46.8)	1168 (42.7)	8.3
Diabetes illness severity				
Baseline HbA_{1c}, mean ± SD	8.4 ± 2.0	8.4 ± 1.9	8.5 ± 2.1	7.6
Proportion with sustained HbA_{1c} > 9%, no. (%)	5413 (22.6)	4744 (22.4)	669 (24.5)	4.9
Duration of diabetes, yr, mean ± SD	8.9 ± 6.1	8.9 ± 6.0	9.1 ± 6.2	2.4
Admissions to hospital or visits to EDs for diabetes-specific ACSC in year before visit,† mean ± SD	0.35 ± 0.97	0.32 ± 0.86	0.53 ± 1.5	13.2
Patients with 1 hospital or ED visit for diabetes-specific ACSC in year before visit,† no. (%)	3888 (16.2)	3354 (15.8)	534 (19.5)	5.8
Patients with 2 or more hospital or ED visits for diabetes-specific ACSC in year before visit,† no. (%)	1452 (6.1)	1167 (5.5)	285 (10.4)	5.8
Comorbidities				
CKD, no. (%)	8993 (37.5)	7897 (37.2)	1096 (40.1)	5.8
More advanced CKD,‡ no. (%)	1345 (15.0)	1158 (14.7)	187 (17.1)	6.6
1 comorbidity only (including diabetes),§ no. (%)	3848 (16.1)	3343 (15.8)	505 (18.5)	13.2
2 comorbidities,§ no. (%)	6063 (25.3)	5474 (25.8)	589 (21.5)	10.1
3 or 4 comorbidities,§ no. (%)	9572 (40.0)	8558 (40.3)	1014 (37.1)	6.7
≥ 5 or more comorbidities,§ no. (%)	4471 (18.7)	3843 (18.1)	628 (23.0)	12.0

Note: ACSC = ambulatory care sensitive condition, CKD = chronic kidney disease, ED = emergency department, SD = standard deviation.
*Primary care attachment (also called relational continuity) categories are defined as infrequent (1 or 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 1 primary care physician).
†Diabetes-specific ambulatory care sensitive conditions include coma, acidosis and hypoglycemia and no mention of complications for type 1, type 2, other specified and unspecified diabetes.
‡More advanced CKD is defined as estimated glomerular filtration rate (eGFR) < 30 mL/min/1.73 m^2, eGFR < 45 mL/min/1.73 m^2 with moderate or severe albuminuria, or eGFR < 60 mL/min/1.73 m^2 with severe albuminuria. Moderate albuminuria is defined as albumin-creatinine ratio (ACR) 30–300 mg/g, protein-creatinine ratio (PCR) 150–500 mg/g, urine dipstick (UDIP) 1+ and severe albuminuria is defined as ACR > 300 mg/g, PCR > 500 mg/g, UDIP ≥ 2+.
§Comorbidities included diabetes, CKD and 28 other chronic conditions with validated administrative data algorithms.[20]

Overall, 11 130 (46.5%) visits were to diabetes specialists. Of these visits, 56.6% (*n* = 6297) had a clear indication for a specialist visit (Table 4). Patients with diabetes seen for the first time by salary-based diabetes specialists were more likely to have a clear indication for their visit than patients seen by FFS diabetes specialists (65.2% [*n* = 744] v. 55.6% [*n* = 5553]; RR [95% CI] 1.17 [1.09–1.27]), with more visits to salary-based specialists having a clear indication across 3 of the 4 visit types (HbA_{1C} > 8.5%; HbA_{1C} > 7.5% on insulin; or a hospital admission or emergency department visit for a

Table 3: Characteristics of specialist physicians seeing patients with diabetes, by physician payment model

Characteristic	Fee for service *n* = 193	Salary based *n* = 109
Physician type*		
Diabetes specialist, no. (%)	12 (6.2)	11 (10.1)
Internal medicine specialist, no. (%)	165 (85.5)	79 (72.5)
Kidney specialist, no. (%)	16 (8.3)	19 (17.4)
Years practising in Alberta since 1994, mean ± SD	7.5 ± 7.0	8.7 ± 5.6
Clinical workload†		
Lowest tertile, no. (%)	46 (23.8)	26 (23.9)
Mid tertile, no. (%)	79 (40.9)	79 (72.5)
Highest tertile, no. (%)	68 (35.2)	4 (3.7)
Location‡		
Urban zone 1, no. (%)	119 (61.7)	49 (45.0)
Urban zone 2, no. (%)	74 (38.3)	60 (55.1)
Clinic location		
Teaching hospital, no. (%)	21 (11)	60 (55)
Large urban hospital, no. (%)	64 (33)	20 (18)
Suburban/rural hospital, no. (%)	10 (5)	0 (0)
Community ambulatory centre, no. (%)	31 (16)	16 (15)
Missing,§ no. (%)	67 (34)	13 (12)

Note: SD = standard deviation.
*Diabetes specialists are endocrinologists and internal medicine physicians who see > 50 patients with diabetes each year and for whom > 30% of claims are for outpatient diabetes care.
†Clinical workload is defined as the following: tertile 1 = fewer than 94 days billing per year, tertile 2 = 95–221 days billing per year, tertile 3 = 222–365 days billing per year.
‡The province of Alberta has 2 large urban areas: the cities of Calgary and Edmonton.
§Includes patient home visits and missing clinic locations.

diabetes-specific ambulatory care sensitive condition in the prior year) (Table 4). The exception was for visits among people with elevated HbA_{1C} on 3 or more (non-insulin) diabetes medications (i.e., with type 2 diabetes because all people who have type 1 receive insulin), among the full cohort and those 30 years of age and older (Table 4).

Interpretation

We found important differences in the types of new patients being seen for a first visit by FFS and salary-based specialists across a range of demographic and clinical characteristics as well as severity of illness. Compared with FFS specialists, salary-based specialists were more likely to see female patients, younger patients (who were presumed to have type 1 diabetes), patients with a greater burden of disease and patients with poorly controlled diabetes. More patients seen by salary-based specialists were First Nations and from rural communities, possibly relating to outreach clinics to First Nations and other rural communities by salary-based specialists or to historical referral patterns between primary and specialist care. Salary-based specialists also were more likely to consult with another physician by video/phone about a patient than FFS specialists, which may be related to the goals of the salary-based payment program to change the model of care, including increasing the use of telehealth. We also noted that patients with diabetes seen for the first time by salary-based diabetes specialists were more likely to have a clear indication for their visit than patients seen by FFS diabetes specialists, indicating that FFS specialists were seeing healthier patients. We observed this increase for salary-based diabetes specialists across 3 of the 4 indicators of the need for specialist care.

When comparing our results with those of other researchers, it is helpful to frame these in the context of theory. Our results on patient severity both differ from and support theory. FFS theoretically rewards physicians for treating sicker patients because physicians will receive additional compensation to treat patients needing more care;[6] however, we found that salary-based specialists saw sicker patients. In contrast to our findings, a study of primary care in Ontario found physicians with patients with the highest levels of need were more likely to select FFS and less likely to select capitation, relative to an enhanced FFS payment model.[7] However, a study of payment models for anesthesiologists found that physicians saw patients with higher disease severity and more functional limitations after they switched from FFS to a salary-based

Table 4: Proportion of patients with a clearly indicated visit to a diabetes specialist, by age of patient and physician payment model

Characteristic	Total, no. (%) *n* = 11 130	Fee for service, % (95% CI) *n* = 9988	Salary based, % (95% CI) *n* = 1142	Comparison of patients seen by salary-based physicians with patients seen by fee-for-service physicians, risk ratio (95% CI)	*p* value
All patients					
Visit with a clear indication to a diabetes specialist*	6297 (56.6)	55.6 (54.1–57.1)	65.2 (60.7–70.1)	1.17 (1.1–1.3)	< 0.001
Poorly controlled HbA_{1c}†	4442 (39.9)	38.8 (37.6–40.0)	49.9 (46.0–54.2)	1.29 (1.2–1.4)	< 0.001
Elevated HbA_{1c} and on 3 or more diabetes medications‡	970 (8.7)	9.2 (8.6–9.8)	4.5 (3.4–5.9)	0.49 (0.4–0.6)	< 0.001
Elevated HbA_{1c} and on insulin§	4058 (36.5)	35.1 (34.0–36.3)	48.4 (44.6–52.6)	1.38 (1.3–1.5)	< 0.001
Hospital or ED visits for a diabetes-specific ACSC in the year before the specialist visit¶	162 (1.5)	1.3 (1.1–1.5)	3.2 (2.3–4.4)	2.50 (1.7–3.6)	< 0.001
Age 18–29 yr	*n* = 906	*n* = 610	*n* = 296		
Visit with a clear indication to a diabetes specialist*	560 (61.8)	61.0 (55.1–67.5)	63.5 (55.1–73.3)	1.04 (0.9–1.2)	0.7
Poorly controlled HbA_{1c}†	439 (48.5)	47.7 (42.5–53.5)	50.0 (42.6–58.7)	1.05 (0.9–1.3)	0.6
Elevated HbA_{1c} and on 3 or more diabetes medications‡	3 (0.3)	0.33 (0.1–1.3)	0.34 (0.1–2.4)	1.03 (0.1–11.4)	1.0
Elevated HbA_{1c} and on insulin§	455 (50.2)	47.9 (42.7–53.7)	55.1 (47.2–64.2)	1.15 (1.0–1.4)	0.2
Hospital or ED visits for a diabetes-specific ACSC in the year before the specialist visit¶	22 (2.4)	2.5 (1.5–4.1)	2.4 (1.1–5.0)	0.96 (0.4–2.4)	0.9
Age > 29 yr	*n* = 10 224	*n* = 9378	*n* = 846		
Visit with a clear indication to a diabetes specialist*	5737 (56.1)	55.2 (53.8–56.8)	65.8 (60.6–71.5)	1.19 (1.1–1.3)	< 0.001
Poorly controlled HbA_{1c}†	4003 (39.2)	38.2 (37.0–39.5)	49.9 (45.3–54.9)	1.31 (1.2–1.5)	< 0.001
Elevated HbA_{1c} and on 3 or more diabetes medications‡	967 (9.5)	9.8 (9.2–10.4)	5.9 (4.5–7.8)	0.60 (0.5–0.8)	< 0.001
Elevated HbA_{1c} and on insulin§	3603 (35.2)	34.3 (33.1–35.5)	46.1 (41.7–50.9)	1.35 (1.2–1.5)	< 0.001
Hospital or ED visits for a diabetes-specific ACSC in the year before the specialist visit¶	140 (1.4)	1.18 (0.98–1.4)	3.4 (2.4–4.9)	2.90 (1.9–4.4)	< 0.001

Note: ACSC = ambulatory care sensitive condition, CI = confidence interval, ED = emergency department.
*Diabetes specialists were defined as those seeing > 50 patients with diabetes each year and for whom > 30% of claims were for outpatient diabetes treatment.
†HbA_{1c} > 8.5.
‡HbA_{1c} > 7.5 and taking 3 or more non-insulin antihyperglycemic agents.
§HbA_{1c} > 7.5 and on insulin.
¶Hypoglycemic- or hyperglycemic-related incidents (ICD-10 [*International Statistical Classification of Diseases and Related Health Problems, 10th revision*] 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] and E14.63 [unspecified with hypoglycemia]).

model.[25] As we found, FFS physicians are theoretically expected to be less likely than physicians compensated differently both to cooperate with other providers (e.g., the referring primary care physician) and to participate in models of care that are less dependent on office visits.[6] Although there is limited research on specialist physician payment models, a study in primary care did find that FFS negatively influences collaboration and that older family physicians are more likely to collaborate with specialists and other health professionals.[26] Further, a recent study found substantial variation in patient complexity between specialties, which raises additional questions about the most appropriate payment model for compensating specialists for treating complex patients, many of whom would benefit from multidisciplinary care.[27]

Limitations

This study has important limitations. First, because we used administrative data, assumptions were required when

identifying diagnoses as well as patient and physician characteristics. Second, because we did not have specific information on the reason for referral, we used administrative, laboratory and medication data to assign visit indications. Because a variety of patient needs could lead to a primary care physician to refer a patient to a specialist, we examined a range of indications for which patients with diabetes might see a specialist, focusing on appropriate indications for visits rather than inappropriate visits, which are very difficult to determine precisely without having more detailed clinical knowledge of the referral. Additionally, some of these patient differences may be related to differences in referral patterns from primary care. Referrals may be affected by both specialist and primary care practices and characteristics, including interpretation of patient needs, location, physicians' relationships or past experience with the timeliness of the referring office (factors we were unable to capture with our data sets). Third, we did not have specific information on clinical need, including whether patients had type 1 or type 2 diabetes. Salary-based specialists were more likely to see patients who had a clear indication across 3 of the 4 visit types, the exception being for patients with poorly controlled diabetes who were on 3 non-insulin antihyperglycemic agents and who presumably needed to start insulin. This suggests that FFS specialists may see a higher proportion of patients who need to start insulin, possibly because salary-based specialists in the 2 urban centres in Alberta can redirect uncomplicated insulin starts to allied health care professionals. Alternatively, salary-based specialists were more likely to see patients whose diabetes was not controlled on insulin and those with type 1 diabetes. Whether this reflects decisions of referring physicians to direct more complex cases to salary-based specialists or an increased likelihood that "simpler" cases will be accepted by FFS specialists is not clear. Fourth, our study included only people from Alberta, and our findings may not be generalizable to other provinces.

Despite these limitations, our study has important strengths, including the use of population-based data from Alberta, the use of validated algorithms to define diabetes and other comorbidities and the use of physician claims data with high billing submission rates and accuracy[28] to define our explanatory variable.

Conclusion

Our study suggests that salary-based specialists are seeing sicker patients than FFS physicians and that a higher proportion of visits to salary-based specialists are for a clear indication. It is possible that the differences we observed are not solely due to the payment model but instead to the type of specialists who self-select into salary-based payment models or differences in the settings in which FFS and salary-based specialists operate. For example, because most salary-based specialists work in teaching hospitals, where a portion of their work relates to teaching and research, we may be capturing differences in academic versus community physicians. Academic physicians may also have greater access to allied health multidisciplinary teams, making it easier for them to see patients with more complex needs. Future qualitative research is planned to further assess these explanations. It is unclear whether either payment model is achieving the goal of policymakers that the right patient be seen in the right place and at the right time. It is also unclear whether some of the patients seen by specialists reimbursed under FFS could have continued to be managed in primary care. It is clear that different types of patients are being seen by salary-based and FFS physicians; future studies should assess whether this difference is due to the funding models themselves or to differences in the types of specialists selecting into the funding models.

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