The Relationship Between Local Availability and First-time Use of Specialists in an Arthritis Population

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ABSTRACT

Objective: To determine what health area characteristics, in particular local availability of specialists, were associated with the age-sex adjusted ambulatory utilization rate of musculoskeletal (MSK) specialists (i.e., rheumatologists, orthopaedic surgeons and general internists) in an arthritis and rheumatism (A&R) cohort.

Methods: The cohort was composed of respondents aged 15+ from the 1996/97 Ontario Health Survey who self-reported A&R and/or had a primary care encounter for A&R during the two years preceding the survey, as determined by their billings in the Ontario Health Insurance Plan. Respondents with prior exposure to MSK specialists were excluded. The outcome of an encounter with a MSK specialist for A&R was determined during the three-year period after the survey.

Results: The A&R cohort was composed of 5,052 respondents, of whom 11% had an A&R encounter with a MSK specialist in the three-year post-survey period. There was area variation in the age-sex adjusted ambulatory utilization rate of MSK specialists in the A&R cohort. The backwards stepping linear regression to examine predictors for seeing MSK specialists found a positive association with local availability of rheumatologists, a negative association with the proportion of high school graduates in the health area and a negative association with the proportion of people aged 65 years and older.

Discussion: At the health area level, we found that the local availability of rheumatologists was an important factor associated with utilizing MSK specialists for A&R-related conditions in a cohort of respondents who have not been previously exposed to MSK specialists for musculoskeletal-related conditions.

MeSH terms: Arthritis; access to health care; specialist, medical

La traduction du résumé se trouve à la fin de l'article.

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Acknowledgement: E. Boyle was supported by a doctoral research award from the Canadian Institutes of Health Research and a fellowship in Transdisciplinary Understanding and Training on Research – Primary Health Care (TUTOR-PHC), a Canadian Institutes of Health Research Strategic Training Programme.

Arthritis is one of the leading causes of morbidity and disability in Canada and it is reported by 16% of the population aged 15 years and older.¹ It is a frequent reason for consulting with a primary care physician; yet, while at medical schools and during their post-graduate education, primary care physicians receive very little training in the management of patients with arthritis.²⁻⁴ Only a small subset of patients are referred to a specialist for treatment, although it is recommended by the American College of Rheumatology⁵ that patients with rheumatoid arthritis be referred in the early stages of their disease, and that patients with end-stage osteoarthritis be referred to an orthopaedic surgeon for consideration of joint replacement surgery.

It has been noted in the literature that there is area variation in joint replacement surgery⁶ and prescription of disease-modifying anti-rheumatic drugs in Ontario.⁷ In the current study, we will examine the effects of the local availability of musculoskeletal (MSK) specialists on the utilization rate of their services for arthritis and rheumatism (A&R)-related conditions in a cohort of individuals who have arthritis after controlling for area-level predisposing characteristics. A MSK specialist is defined as a rheumatologist, an orthopaedic surgeon or a general internal medicine specialist.

METHODS

The cohort was composed of respondents aged 15 years and older from the 1996/97 Ontario Health Survey (OHS) who either consulted with a primary care physician for A&R-related conditions, or self-reported A&R as a chronic health condition and had also consulted with at least one primary care physician for any reason during the two-year period prior to their health survey interview. Respondents were excluded from the cohort if they had prior exposure to MSK specialists in either the ambulatory or hospital care setting for treatment of their musculoskeletal disease.

The cohort was followed for three years after their interview date in order to determine if they had an ambulatory A&R-related encounter with a MSK specialist. Age-sex adjusted ambulatory MSK specialist utilization rate was calculated for the 23 health areas that were defined in the OHS.

TABLE 1

Descriptive Analysis, Small Area Analysis and Moran's I Spatial Autocorrelation of the 1996 Census-related Variables and the Local Availability of Rheumatologists, Orthopaedic Surgeons and General Internal Medicine Specialists in Health Area Ontario

	Descriptive Analysis					Small Area Analysis			Spatial Auto-correlation
	Mean	Median	Standard Deviation	Minimum	Maximum	Extremal Quotient	Coefficient of Variation	Systematic Component of Variation	Moran's I
1996 Census Variables									
Proportion Female	50.9	50.8	0.4	50.1	51.9	1.04	0.77	465.64	0.042
Proportion Married	55.7	55.8	3.1	48.3	61.3	1.27	5.49	475.91	-0.030
First Nation per 1,000 Population	20.5	10.4	30.7	2.9	143.8	50.05	149.30	10,845.57	0.273*
Recent Immigrants per 1,000 Population	26.2	14.7	32.2	2.8	133.5	48.35	122.83	349.68	0.367**
Proportion Completed High School	65.4	64.6	4.8	58.4	77.2	1.32	7.40	390.40	0.252*
Proportion of Low Household Income	15.1	14.6	3.9	9.3	27.6	2.97	25.49	414.36	-0.143
Proportion Aged 65 Years and Older	12.0	12.2	2.4	6.9	16.3	2.41	19.69	629.10	0.209
Clinical Half/Days per Week per 100,000 Population									
Rheumatology Clinic	6.7	5.8	5.3	0.0	18.9	†	79.28	803.75	-0.050
Orthopaedic Office	13.8	11.5	5.2	6.4	24.6	3.82	38.04	470.64	-0.059
Orthopaedic Surgery	7.8	7.4	3.8	0.0	16.7	557.33	48.88	604.08	-0.198
Orthopaedic Clinics (Office and Surgery)	21.5	19.3	8.5	6.5	36.3	5.61	39.59	482.85	-0.143
Rheumatology & Orthopaedic Office	20.4	16.8	9.3	9.6	43.5	4.54	45.76	384.55	-0.038
Rheumatology & Orthopaedic Clinics	28.2	23.7	12.2	9.6	55.2	5.74	43.30	393.35	-0.090
Specialists per 100,000 Population									
General Internists	5.7	5.5	2.2	3.0	10.9	3.59	38.05	431.89	-0.168
Rheumatologists	0.8	0.7	0.8	0.0	3.2	†	98.36	931.22	-0.081
Orthopaedic Surgeons	2.8	2.3	1.3	1.1	5.4	5.08	45.30	416.23	-0.047
MSK Specialists	9.3	8.1	3.8	4.7	18.1	3.86	40.98	360.85	-0.142

* significant at $p < 0.05$ ** significant at $p < 0.01$

† unable to calculate

Figure 1. Age-sex adjusted utilization rate per 1,000 respondents of ambulatory MSK specialists (rheumatologists, general internists and orthopaedic surgeons) for arthritis and rheumatism-related diagnosis by health area in 1996

Area-level predisposing characteristics were defined using the 1996 census data. Local availability of specialists was defined using two different methods. The first method was the number of clinical half/days per week per 100,000 population

reported by the rheumatologists and the orthopaedic surgeons ascertained by mailed surveys conducted by the Arthritis Community Research and Evaluation Unit.⁸ The second was the number of specialists per 100,000 population as deter-

mined by their billing address found in the Ontario Health Insurance Plan database.

We calculated the mean, median, standard deviation, extremal quotient (ratio of the highest observed health area divided by the lowest), coefficient of variation rate (ratio of the standard deviation of health area rates divided by the mean health area rate multiplied by 100) and the systematic component of variation.⁹ Spatial autocorrelation was examined using the Moran's I, based on the Pearson correlation coefficient, which can range from -1 to 1.¹⁰ When there is spatial autocorrelation occurring, the residuals of the regression analyses need to be tested for this. If the residuals are spatially autocorrelated, the variance estimates of the covariates in the regression model have been inflated and therefore, linear regression without adjusting for spatial autocorrelation is an inappropriate analysis. A choropleth map was constructed to visualize the age-sex adjusted ambulatory utilization rates based on equal counts with five groups. Separate backwards stepping linear regression models with removal of variables at a p value greater than 0.10 were constructed for each of the local availability measures. This study received ethical approval from the research ethics board of Sunnybrook and Women's College Health Sciences Centre.

TABLE II

Results of the Backwards Stepping Linear Regression Determining the Association of Age-sex Adjusted Utilization Rate of Ambulatory MSK Specialists (Rheumatologists, General Internists and Orthopaedic Surgeons) for Arthritis and Rheumatism-related Diagnosis

	Unstandardized Coefficients		Standardized Coefficients	t	p value
	Beta	Std. Error	Beta		
Number of Rheumatology Half/Days per Week					
Constant	31.892	2.491		12.803	<0.001
Proportion of individuals aged 65 years and older	-3.147	1.342	-0.506	-2.345	0.030
Proportion of individuals completed high school	-2.731	0.733	-0.897	-3.723	0.001
Number of rheumatology clinical half/days per week per 100,000 population	1.455	0.564	0.521	2.580	0.018
Number of Rheumatology and Orthopaedic Half/Days per Week					
Constant	31.892	2.609		12.223	<0.001
Proportion of individuals aged 65 years and older	-3.325	1.459	-0.534	-2.279	0.034
Proportion of individuals completed high school	-2.565	0.764	-0.843	-3.359	0.003
Number of rheumatology clinical and orthopaedic (office only) half/days per week per 100,000 population	0.697	0.333	0.442	2.093	0.050
Number of Rheumatologists					
Constant	31.932	2.278		14.020	<0.001
Proportion of individuals aged 65 years and older	-3.640	1.426	-0.965	-3.715	0.001
Proportion of individuals completed high school	-2.939	0.791	-0.585	-2.552	0.019
Number of rheumatology physicians per 100,000 population	9.913	3.966	0.545	2.499	0.022

RESULTS

There were 22,333 respondents of the 1996/97 OHS who could be linked to their health care utilization data. The A&R cohort was composed of 4,401 respondents who self-reported A&R as a chronic condition and 2,192 respondents who had a primary care visit for A&R. Twenty-three percent of these respondents had prior exposure to a MSK specialist in an ambulatory setting and/or were hospitalized for a MSK-related diagnosis during the two-year period preceding the survey. The final sample size of the A&R cohort was 5,052 respondents (weighted N = 1,691,365).

There was some small area variation in the 1996 census variables and local availability of specialists (Table I). There was positive spatial correlation exhibited for First Nation individuals per 1,000 population, recent immigrants per 1,000 population and proportion of individuals who completed high school.

Eleven percent of the A&R cohort had an encounter with a MSK specialist for A&R. There was marked area variation in the age-sex adjusted rate of MSK specialist utilization for A&R-related diagnoses by health area (Figure 1). The age-sex adjusted utilization rate ranged from 41.5 per 1,000 respondents for the Timiskaming, Muskoka, Parry Sound and Nipissing health area to 153.6 per 1,000 respondents for the Toronto health area. The choropleth map showed a band of low health care utilization that ran from the Brant, Haldimand and Norfolk health area in the Central South region to the Timiskaming, Muskoka, Parry Sound and Nipissing health area in the Central East region.

In separate regression models, the age-sex adjusted ambulatory utilization rate of MSK specialists was positively associated with the number of rheumatology clinical and orthopaedic (office only) half/days per week per 100,000 population (28% of variance explained), the number of rheumatology clinical half/days per week per 100,000 population (34% of variance explained), as well as the number of rheumatologists per 100,000 population (45% of variance explained) (Table II). It was found that areas with an increasing proportion of high school graduates and areas with an increasing proportion of individuals aged 65 years and older were negatively associated with areas of increasing age-sex adjusted MSK specialist utilization for A&R-related conditions. The residuals of the regression models were not spatially autocorrelated.

DISCUSSION

This study showed that local availability of rheumatologists explained significant variation in the utilization of MSK specialist care in a previously unexposed A&R cohort as determined by a survey of service provision as well as by billing data. The local availability of the other MSK specialists was not significantly related to the age-sex adjusted ambulatory utilization of MSK specialists. In particular, the lack of significance of local availability of orthopaedic surgeons needs further investigation given that osteoarthritis was the most common A&R diagnosis in the cohort.

At the health area level, there was a negative association with respect to age and education level. At the individual level, it

has been shown that the visiting rate decreases with individuals aged 75 years and older.¹¹ Additionally, we excluded individuals who already had been exposed to specialists for their musculoskeletal treatment and it is expected that a high proportion of the older individuals had already seen a specialist. At the individual level, those respondents who were excluded from the A&R cohort because of MSK specialist exposure had a significantly higher percentage of completed high school education than respondents in the A&R cohort. It is unclear whether these relationships at the individual level would still exist at the health area level.

The findings of this study suggest there are areas in the province that are underserved with regards to A&R provision. This points to the need to target future health resources to reduce the population's A&R-related disability by providing local services.

Further work will be done in order to examine what individual and health area level factors are predictive of MSK specialist ambulatory utilization in the A&R cohort. In particular, the effects of place at both the individual and health area level will be explored.

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RÉSUMÉ

Objectif : Déterminer quels facteurs de santé, et plus particulièrement l'accès local à des spécialistes, sont associés au taux d'utilisation ambulatoire – ajusté selon l'âge et le sexe – des spécialistes de la santé musculosquelettique (rhumatologues, chirurgiens orthopédistes et internistes généralistes) au sein d'une cohorte d'individus souffrant d'arthrite et de rhumatisme (A/R).

Méthodologie : La cohorte est composée de répondants âgés de 15 ans ou plus qui, dans le cadre de l'Enquête sur la santé en Ontario de 1996-1997, ont déclaré souffrir d'arthrite ou de rhumatisme et/ou qui, selon un examen de la facturation de l'Assurance-santé de l'Ontario, avaient consulté en soins primaires pour des problèmes d'A/R au cours des deux années précédant la tenue de l'enquête. Nous n'avons pas tenu compte des répondants ayant déjà consulté un spécialiste des troubles musculosquelettiques. Le résultat d'une consultation auprès d'un spécialiste a été déterminé durant la période de trois ans suivant la tenue de l'enquête.

Résultats : La cohorte était composée de 5 052 répondants, dont 11 % avaient eu une rencontre avec un spécialiste pour un problème d'arthrite ou de rhumatisme au cours de la période de trois ans suivant l'enquête. La régression multiple descendante utilisée pour examiner les prédicteurs de consultation des spécialistes montre une association positive avec la disponibilité locale des rhumatologues, une association négative avec la proportion de diplômés du secondaire dans la région sanitaire et une association négative avec la proportion de personnes âgées de 65 ans ou plus.

Discussion : En ce qui concerne la région sanitaire, nous avons constaté que la disponibilité locale des rhumatologues constituait un facteur important dans le recours aux spécialistes pour le traitement des troubles d'arthrite et de rhumatisme chez une cohorte de répondants qui n'avaient pas auparavant consulté de spécialistes pour des troubles musculosquelettiques.

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