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Arthritis Community Research & Evaluation Unit

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EVALUATION UNIT (ACREU)
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**ARTHRITIS AND RELATED
CONDITIONS WITHIN
ONTARIO EMERGENCY
DEPARTMENTS**

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EXECUTIVE SUMMARY

Arthritis is one of the most common chronic conditions, affecting more than 1.6 million Ontarians(1). Arthritis is a major cause of morbidity, disability and health care utilization. Most arthritis is managed in primary care by general practitioners and family physicians but many people with arthritis require specialist care, and some are treated in emergency departments. In 2003, over 4.6 million visits were made to Ontario emergency departments(2), several of which were for arthritis and related conditions.

The purpose of this report is to examine the patterns of emergency department use by Ontarians with arthritis and related conditions by age, sex and geography, for the purpose of service planning and enhancement.

Key Findings

- In 2003, 165,000 Ontarians visited an emergency department due to arthritis and related conditions. This is equivalent to 13.4 arthritis-related visits per 1,000 Ontarians per year.
- Arthritis-related emergency department visits increase with age, but the majority of visits is made by working-age individuals.
- More women than men visit emergency departments for osteoarthritis and rheumatoid arthritis, and more men than women visit for gout.
- Proportionally more arthritis-related visits are triaged as less urgent or non-urgent than the average emergency department visit. This is especially seen in rural areas where significantly more visits are made for non-urgent conditions than in urban areas.
- Nearly half of visitors for arthritis and related conditions receive an intervention in the emergency department, and the majority of interventions consist of diagnostic imaging such as an x-ray.
- Younger visitors for arthritis and related conditions are more likely to leave without being seen, and older visitors are more likely to go on to receive further care following the emergency department visit.
- Morning is the most popular time to visit for arthritis and related conditions. More visits are made on Monday than on any other day, and very few visits are made during the night.
- Areas with low provision of specialist services, such as rheumatologists and orthopaedic surgeons, tend to have the highest rates of arthritis-related emergency department visits per capita.

INTRODUCTION

Arthritis is one of the most common chronic conditions, affecting more than 1.6 million Ontarians(1). Arthritis is a major cause of morbidity, disability and health care utilization(1;3). Most arthritis is managed in primary care by general practitioners and family physicians; however many types of arthritis require specialist care, and some are treated in emergency departments. Previous research has examined the utilization of health care services by persons with arthritis in Ontario(1). However there is a scarcity of literature concerning emergency department utilization for people with arthritis and related conditions. The United States National Ambulatory Care Survey listed arthritis as the underlying condition for approximately 2.1% of all emergency department visits in 1997(4), but few other sources exist with which to compare Ontario.

In 2005, the Ontario Ministry of Health and Long-Term Care (MOHLTC) identified a need to examine emergency department usage by persons with arthritis and related conditions. The purpose of this report is to examine the patterns of emergency department use by Ontarians with arthritis and related conditions by age, sex and geography, for the purpose of service planning and enhancement.

METHODS

Emergency Department Records

Emergency department visit records were obtained from the National Ambulatory Care Reporting System (NACRS) database through the Canadian Institute for Health Information (CIHI). The NACRS is currently used by all Ontario emergency departments and is the primary data source to describe emergency department visits in Ontario. The NACRS describes a patient's diagnoses using the International Classification of Disease, version 9 (ICD-9) for 2001 and version 10 (ICD-10) for 2002 and 2003. A panel of experts from the Arthritis Community Research and Evaluation Unit has carefully examined the ICD-9 and ICD-10 and grouped diagnoses to represent the different types of arthritis and related conditions (Table A, Appendix). Data were provided for the years 2001 through 2003, the only years for which the NACRS has been mandatory for use in Ontario emergency departments. Records were selected which had a code for arthritis or a related condition as any one of the recorded diagnoses. Within the NACRS, all patients must have at least one diagnosis recorded, but could have up to six diagnoses recorded in 2001, and up to ten diagnoses recorded in 2002 and 2003.

The interventions (treatments) received by emergency department visitors are coded in the NACRS using standardized classifications. In 2001, the intervention received was coded using the Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures (CCP). In 2002 and 2003, the Canadian Classification

of Health Interventions (CCI) was used. Due to the change in coding classification we could not examine trends in interventions from 2001-2003.

Data were anonymised and sensitive, potentially identifying fields were encrypted by CIHI so that patients and caregivers could not be individually identified. Data were stored on a secure server and were password protected.

Urban/Rural Designation

Patients were classified as either urban or rural dwellers according to Canada Post's most basic urban/rural classification using the second digit of the residential postal code in their NACRS record. The NACRS dataset as released by CIHI provides the first three digits of the patient's postal code, which is called the forward sortation area (FSA). The last three digits of residential postal code were unavailable for analyses. When the second digit of a valid FSA is "0" the patient is classified as a rural dweller, and when the second digit of a FSA is a number between 1 and 9 inclusive, the patient is classified as an urban dweller. Valid FSAs were not recorded for a minority of patients (less than 1%). Urban/rural analyses were only conducted on patients who had a valid FSA recorded.

County-Level Analysis

Patients were organized into counties of residence using the Ontario Ministry of Health and Long-Term Care Residence Coding System. Each patient record had a mandatory MOHLTC residence code. However, in a minority of records (less than 0.01%), the county was not specified, and a generic MOHLTC residence code was assigned, specifying, for example, only the province of residence.

The 49 counties in Ontario as defined by the MOHLTC's Residence Coding System are by and large (with the exception of a few reserve boundaries) equivalent to the census divisions defined by Statistics Canada for the 2001 Canadian Census. Data from the 2001 Canadian Census were obtained from the University of Toronto's Data Library Service and were used to calculate demographic information such as age and sex distribution, median income, education level, distribution of the labour force by industry, and percentage of persons living in an urban area by census division.

The data concerning the supply of general practitioners and family physicians by county in 2001/2002 were obtained from the Institute for Clinical Evaluative Sciences 2005 report "Supply and Utilization of General Practitioner and Family Physician Services in Ontario"(5).

The data concerning the number of rheumatologists and orthopaedic surgeons by county in 2000 were obtained from the Arthritis Community Research and

Evaluation Unit's "*Ontario Survey of Rheumatologists (October, 2000)*" and "*Ontario Survey of Orthopaedic Surgeons (October, 2000)*".

Counties were presented by Local Health Integration Network (LHIN) according to the MOHLTC's geographic designations, as described on the MOHLTC website. A full six-digit postal code is required to determine the patient's LHIN, and this information was not provided in the NACRS dataset. However, the county/census division could be determined using the MOHLTC Residence Coding System. Therefore, counties are listed under the LHINs in which they appear. In several cases, a county crosses a LHIN border, and in such cases counties will be listed under more than one LHIN.

Data were analysed descriptively and through cluster analysis using SAS version 9.1. Cluster analyses were based on median income, education, urbanity/rurality, and labour force involvement in agriculture, forestry, fishing and hunting.

FINDINGS

Demographics

Every year in Ontario, approximately 168,000 visits are made to emergency departments for arthritis and related conditions. In 2003, this represented 3.4% of all Ontario emergency department visits(2). An equal number of visits are made by men and women. Very few visits are made by children, and three out of every five visits are made by working-age individuals.

Seventy five percent of Ontarians visiting emergency departments for arthritis and related conditions were classified as urban dwellers, and 25% as rural dwellers. This 3:1 ratio is consistent across age and sex.

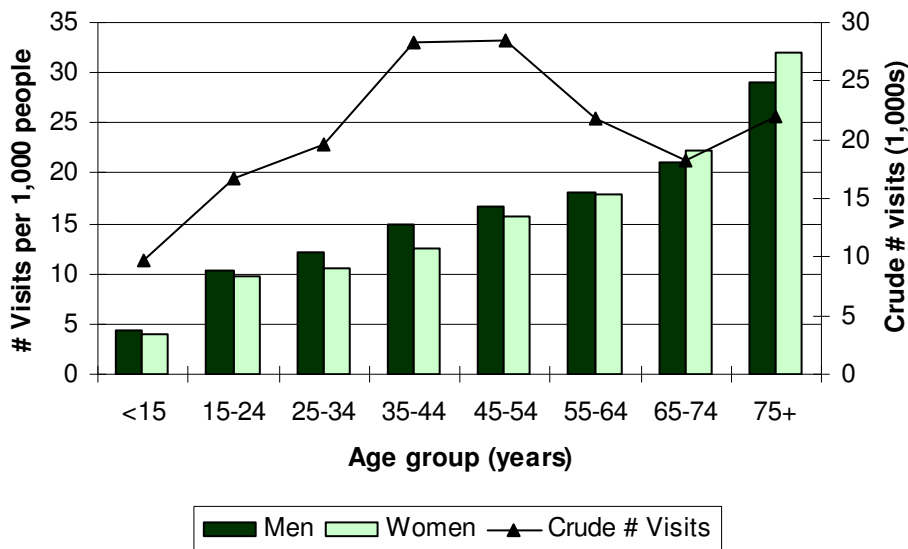
The rate of visits over the three years for which data are available (2001-2003) is equivalent to approximately 14 visits per 1,000 Ontarians (Table 1.). This rate decreased slightly over the years from 14.5 visits/1,000 Ontarians in 2001 to 13.4 visits/1,000 Ontarians in 2003. This observed decrease may be in part due to restriction to emergency departments in Greater Toronto Area hospitals as a result of the Severe Acute Respiratory Syndrome (SARS) outbreak during March through July of 2003(6). The rate of visits was lowest in the young at 4.2 visits/1,000 Ontarians in 2003 and increased steadily and substantially with age to 30.9 visits/1,000 for Ontarians over the age of 75.

While the rate of visits is highest for older Ontarians, the majority of visits are made by working-age Ontarians (Figure 1.) This finding is consistent with the prevalence of arthritis in Ontario, which increases with age, but affects a great number of working-age individuals(1).

Table 1. Emergency department visits for arthritis and related conditions in Ontario, 2001-2003

	Crude Number of Arthritis-Related ED Visits			Arthritis-Related ED Visits per 1,000 Population		
	2001	2002	2003	2001	2002	2003
All Ontario	165,342	172,817	164,557	14.5	14.3	13.4
Sex						
Male	81,811	85,891	81,461	14.7	14.0	13.1
Female	83,522	86,835	83,087	14.3	14.5	13.7
Age (years)						
<15	11,260	10,598	9,659	5.0	4.6	4.2
15-24	17,049	17,647	16,630	11.5	10.9	10.1
25-34	20,430	20,968	19,577	13.1	12.2	11.3
35-44	30,039	31,111	28,371	15.3	15.1	13.7
45-54	27,777	29,250	28,411	17.0	17.1	16.2
55-64	20,107	22,065	21,746	18.9	19.2	17.9
65-74	18,078	18,921	18,197	22.1	22.7	21.7
75+	20,602	22,257	21,966	31.5	32.4	30.9

Figure 1. Emergency department visits for arthritis and related conditions in Ontario, 2003



Reason For Visit

Within the NACRS, all patients must have at least one diagnosis recorded, but could have up to six diagnoses recorded in 2001, and up to ten diagnoses recorded in 2002 and 2003. However, most patients only had only one diagnosis recorded. In this report we have included patients who have arthritis or related conditions recorded as a primary, secondary or other diagnosis. We have included patients with arthritis as a secondary or other diagnosis because even if arthritis was not coded as the primary diagnosis, it may have been an important contributing factor to the patient's condition. In 2003, 89% of the sample had arthritis and related conditions recorded as their primary diagnosis, and 11% had arthritis recorded as a secondary diagnosis (Table 2.).

Table 2. Emergency department visits for arthritis and related conditions by primary diagnosis in Ontario, 2001-2003

Primary Diagnosis	# Of Arthritis-Related Visits			% Of Arthritis-Related Visits		
	2001	2002	2003	2001	2002	2003
Arthropathies	24,267	25,755	23,154	14.5	14.9	14.1
Osteoarthritis	8,414	8,191	7,523	5.1	4.7	4.6
Gout	6,923	7,459	6,633	4.2	4.3	4.0
Rheumatoid arthritis	1,274	1,221	910	0.8	0.7	0.6
Other arthropathies	7,656	8,884	8,088	4.4	5.2	4.9
Soft tissue disorders	82,338	88,785	85,493	49.8	51.3	51.9
Joint derangement & biomechanical lesions	2,894	4,072	3,339	1.7	2.4	2.0
Other joint disorders	37,817	35,222	33,805	22.9	20.4	20.5
Arthritis as a secondary diagnosis	18,026	18,983	18,766	10.9	11.0	11.4
All arthritis-related visits	165,342	172,817	164,557	100%	100%	100%

Five percent of patients had osteoarthritis recorded as their primary diagnosis, 4% gout, and 1% rheumatoid arthritis (Figure 2.). The remaining majority of arthritis-related diagnoses were more general (e.g. soft-tissue disorders, joint disorders) and did not enable identification of specific forms arthritis that the patient may have had. The rate of visits for most conditions was similar for men and women, with the exception of gout and osteoarthritis (Table 3.). The rate of visits for gout was four times higher in men than in women, and the rate of visits for osteoarthritis was more than 1.5 times higher in women than in men (Table 3.). Because specific forms of arthritis could not be identified for the majority of patients, this report presents most analyses for arthropathies as a whole.

Figure 2. Emergency department visits for arthritis and related conditions by primary diagnosis in Ontario, 2003

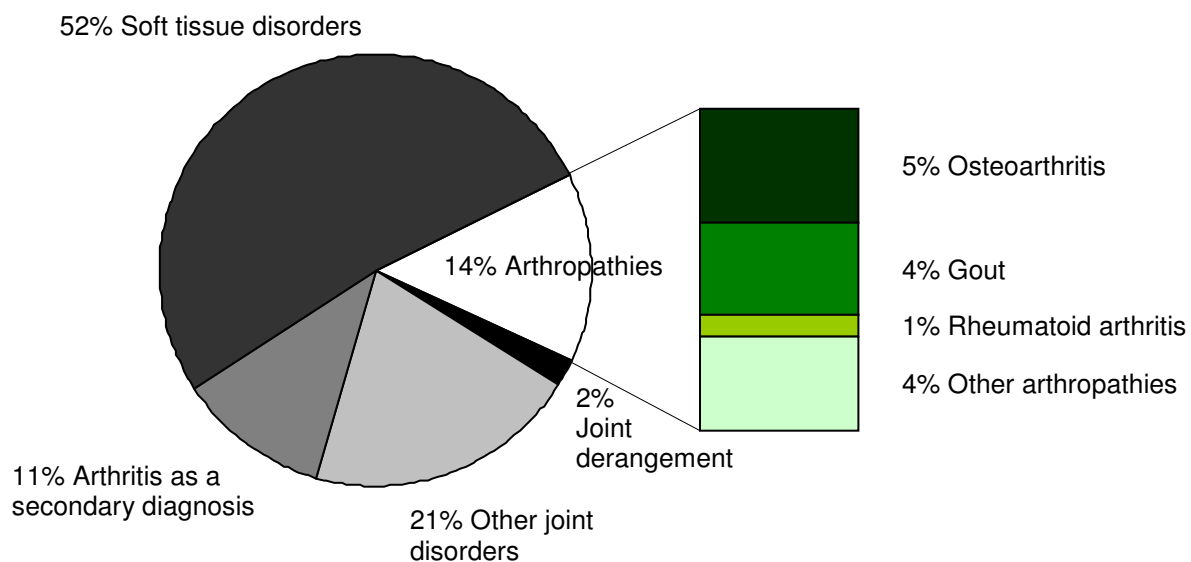


Table 3. Emergency department visits for arthritis and related conditions by primary diagnosis and sex in Ontario, 2003

Primary Diagnosis	Visits/100,000 population		
	Men	Women	Both
Arthropathies	196.5	181.5	188.9
Osteoarthritis	46.0	76.3	61.4
Gout	87.8	21.3	54.1
Rheumatoid arthritis	4.6	10.2	7.4
Other arthropathies	58.1	73.7	66.0
Soft tissue disorders	696.7	698.3	697.5
Joint derangement & biomechanical lesions	31.0	23.6	27.2
Other joint disorders	275.6	276.0	275.8
Arthritis as a secondary diagnosis	145.8	160.3	153.1
All arthritis-related visits	1,345.4	1,339.7	1,342.6

Triage

The NACRS classifies the severity of the patient's condition according to the Canadian Triage and Acuity Scale (CTAS). The CTAS system groups patients into five categories in order of urgency: *resuscitation*, *emergent*, *urgent*, *less urgent* and *non urgent*. The most serious triage level, *resuscitation*, describes patients who need to be resuscitated or whose lives are threatened due to their condition and should be seen immediately(7). In 2003, less than 1% of all Ontario emergency department visits were classified as *resuscitation*(2), and only 0.03% of all arthritis-related emergency department visits (Table 4.).

The next serious level of triage is *emergent*, and describes conditions that are potentially life-threatening and usually require immediate intervention. *Emergent* patients should ideally be seen within 15 minutes of arrival at the emergency department. Three percent of Ontario emergency department visits for arthritis and related conditions were triaged as *emergent*, compared to 8% of all Ontario emergency department visits(2).

The next triage level, *urgent*, describes patients who require urgent care and have conditions that may lead to serious problems. *Urgent* patients should ideally be seen within 30 minutes of arrival at the emergency department. Twenty-three percent of arthritis-related ED visits were triaged as *urgent*, as compared to 35% of all Ontario ED visits(2).

Less urgent conditions are often related to age, and are considered less likely to require immediate intervention. According to the CTAS recommendations, patients who are triaged as *less urgent* should be seen within one hour. Forty-two percent of all Ontario visits were triaged as *less urgent*(2), compared to 54% of all arthritis-related visits. The least serious triage category, *non urgent*, describes conditions that do not require immediate attention, and could often be treated later, outside of an emergency department. One and a half times more arthritis-related visits were triaged as *non urgent*, as compared to all ED visits.

Compared to all Ontario emergency department visits, proportionally more arthritis-related visits were triaged as *less urgent* and *non urgent*, and far fewer were triaged as *resuscitation*, *emergent* and *urgent* (Table 4.).

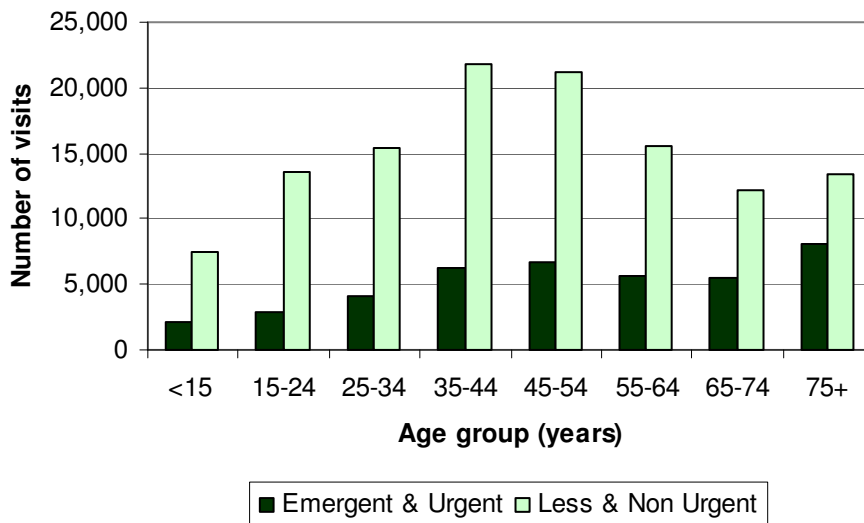
Table 4. Triage of emergency department visits for arthritis and related conditions vs. triage of all emergency department visits in Ontario, 2003

	Total #	Resuscitation	Emergent	Urgent	Less Urgent	Non Urgent
All ED Visits*	4,671,317	0.50%	8%	35%	42%	14%
All Arthritis-related ED Visits	164,557	0.03%	3%	23%	54%	21%

*Data for "all ED visits" are taken from Hospital Report 2005: Emergency Department Care(2)

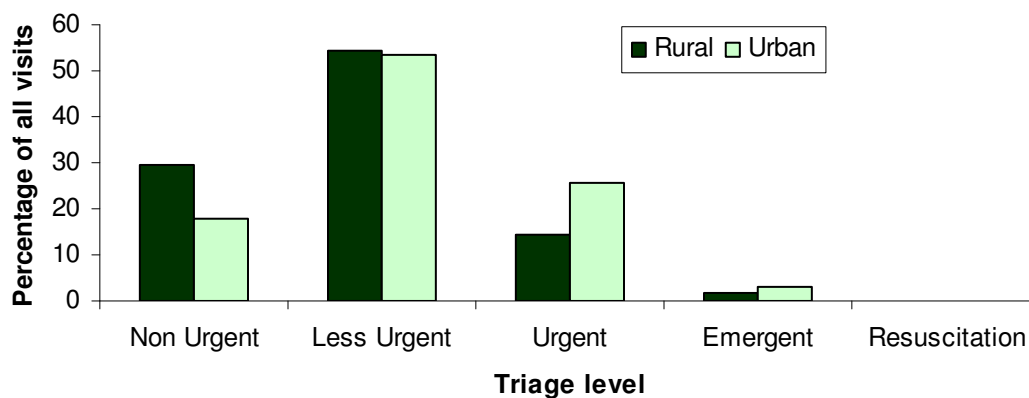
A higher proportion of older patients were triaged as *urgent* and *emergent*, as compared to younger patients (Figure 3.), and the greatest number of *less urgent* and *non urgent* visits were made by individuals aged 35-54 years, compared to all other age groups.

Figure 3. Triage distribution of emergency department visits for arthritis and related conditions in by age, in Ontario, 2003



Significant urban/rural differences were seen with respect to triage of arthritis-related ED visits (Figure 4.) A higher proportion of visits made by urban dwellers were triaged as *urgent* and *emergent*, compared to visits made by rural dwellers. Rural dwellers made proportionally more *non-urgent* visits.

Figure 4. Triage of emergency department visits for arthritis and related conditions by rurality, in Ontario, 2003



Treatment

In 2001, 57% of visitors with arthritis and related conditions received interventions, the majority of which were classified as radiology (Figure 5.). By 2003 the proportion of visitors with arthritis who received interventions dropped to 46% (Figure 6.). The data offer little explanation as to why this 10% drop is seen, although it is possible that the drop is an artifact from the change in classification of intervention between 2001 and 2002. What remains consistent over the three years is that the majority of patients with arthritis-related diagnoses who receive treatment receive some sort of radiology or diagnostic imaging. In 2003, the most common popular diagnostic imaging procedures performed were x-rays of the knee, chest, hip, shoulder, and foot.

Figure 5. Emergency department visits for arthritis and related conditions by treatment, in Ontario, 2001

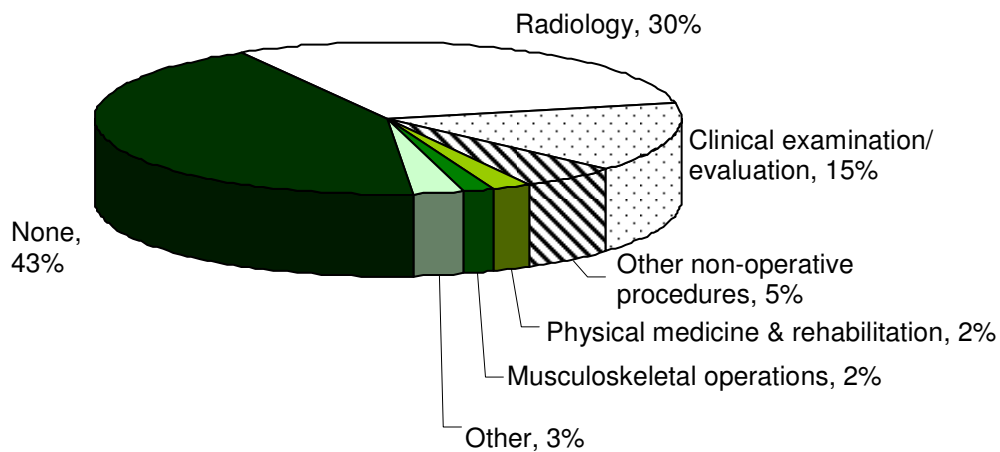
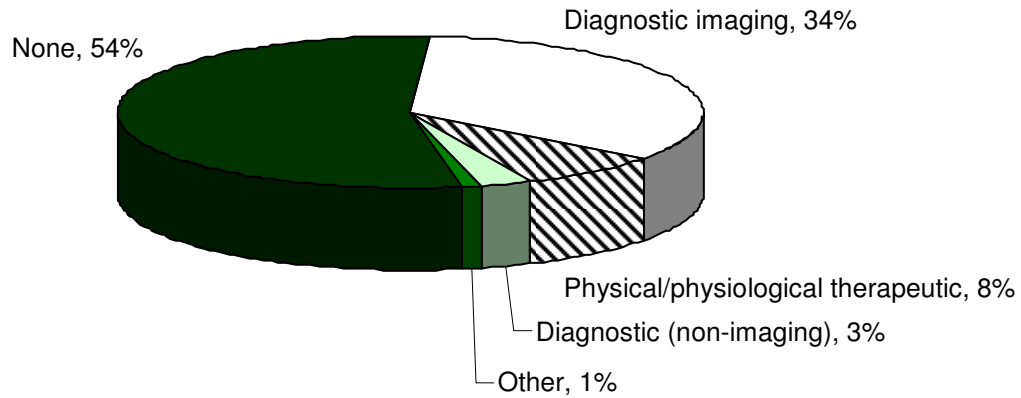


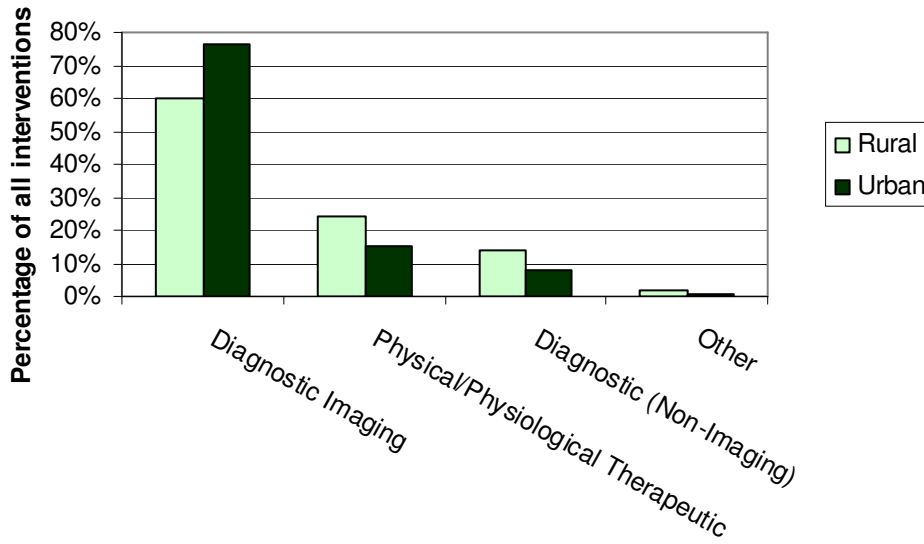
Figure 6. Emergency department visits for arthritis and related conditions by treatment in Ontario, 2003



Notable urban/rural differences were seen with respect to intervention received. More urban dwellers received diagnostic imaging (76%) than rural dwellers (60%), perhaps due to the increased availability of imaging technology in urban areas or the greater acuity in general of urban visits (Figure 7.). Conversely, proportionally more rural dwellers than urban dwellers received physical/physiological therapeutic interventions (24% vs. 15%) and diagnostic tests that did not involve imaging (14% vs. 8%).

The Canadian Classification of Health Interventions allows for extremely specific record-keeping and the most common physical/physiological therapeutic interventions in 2003 were “implantation of an intravenous needle” (1.3% of all interventions), and “drainage of the knee joint using percutaneous needle aspiration” (1.5%). The most common diagnostic tests that did not involve imaging were “electrophysiological measurement of the heart” (4.0% of all interventions) and “whole body assessment/examination” (3.4%).

Figure 7. Interventions performed during emergency department visits for arthritis and related conditions by rurality in Ontario, 2003



Receiving an intervention varied with sex and increased with age after age 35 (Figure 8.). Proportionally more men received interventions than women under the age of 35 years, and proportionally more women than men received interventions after 45 years of age.

Figure 8. Interventions performed during emergency department visits for arthritis and related conditions by age group and sex in Ontario, 2003



Disposition

Disposition refers to where the patient is sent after visiting an emergency department. The majority of all emergency department visitors are sent home following the visit(2) (Table 5.). Compared to all emergency visitors, proportionally fewer patients with arthritis and related conditions are sent on to receive further care, and proportionally more leave at some point during the visit or before being seen by a nurse or physician (Table 5.). Elevated rates of leaving before discharge from the ED have been associated with longer waits to see a nurse or doctor(6). This might explain why arthritis-related visitors, who were more commonly triaged as less urgent or non urgent, more frequently left before the visit was through.

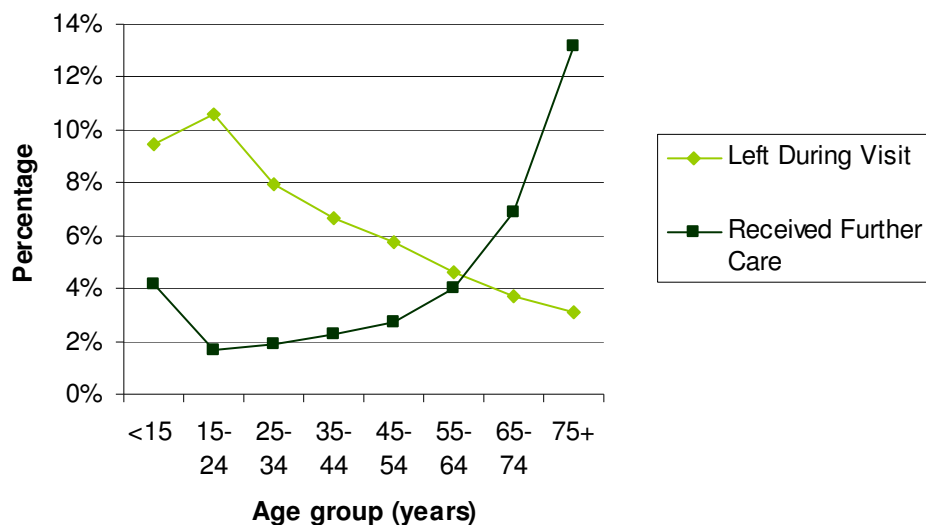
Table 5. Disposition of emergency department visitors in Ontario, 2003

	Total # Visits	Disposition			
		Sent Home	Left During Visit	Further Care	Died
All ED Visits*	4,671,317	83.9%	4.6%	10.8%	0.7%
Arthritis- Related ED Visits	164,557	89.3%	6.2%	4.6%	0.0%

*Data for “all ED visits” are taken from Hospital Report 2005: Emergency Department Care(2)

Disposition of arthritis-related visitors also varies with age. A higher proportion of children and older visitors were sent on to receive further care than working-age individuals (Figure 9.). This relationship was likely seen because a greater proportion of older visitors than any other group visited for more serious conditions (Figure 3.) In adults, as age increased, fewer ED visitors for arthritis and related conditions left before the visit was completed (Figure 9.).

Figure 9. Disposition of emergency department visits for arthritis and related conditions by age group in Ontario, 2003

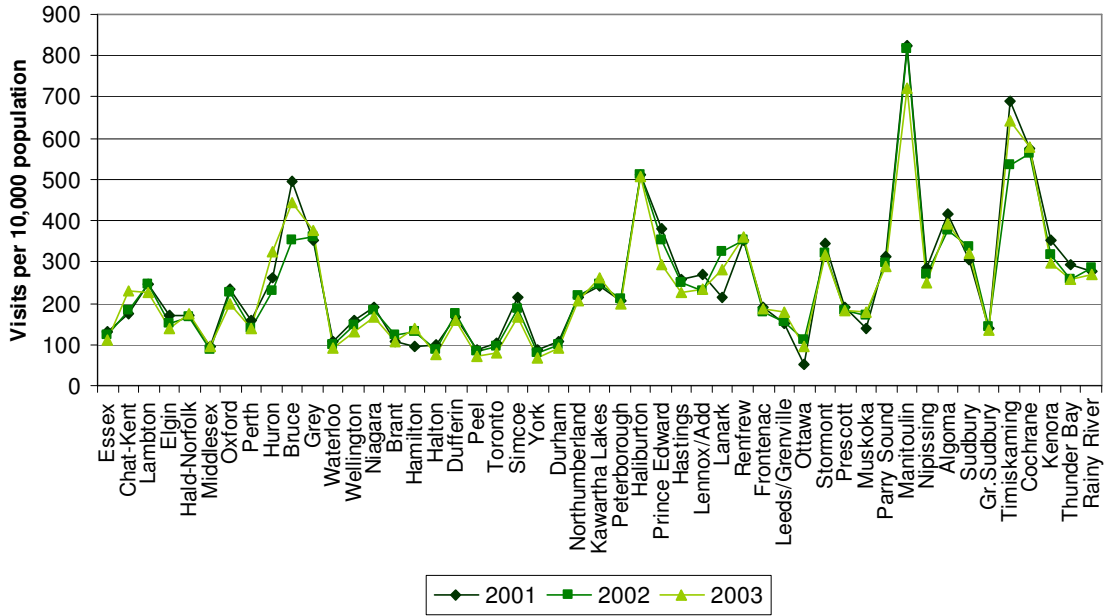


Time Trends

The NACRS is a relatively new reporting system and has only been mandatory in Ontario since 2001. Thus, for time-related analyses data are available only from 2001 onward. Adding further complication, the change from the ICD-9 to the ICD-10 diagnostic classification and from the CCP to the CCI intervention classification make studying time trends over the years next to impossible.

As noted in Table 1., the rate of arthritis-related emergency department visits in Ontario has remained fairly steady from 2001-2003, with the exception of the minor decrease in 2003, which may be due to the restriction of many emergency departments due to the SARS outbreak of 2003(6). The rate of emergency department visits per capita was also steady across census divisions for the three reported years (Figure 10.).

Figure 10. Age-sex standardized emergency department visits for arthritis and related conditions, by census division, in Ontario, 2001-2003



With respect to season, few differences in visit rates were observed (Figure 11.). However, notable differences were seen by time of day (Figure 12.) and day of week (Figure 13.).

Figure 11. Emergency department visits for arthritis and related conditions, by season, in Ontario, 2003

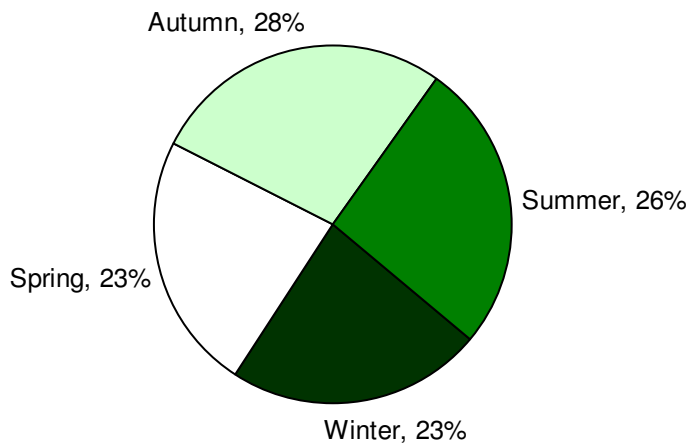
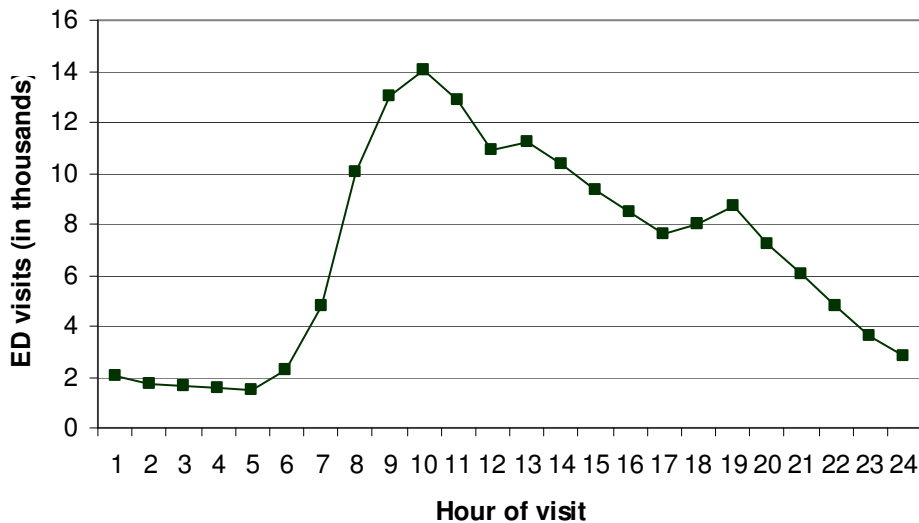
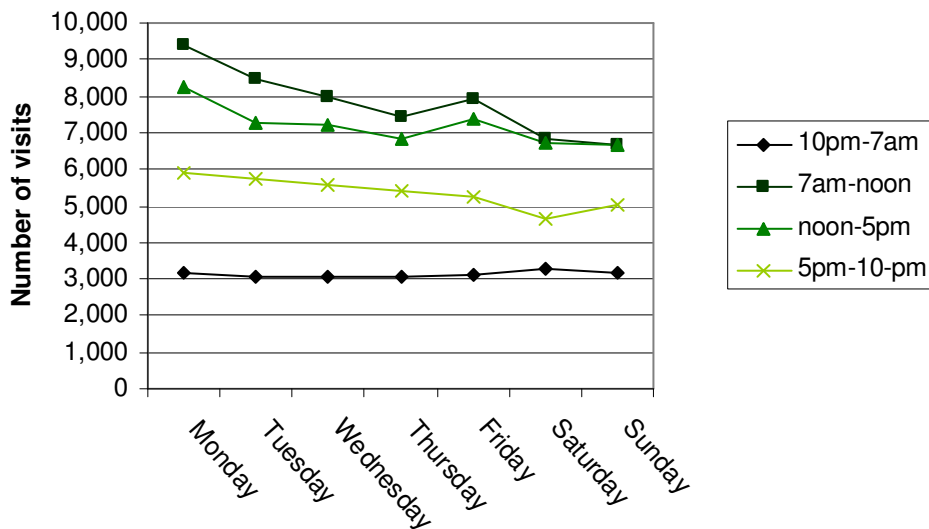


Figure 12. Emergency department visits for arthritis and related conditions, by time of day, in Ontario, 2003



A distinct pattern emerges for the time of day that people with arthritis and related conditions visit emergency departments. Far fewer visits are made during the night than at any other time (Figures 12.&13.). This pattern is consistent with that of all ED visits in Ontario(6). The number of visits for arthritis and related conditions peaks dramatically in the morning, from 8:00 a.m. until 12:00 pm, and the number of visits per hour generally decreases over the course of the day, with a minor peak between 5:00 pm and 7:00 pm (Figures 12.&13.).

Figure 13. Emergency department visits for arthritis and related conditions, by day of week and time of day, in Ontario, 2003



The number of late-night/early-morning, after-hours visits (10:00 p.m. until 7:00 a.m.), was consistent throughout the week. Morning (7:00 a.m. until 12:00 p.m.) and afternoon (12:00 p.m. until 5:00 p.m.) visits peaked on Monday, and gradually declined throughout the week, with the exception of small increases on Friday. Evening (5:00 p.m. until 10:00 p.m.) visits also peaked on Monday, and dipped slightly on Saturday (Figure 13.).

Geographic Variation

Variation By Census Division

Substantial geographic variation was seen with respect to the rate of ED visits for arthritis and related conditions. Within the Province of Ontario, age-sex standardized rates are presented for the years 2001-2003 by census division (Table 6.) The lowest rates of visits were seen in Ottawa Division, Middlesex County, (which includes the city of London), Toronto Division, and in the Greater Toronto Area, including Halton Regional Municipality, Peel Regional Municipality, York Regional Municipality and Durham Regional Municipality. Excluding Ottawa, these low visit-rate census divisions are all located in Southern Ontario. From 2001-2003, of all census divisions, Manitoulin District had by far the highest standardized rate of ED visits for arthritis and related conditions. This extreme rate may be in part an artifact due to the very small population of Manitoulin District. Close behind Manitoulin District were Timiskaming District, Cochrane District and Haliburton County, which are all northern and/or more remote census divisions.

Table 6. Age-sex standardized rate of arthritis-related emergency department visits by census division, in Ontario, 2001-3, organized by Local Health Integration Network

#	LHIN Name	Census Divisions*	Age and sex standardized rate (per 10,000 population)		
			2001	2002	2003
1	Erie St. Clair	Essex County	129.0	121.4	112.7
		Chatham-Kent Division	173.1	183.6	231.8
		Lambton County	244.5	246.0	226.4
2	South West	Elgin County	172.0	149.1	139.6
		Haldimand-Norfolk Regional Municipality ^{2,4}	170.2	167.2	175.5
		Middlesex County	96.1	88.1	93.4
		Oxford County	232.8	224.1	199.1
		Perth County	159.4	138.6	139.8
		Huron County	260.9	228.2	325.9
		Bruce County	495.9	352.0	442.2
Grey County ^{2,3}	351.7	362.2	375.8		

#	LHIN Name	Census Divisions*	Age and sex standardized rate (per 10,000 population)		
			2001	2002	2003
3	Waterloo Wellington	Waterloo Regional Municipality	107.9	99.5	92.3
		Wellington County	160.3	148.4	132.3
		Grey County ^{2,3}	351.7	362.2	375.8
4	Hamilton Niagara Haldimand Brant	Haldimand-Norfolk Regional Municipality ^{2,4}	170.2	167.2	175.5
		Niagara Regional Municipality	191.8	183.3	167.1
		Brant County	109.0	124.0	108.6
		Hamilton Division	94.5	132.8	138.9
		Halton Regional Municipality ^{4,6}	98.6	88.7	76.2
5	Central West	Dufferin County	167.1	175.6	158.3
		Peel Regional Municipality ^{5,6}	88.0	83.3	69.7
6	Mississauga Halton	Halton Regional Municipality ^{4,6}	98.6	88.7	76.2
		Peel Regional Municipality ^{5,6}	88.0	83.3	69.7
		Toronto Division ^{6,7,8,9}	101.7	95.5	80.1
7	Toronto Central	Toronto Division ^{6,7,8,9}	101.7	95.5	80.1
8	Central	Toronto Division ^{6,7,8,9}	101.7	95.5	80.1
		York Regional Municipality	88.9	80.5	68.0
		Simcoe County ^{8,12}	212.9	187.7	168.0
9	Central East	Toronto Division ^{6,7,8,9}	101.7	95.5	80.1
		Durham Regional Municipality	108.9	99.4	91.0
		Northumberland County ^{9,10}	215.6	218.4	206.2
		Kawartha Lakes Division	240.2	247.7	261.0
		Peterborough County	208.1	211.7	198.1
10	South East	Haliburton County	513.4	511.8	508.2
		Northumberland County ^{9,10}	215.6	218.4	206.2
		Prince Edward Division	379.8	353.0	292.6
		Hastings County	259.4	250.5	224.5
		Lennox and Addington County	270.3	230.2	233.8
11	Champlain	Frontenac County	188.8	178.0	187.0
		Leeds and Grenville United Counties	151.9	153.8	177.2
		Lanark County ^{10,11}	214.1	324.0	282.3
		Renfrew County	352.4	352.1	359.7
		Lanark County ^{10,11}	214.1	324.0	282.3
		Ottawa Division	50.3	109.9	96.2
12	North Simcoe Muskoka	Stormont, Dundas and Glengarry United Counties	343.8	319.4	317.3
		Prescott and Russell United Counties	189.1	183.6	184.3
		Simcoe County ^{8,12}	212.9	187.7	168.0
		Muskoka District Municipality	138.8	172.0	179.1

#	LHIN Name	Census Divisions*	Age and sex standardized rate (per 10,000 population)		
			2001	2002	2003
13	North East	Parry Sound District	313.8	295.6	291.0
		Manitoulin District	826.3	818.6	721.7
		Nipissing District	285.6	268.9	248.3
		Algoma District	416.0	376.8	391.0
		Sudbury District	303.7	335.2	321.3
		Greater Sudbury Division	140.0	142.7	134.0
		Timiskaming District	688.6	537.1	644.1
		Cochrane District	573.5	562.8	577.5
		Kenora District ^{13,14}	351.5	317.1	296.1
14	North West	Thunder Bay District	293.9	256.5	256.6
		Rainy River District	276.3	285.2	267.6
		Kenora District ^{13,14}	351.5	317.1	296.1

*Census divisions indicated by superscript numbers span more than one LHIN. The superscript numbers represent the numbers of all the LHINs of which the indicated census divisions are a part.

Predictors of High Visit Rates

County-level characteristics such as median income, education, the urban/rural split and percentage of the labour force involved in agriculture, fishing, forestry and hunting were examined in combination with the rate of arthritis-related ED visits and the availability of health care providers such as general practitioners, family physicians, rheumatologists and orthopaedic surgeons.

Socio-Economic Factors

Of all the factors examined, median household income per county was the biggest predictor of the rate of arthritis-related ED visits per capita. Counties with high median household incomes had fewer arthritis-related ED visits, and lower income areas had more visits. Education showed a similar relationship: areas where more people had completed post-secondary education tended to have fewer visits per capita. Areas that were more urban tended to have fewer visits, and areas where more people were involved in agriculture, forestry, fishing and hunting tended to have more visits.

Availability of Specialist Services

Provision of specialist services provided by rheumatologists and orthopaedic surgeons was strongly correlated with the rate of arthritis-related ED visits per capita. Areas with high provision of rheumatologists and orthopaedic surgeons had fewer arthritis-related ED visits, and areas with little or no provision of specialist services had increased arthritis-related ED visits per capita.

Availability of General Practitioners/Family Physicians

A more complex relationship was observed between the provision of family physicians per capita and the rate of arthritis-related ED visits. The number of general practitioner/family physician full time equivalents per capita did not vary as much by county as the number of rheumatologists and orthopaedic surgeons per capita. The census divisions with very low rates of arthritis-related ED visits and census divisions with very high rates, both were found to have a higher availability of family physicians/general practitioners per capita, but overall, no discernible relationship was observed.

Cluster Analysis

Statistical analyses were performed to determine if similar census divisions tended to “cluster” together, with respect to use of ED services for arthritis. Three distinct groups of census divisions emerged when area-level characteristics were examined (Tables 7. & 8.).

1. Northern & Remote

Group 1 consisted of census divisions with *very high visit rates*. Characteristics that these areas shared were:

- northern or remote location
- low median household income
- fewer post-secondary graduates
- very low provision of specialist services (rheumatologists & orthopaedic surgeons)

Comprises: Manitoulin, Timiskaming, Cochrane, Haliburton

2. Rural

Group 2 consisted of census divisions with *visit rates close to the provincial average*. These census divisions tended to more rural and contained no large cities. Characteristics that these areas shared were:

- more rural dwellers
- medium median household income
- medium level of post-secondary graduates
- more workers in agriculture, forestry, fishing, hunting
- generally low provision of specialist services (rheumatologists & orthopaedic surgeons)

Examples: Northumberland, Parry Sound, Renfrew, Chatham-Kent

3. Urban & Suburban

Group 3 consisted of census divisions with the *lowest visit rates*. These census divisions all contained large cities and/or suburban areas near large cities. Characteristics that these areas shared were:

- urban or suburban location
- proximity to one or more large cities
- high median household income
- more post-secondary graduates
- higher provision of specialist services (rheumatologists & orthopaedic surgeons)

Examples: Ottawa, Toronto, Hamilton, Halton

Table 7. Cluster analysis results: characteristics of census divisions within the Northern & Remote, Rural, and Urban & Suburban clusters

Census Division Characteristics	Cluster		
	Northern & Remote	Rural	Urban & Suburban
ED visits per 10,000 population (adjusted)	650.5	266.4	140.6
Median household income (\$)	45,183	53,132	63,836
Population 20 years and older with college or university education (%)	34.1	38.1	49.0
Urban dwelling population (%)	38.7	49.5	85.3
Labour force in agriculture, forestry, fishing, hunting (%)	5.0	6.2	2.1
Rheumatologists per 100,000 population	0.0	0.2	1.3
Orthopaedic surgeons per 100,000 population	0.3	1.3	2.9
Family physician/general practitioner full-time equivalents per 100,000 population	90.2	78.0	77.5

Table 8. Grouping of census divisions based on area-level characteristics, as defined by cluster analysis

Northern & Remote	Rural	Urban & Suburban
Haliburton County	Chatham-Kent Division	Essex County
Manitoulin District	Elgin County	Lambton County
Timiskaming District	Haldimand-Norfolk	Middlesex County
Cochrane District	Regional Municipality	Waterloo Regional Municipality
	Oxford County	Wellington County
	Perth County	Niagara Regional Municipality
	Huron County	Brant County
	Bruce County	Hamilton Division
	Grey County	Halton Regional Municipality
	Kawartha Lakes Division	Dufferin County
	Peterborough County	Peel Regional Municipality
	Northumberland County	Toronto Division
	Prince Edward Division	York Regional Municipality
	Hastings County	Simcoe County
	Lennox and Addington	Durham Regional Municipality
	County	Frontenac County
	Leeds and Grenville	Ottawa Division
	United Counties	Greater Sudbury Division
	Lanark County	Thunder Bay District
	Renfrew County	
	Stormont, Dundas and	
	Glengarry United	
	Counties	
	Prescott and Russell	
	United Counties	
	Muskoka District	
	Municipality	
	Parry Sound District	
	Nipissing District	
	Algoma District	
	Sudbury District	
	Kenora District	
	Rainy River District	

DISCUSSION

This report is the first to examine emergency department visits for arthritis and related conditions in Ontario. From 2001-2003 a considerable number of visits were made, and distinct patterns are apparent.

The rate of visits for arthritis and related conditions in Ontario is greater than what has been reported in the United States (4;8), but a scarcity of published findings as well as differences in diagnoses and coding make comparisons difficult at this stage.

Arthritis-related visits were much more frequently triaged as *non urgent* than the average emergency department visit, suggesting that perhaps these patients could be treated somewhere other than the emergency department. Visits made by rural dwellers were more often *non urgent*, compared to visits made by urban dwellers. These findings suggest that arthritis-related visits that could potentially be treated elsewhere and are perhaps being made due to a lack of availability of more appropriate health services.

Visit rate by county was strongly linked to area-level characteristics such as income, education, and provision of services. The rate of arthritis-related visits was consistently higher in areas with lower income, lower education, and low provision of specialist services. This reflects the increased need for specialist care in rural, remote, and northern areas, and supports the hypothesis that improving provision specialist services will help to relieve some of the burden on emergency departments. These findings for arthritis may also be true for other conditions. Increased utilization of emergency departments in general has been observed in northern areas (6;9) and rural areas (8), and has been linked with decreased availability of health services. In rural areas, physicians spend proportionally more time in the emergency department and less time in an office, as compared to urban areas (10), which may contribute to the increased emergency department utilization in rural areas.

In the last 10 years, the supply of general practitioners and family physicians to rural, remote and northern areas has been improving (10). However, persons with arthritis remain under-serviced in these areas. Rural areas have the highest rates of physician turnover and the number of specialists in rural areas is small and declining (10). Access to specialist care and continuity of primary care are integral to the health and well-being of persons with arthritis, and may prevent avoidable trips to the emergency department.

Further strategies have been identified to reduce the number of unnecessary emergency departments visits made by people with arthritis. Community-based group interventions such as self-management programs(11-13) have resulted in healthier patients, decreased emergency department visits, reduced out-of-pocket costs to persons with arthritis, and lower utilization of health services in general. Such strategies should be considered to improve community health and to reduce the strain on emergency department services.

References

- (1) Badley EM, Boyle E, Corrigan L, DeBoer D, Glazier RH, Guan J et al. Arthritis and related conditions in Ontario: ICES Research Atlas. 2 ed. Toronto, Ontario: Institute for Clinical Evaluative Sciences, 2004.
- (2) Hospital Report 2005: Emergency Department Care. 2005. Toronto, Hospital Report Research Collaborative.
- (3) Arthritis in Canada: An ongoing challenge. Ottawa, Ontario: Health Canada, 2003.
- (4) Impact of arthritis and other rheumatic conditions on the health-care system - United States, 1997. Morbidity and Mortality Weekly Report 1999; 48(17):349-353.
- (5) Chan B, Schultz S. Supply and Utilization of General Practitioner and Family Physician Services in Ontario. 2005. Toronto, Institute for Clinical Evaluation Sciences.
- (6) Understanding Emergency Department Wait Times. 2005. Ottawa, Canadian Institute for Health Information.
- (7) The Canadian E.D. Triage and Acuity Scale. <http://www.caep.ca/002.policies/002-02.ctas.htm> . 2005.
- (8) Hootman JM, Helmick CG, Schappert SM. Magnitude and characteristics of arthritis and other rheumatic conditions on ambulatory medical care visits, United States, 1997. Arthritis Rheum 2002; 47(6):571-581.
- (9) Chan B, Schull M, Schultz S. Emergency Department Services in Ontario. 2001. Toronto, Institute for Clinical Evaluative Sciences.
- (10) Tepper J, Schultz S, Rothwell D, Chan B. Physician Services in Rural and Northern Ontario. 2006. Toronto, Institute for Clinical and Evaluative Sciences.
- (11) Coleman EA, Eilertsen TB, Kramer AM, Magid DJ, Beck A, Conner D. Reducing emergency visits in older adults with chronic illness. A randomized, controlled trial of group visits. Eff Clin Pract 2001; 4(2):49-57.
- (12) Lorig KR, Ritter P, Stewart AL, Sobel DS, Brown BW, Jr., Bandura A et al. Chronic disease self-management program: 2-year health status and health care utilization outcomes. Med Care 2001; 39(11):1217-1223.
- (13) Lorig K, Ritter PL, Plant K. A disease-specific self-help program compared with a generalized chronic disease self-help program for arthritis patients. Arthritis Rheum 2005; 53(6):950-957.

APPENDIX

Table A. Grouping of arthritis and related conditions for ICD-9 and ICD-10 diagnoses.

Category	Type	ICD-9 Diagnosis Code	ICD-10 Diagnosis Code
Arthropathies	Osteoarthritis	715 Osteoarthritis and allied disorders	M15 Polyarthrosis M16 Coxarthrosis M17 Gonarthrosis M18 Arthrosis of first carpometacarpal joint M19 Other arthrosis
	Rheumatoid arthritis	714 Rheumatoid arthritis and other inflammatory polyarthropathies	M05 Seropositive rheumatoid arthritis M06 Other rheumatoid arthritis M07 Psoriatic and enteropathic arthropathies M08 Juvenile arthritis M09 Juvenile arthritis in diseases classified elsewhere
	Gout	712 Crystal Arthropathies 274 Gout	M10 Gout M11 Other crystal arthropathies M14 Arthropathies in other diseases classified elsewhere
	Infectious arthritis	711 Arthroplasty associated with infections	M00 Pyogenic arthritis M01 Direct infections of joint in infectious and parasitic diseases classified elsewhere
	Reactive arthritis	713 Arthropathies associated with other disorders classified elsewhere	M02 Reactive arthropathies M03 Postinfective and reactive arthropathies in diseases classified elsewhere
	Diffuse diseases of connective tissue	710 Diffuse diseases of connective tissue	M32 Systemic lupus erythematosus M33 Dermatopolymyositis M34 Systemic Sclerosis M35 Other Systemic involvement of connective tissue M36 Systemic disorders of connective tissue in diseases classified elsewhere
	Ankylosing spondylitis	720 Ankylosing spondylitis and other inflammatory spondylopathies	M45 Ankylosing spondylitis M46 Other inflammatory spondylopathies
	Spondylosis	721 Spondylosis and allied disorders	M47 Spondylosis M48.0 Spinal stenosis M48.1 Ankylosing hyperstosis M48.2 Kissing Spine M48.8 Other specified spondylopathies, multiple sites in spine M48.9 Spondylopathy, unspecified, multiple sites in spine
	Polymyalgia	725 Polymyalgia rheumatica	
	Other and unspecified arthropathies	716 Other and unspecified arthropathies	M12 Other specific arthropathies M13 Other arthritis

Category	Type	ICD-9 Diagnosis Code	ICD-10 Diagnosis Code
Soft tissue disorders	Enthesopathies	726 Peripheral enthesopathies and allied syndromes	M75 Shoulder lesions M76 Enthesopathies of lower limb, excluding foot M77 Other enthesopathies
	Other soft tissue disorders	729 Other disorders of soft tissues	M79 Other soft tissue disorders not elsewhere classified
	Synovium, tendon, bursa disorders	727 Other disorders of synovium, tendon and bursa	M65 Synovitis and tenosynovitis M66 Spontaneous rupture of synovium and tendon M67 Other disorders of synovium and tendon M68 Disorders of synovium and tendon in diseases classified elsewhere M70 Soft tissue disorders related to use overuse and pressure M71 Other bursopathies
Joint derangement And biomechanical lesions	Knee derangement	717 Internal derangement of the knee	M22 Disorders of patella M23 Internal derangement of knee
	Derangement of joint (non-knee)	718 Other derangement of joint	M24 Other specific joint derangements
	Biomechanical lesions	739 Nonallopathic lesions, not elsewhere classified	M99 Biomechanical lesions not elsewhere classified
Other joint disorders	Other joint disorders	719 Other and unspecified disorders of the joint	M25 Other joint disorders, not elsewhere classified