

Family Physician Remuneration Schemes and Referrals to



Canadian Centre for Health Economics Centre canadien en économie de la santé Specialists: Evidence from Ontario

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- Background
- Theory
- Methodology
- Data & Variables
- Results











- Referral of patients to specialists is an understudied area – mixed evidence in the current empirical literature
- Relevant in several contexts
- Physician remuneration schemes (Allard et al., 2014, 2011; Barros and Martinez-Giralt, 2003; Iversen and Lurås, 2000)
- Optimal incentive contracts (Malcomson, 2004; Mariñoso and Jelovac, 2003)











- Physician's diagnostic ability (Allard et al., 2014, 2011; González, 2010)
- Physician altruism (Allard et al., 2014, 2011)
- Competition among primary care physicians (Allard et al., 2014; Godager et al., 2015; Iversen and Ma, 2011) or specialists (Brekke et al., 2007)
- Patients' beliefs about the appropriateness of care (González, 2010)











• Theoretical Results:

- Capitation mostly increases referrals to specialists compared to other forms of physician payment (Allard et al., 2014, 2011; Iversen and Lurås, 2000)
- Differences in referral rates under fee-forservice, capitation, and fundholding depend on the level of physician altruism, diagnostic ability and specific medical conditions (Allard et al., 2014, 2011)











- Policy Context:
 - Physician Payment Schemes in Ontario
 - Fee-for-service (FFS)
 - FHG (FFS + Incentives): 2003
 - FHN/FHO (Capitation + Incentives): 2005
 - Others (Mixed)















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• Key Characteristics of FHGs and FHOs

	FHG	FHO
Physician Remuneration	Blended FFS	Blended Cap.
After-hours Requirement	≥ 3 hours/wk (30% premium)	≥ 3 hours/wk (30% premium)
Group Size	≥ 3	≥ 3
Patient Enrollment	Yes	Yes
P4P: preventive care bonuses, chronic disease management, unattached patients	Yes	Yes
Bonus loss for outside use	No	Yes
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Background



- Several papers conclude that capitation form of payment is associated with increased referrals (Krasnik et al., 1990; Iversen and Luras, 2000; Forrest et al., 2006, 2003; Dusheiko et al., 2006) -- magnitudes vary widely
- Some studies find no difference in the referral rates between FFS and capitation payments (Gosden et al., 2003; Sørensen and Grytten, 2003)
- Ontario: Kralj and Kantarevic (2013): physicians practicing in FHOs have 4% fewer referrals per enrolled patient than those in FHGs; Liddy et al. (2014) conclude that physicians practicing in FFS have lower referral rates compared to capitation-based models











- Recent administrative data from FHG and FHO models (2005 - 2013 fiscal years)
- Costs of referrals for the first time (no information on costs of referrals in the literature)
- Control for patient co-morbidity using Johns Hopkins' ACG methodology
- Number of unique patient referrals as robustness check
- Analysis on enrolled vs. non-enrolled patients









- Follow Allard, Léger and Rochaix (2011, 2014)
- The patient has either a low-severity illness $\theta \downarrow L$ or a high-severity $\theta \downarrow H$
- Both the FP and the specialist can treat appropriately a patient with $\theta \downarrow L$
- But only the specialist can effectively treat a patient with $\theta \downarrow H$
- FPs: heterogeneous in terms their altruism
- For simplicity, we assume that the FP perfectly observes the true severity









- Timing
- Stage 1: the FP chooses between the FHO and FHG contracts
- Stage 2: the patient becomes ill and seeks care from his/her FP. A patient with $\partial \downarrow i$ requires an appropriate treatment $t \downarrow i$, with i = L, H
- Stage 3: the FP observes $\theta \downarrow i$ and decides whether to treat the patient himself/herself or to refer the patient to the specialist
- i. If the patient is referred then the game ends

if $t \downarrow L$ is provided for $\theta \downarrow L (\theta \downarrow H)$

ii. If the patient is treated by the FP, he may get better (worse/same)







- Patient's post-treatment health *h*
- depends on the illness severity and the treatment received
- If $\theta = \theta \downarrow L$ then $h \downarrow 1 = h(\theta \downarrow L$, $t \downarrow L$) and does not depend on the type of provider
- If $\theta = \theta \downarrow H$ then:
- i. $h \downarrow 2 = h(\theta \downarrow H, t \downarrow H)$ if the patient is referred after the FP's diagnosis
- ii. $hJ3 = h(\theta JH, tJL, tJH)$ if the referral occurs after the FP's treatment









- Physician's utility
- The FP derives utility from his/her practice income and the patient's health
- The FP's concern about the patient's health is characterized by an altruism parameter α
- The FHO model: a fixed capitation payment regardless of whether or not a treatment is provided and a FFS payment *F1FHO* if a treatment is provided
 The FHG model: no capitation payment and a FFS payment *F1FHG* only if a treatment is provided









- Physician's behaviour
- The FP chooses a strategy (i.e., treatment or referral) to maximize his/her expected utility:
- $U\downarrow j = R + F\uparrow j + \alpha h\downarrow i; j = FHO, FHG; i = 1,2,3$
- If $\theta = \theta \downarrow L$, the FP will never refer the patient to the specialist because:
- i. in the FHO model: $R + F \uparrow FHO + \alpha h \downarrow 1 > R + \alpha h \downarrow 1$
- ii. In the FHG model: $F\uparrow FHG + \alpha h \downarrow 1 > \alpha h \downarrow 1$
- The FP's behaviour is not affected by the payment mechanism or the altruism parameter









- If $\theta = \theta \downarrow H$, the FP will provide a treatment if and only if $F \uparrow j > \alpha (h \downarrow 2 h \downarrow 3)$
- i. Because both $F \uparrow j$ and $(h \downarrow 2 h \downarrow 3)$ are positive, the FP's behaviour is a priori ambiguous
- ii. If $\alpha = 0$, the FP will never refer the patient
- iii. If α is relatively high, the FP is more likely to refer the patient to the specialist
- iv. For a fixed α , a FHO FP is more likely to refer









- Summary
- A selfish FP ($\alpha = 0$) will systematically treat the patient regardless of the remuneration type and the illness severity
- The impact of the FHO model on the number of referrals to specialists will depend not only on the altruism parameter but also on the distribution of the illness severity

- Selection of physicians into FHO: pre-treatment characteristics and expected payment
 - Expected payment: (i) capitation payment for enrolled patients (in-basket services), (ii) 10% FFS for (i), (iii) 100% FFS payment for nonenrolled patients (in-basket) subject to hard cap, (iv) 100% of FFS value for out-of-basket services to any patient, and (v) special payments

West

- Sample Selection: FHG physicians in 2006 fiscal yr
- Minimum 500 total patients; remained in FHG or switched to FHO until 2013 fiscal year (multiple switching excluded); exclude missing data
- Study sample: 2974 FHG physicians in 2006
- 2013: 1281 FHG, 1693 FHO
- Propensity score matching (no support for 49 FHO physicians) => Final sample 2925 physicians: 1281 (FHG) vs. 1644 (FHO)
 - FHO: 188 (2007), 463 (2008), 909 (2009), 1192 (2010), 1443 (2011), 1602 (2012), 1644 (2013)

Propensity Score Before and CCES Canadian Centre for Health Economics **After Matching** Centre canadien en économie de la santé

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CCHE CCES Propensity Score Before and

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After Matching

- Quality of Matching
- Table 1.docx

- Appendix A.docx

Methodology

• Reduced-form models: (1) $\ln R_{it} = \alpha_i + \lambda \tau + \delta FHO_{it} + \beta_1 X_{it} + \varepsilon_{it}$ (2) $\ln C_{it} = \alpha_i + \lambda \tau + \gamma FHO_{it} + \beta_2 X_{it} + \upsilon_{it}$

Pooled OLS; Population Averaged; Fixed-effects

Methodology

- Interpretation of the results:
- The estimated coefficient δ in (1) tells the impact of FHO on referrals to specialists relative to FHG
- The estimated coefficient γ in (2) tells the impact of FHO on costs of referrals to specialists relative to FHG

Methodology

- R_{it}: Number of referrals or unique patient referrals (overall, enrolled, non-enolled)
- C_{it}: Cost of referrals
- FHO_{it} : FHO/FHN = 1, FHG/CCM = 0

• X_{it}: Time trend, Age, Age squared, Years (time spent in non-FFS model), Years squared, Female, IMG, group size, average age of patients, average ADG score, proportion patients living in deprived neighbourhoods, proportion of rural patients

Data and Variables

Data sources (ICES):

- ICES Physician Database (IPDB)
- Corporate Provider Database (CPDB)
- Client Agency Program Enrolment Database (CAPE)
- Ontario Health Insurance Plan Database (OHIP)
- Registered Persons Database (RPDB)
- CIHI Discharge Abstract Database (DAD)
- Dissemination area level Socioeconomic data (Statistics Canada's Census)

Data and Variables

- Specialist physicians were identified from IPDB
- Referrals/costs of referrals were taken from OHIP
- Primary care physicians and their demographic information (age, gender, IMG) were obtained from IPDB
- CPDB and CAPE were used to identify physician's model, the date of affiliation to a model and roster size as of March 31st of each year and group size
- Patient's characteristics (age, rural/urban status) and postal codes were extracted from RPDB
- Neighbourhood deprivation index: RPDB + Census

- The Johns Hopkins' Adjusted Clinical Group (ACG) Case-Mix System was used to obtain a measure of patient comorbidity
- The ACG system assigns all diagnoses (OHIP, DAD, NACRS) into 32 diagnostic clusters (ADGs)
- Those patients with multiple medical conditions typically use the most resources having higher ADG score
- We use the average of ADG score of physician's patients as measure of patient co-morbidity

Descriptive Results

Weighted Means: All Patients

	Non-switchers (N=1,281)							
Variables	2006	2007	2008	2009	2010	2011	2012	2013
Total referrals	2389	2380	2414	2401	2371	2402	2306	2341
Unique referrals	909	903	911	904	894	887	857	851
Referral costs	149k	149k	156k	157k	158k	162k	152k	153k
	Switchers (N=1,644)							
Variables	2006	2007	2008	2009	2010	2011	2012	2013
Total referrals	2359	2384	2411	2362	2363	2388	2352	2410
Unique referrals	890	891	901	891	880	877	859	855
Referral costs	150k	153k	15 <mark>8k</mark>	157k	161k	165k	157k	160k

Descriptive Results

Weighted Means: Enrolled Patients

	Non-switchers (N=1,281)							
Variables	2006	2007	2008	2009	2010	2011	2012	2013
Total referrals	2150	2198	2244	2243	2205	2239	2154	2187
Unique referrals	802	821	835	835	822	817	792	785
Referral costs	134k	139k	146k	147k	148k	152k	142k	143k
	Switchers (N=1,644)							
Variables	2006	2007	2008	2009	2010	2011	2012	2013
Total referrals	2184	2246	2274	2225	2214	2236	2198	2246
Unique referrals	808	828	840	831	817	815	797	791
Referral costs	140k	144k	149k	148k	150k	154k	147k	149k

Descriptive Results

Weighted Means: Non-Enrolled Patients

	Non-switchers (N=1,281)							
Variables	2006	2007	2008	2009	2010	2011	2012	2013
Total referrals	240	182	170	158	166	163	151	163
Unique referrals	107	82	76	69	72	70	65	69
Referral costs	14.2k	10.9k	10.6k	10.1k	10.9k	10.8k	10k	10.6k
	Switchers (N=1,644)							
Variables	2006	2007	2008	2009	2010	2011	2012	2013
Total referrals	175	138	138	137	149	152	154	164
Unique referrals	82	64	62	60	63	63	62	64
Referral costs	10.7k	8.5k	8.7k	9k	10.1k	10.5k	10.5k	11.1k

CCHE CCES Canadian Centre for Health Economics Centre canadien en économie de la santé Distribution of log of Referrals to Specialists (2006)

ICES

CCHE CCES Canadian Centre for Health Economics Centre canadien en économie de la santé Distribution of log of Referrals to Specialists (2013)

ICES

CCHE CCES Distribution of log of Unique Patient Canadian Centre for Health Economics Centre canadien en économie de la santé Referrals to Specialists (2013)

CCHE CCES Canadian Centre for Health Economics Centre canadien en économie de la santé Referrals to Specialists (2006)

ICES

CCHE CCES Distribution of log of Costs of Canadian Centre for Health Economics Centre canadien en économie de la santé Referrals to Specialists (2013)

ICES

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Regression Results

Weighted OLS regression results: Coeff. on FHO

Year	Log of total referrals	Log of unique patient referrals	Log of referral costs
2006	0.017	-0.008	0.043**
	(0.019)	(0.015)	(0.019)
2007	0.024	-0.007	0.046**
	(0.020)	(0.017)	(0.020)
2008	0.018	-0.005	0.029
	(0.021)	(0.018)	(0.021)
2009	0.003	-0.008	0.015
	(0.023)	(0.019)	(0.023)
2010	0.019	-0.011	0.027
	(0.025)	(0.021)	(0.023)
2011	0.062**	0.026	0.075***
	(0.031)	(0.028)	(0.029)
2012	0.197***	0.115**	0.215***
	(0.052)	(0.048)	(0.052)
2013	0.303***	0.192***	0.327***
	(0.080)	(0.072)	.
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Weighted panel-data regression results: Coeff. on FHO

Variable	OLS	PA	FE
Log of total referrals	0.170***	0.061***	0.058***
	(0.036)	(0.018)	(0.019)
Log unique patient referrals	0.093***	0.064***	0.065***
	(0.035)	(0.016)	(0.017)
Log of referral costs	0.202***	0.080***	0.076***
	(0.033)	(0.016)	(0.017)
Observations	23,400	23,400	23,400
Physicians	2,925	2,925	2,925

- Physicians practicing in FHOs are more likely to refer patients to specialists compared to FHGs
 - 6.0 percentage points higher in number of referrals
 - 6.7 percentage points higher in unique patient referrals
 - 7.9 percentage points higher in costs of referrals
 - Appendix B.docx

- Kralj and Kantarevic (2013): physicians in FHOs have 4% fewer referrals per enrolled patient than those in FHGs
- Differences:
 - patient populations: enrolled vs. total
 - unit of obs. per enrolled patient vs. per physician
 - different timing: 2006-2009 vs. 2006-2013
 - differences in control variables: co-morbidity

Weighted panel-data regression results: Coeff. on FHO (Enrolled)

Variable	OLS	PA	FE
Log of total referrals	0.179***	0.044**	0.038*
	(0.035)	(0.019)	(0.020)
Log unique patient referrals	0.104***	0.050***	0.048***
	(0.034)	(0.017)	(0.018)
Log of referral costs	0.207***	0.061***	0.055***
	(0.033)	(0.017)	(0.018)
Observations	23,400	23,400	23,400
Physicians	2,925	2,925	2,925

Exclude ADG: 2006-2009

Weighted panel-data regression results: Coeff. on FHO (Enrolled)

Variable	OLS	PA	FE
Log of total referrals	-0.017	-0.038***	-0.037***
	(0.038)	(0.015)	(0.015)
Log unique patient referrals	-0.013	-0.023**	-0.027**
	(0.037)	(0.011)	(0.011)
Log of referral costs	0.000	-0.038***	-0.044***
	(0.036)	(0.014)	(0.015)
Observations	11,700	11,700	11,700
Physicians	2,925	2,925	2,925

Exclude ADG: 2010-2013

Weighted panel-data regression results: Coeff. on FHO (Enrolled)

Variable	OLS	PA	FE
Log of total referrals	0.124***	0.098***	0.093***
	(0.046)	(0.029)	(0.032)
Log unique patient referrals	0.066	0.071***	0.094***
	(0.042)	(0.027)	(0.030)
Log of referral costs	0.134***	0.105***	0.090***
	(0.045)	(0.028)	(0.032)
Observations	11,700	11,700	11,700
Physicians	2,925	2,925	2,925

Include ADG: 2006-2009

Weighted panel-data regression results: Coeff. on FHO (Enrolled)

Variable	OLS	PA	FE
Log of total referrals	0.062*	-0.031**	-0.034**
	(0.036)	(0.015)	(0.015)
Log unique patient referrals	0.033	-0.029**	-0.025**
	(0.035)	(0.014)	(0.011)
Log of referral costs	0.087***	-0.038***	-0.040***
	(0.034)	(0.014)	(0.015)
Observations	11,700	11,700	11,700
Physicians	2,925	2,925	2,925

Include ADG: 2010-2013

Weighted panel-data regression results: Coeff. on FHO (Enrolled)

Variable	OLS	PA	FE
Log of total referrals	0.277***	0.150***	0.094***
	(0.045)	(0.029)	(0.031)
Log unique patient referrals	0.156***	0.102***	0.095***
	(0.042)	(0.027)	(0.028)
Log of referral costs	0.297***	0.155***	0.091***
	(0.044)	(0.027)	(0.031)
Observations	11,700	11,700	11,700
Physicians	2,925	2,925	2,925

Future Research

 Do increased referrals in FHO reduce future health care costs?

– ED Visits, Hospitalizations, overall costs

- Patient heterogeneity is not considered here useful to analyze patient-level data
- Specific type of referrals (e.g. radiologists, cardiologists, etc.)
- Referral patterns for specific patient populations (e.g. age groups, neighbourhoods, initial health in terms of ACG score, etc.)

