ARTHRITIS COMMUNITY RESEARCH & EVALUATION UNIT (ACREU)
University Health Network

2006 SURVEY OF ORTHOPAEDIC SURGEONS IN ONTARIO

MARCH 2007

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WORKING REPORT 2007-03

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Acknowledgements

The authors of this report would like to acknowledge the contribution of the College of Physicians and Surgeons of Ontario and the Ontario Orthopaedic Association for their role in recruiting physicians for this study.

We would like to thank the orthopaedic surgeons and the administrative staff who participated in the survey.

We would also like to acknowledge all staff at the Arthritis Community Research and Evaluation Unit (ACREU) who assisted with this project.

Supported by the *Ontario Ministry of Health and Long-Term Care*. The opinions, results and conclusions are those of the authors and no endorsement by the Ministry is intended or should be inferred.

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Executive Summary

- A survey of all orthopaedic surgeons in Ontario was carried out to examine workload and practice patterns of orthopaedic surgeons, geographic availability of orthopaedic services, surgeons' perceived impact of the Ontario Wait Time Strategy on non-hip/knee replacement surgery and sufficiency of resources.

- Three hundred ninety-six practicing orthopaedic surgeons were identified in Ontario in 2006: 359 responded to a two part survey relating to location and nature of practice (91% response rate), and characteristics of their practice including the impact of the Ontario Wait Time Strategy (68% response rate). Most (93.3%) practicing surgeons operated. Orthopaedic surgeons were predominantly male with a mean age of 49 years and were in practice an average of 14 years with a mean expected year of retirement of 2020.

- In Ontario there were 2.86 orthopaedic surgeons per 100,000 population. This number varied by Local Health Integration Network (LHIN) from 1.57 per 100,000 in Waterloo Wellington to 5 per 100,000 in Toronto Central. There was a higher per capita provision of surgeons within the teaching LHINs (LHINs that have a university that offers medical training).

- Across Ontario 112 hours per week of direct clinical time per 100,000 population were provided by orthopaedic surgeons. This was comprised of 56 hours of office time per week, 33 hours of surgery time per week, and 22 hours per week working on call per 100,000 population. This report is the first to quantify the substantial contribution made by working on call.

- The amount of orthopaedic surgeon provision across Ontario per 100,000 population in 2006 was similar to that in 2000 and 1997. The mean age of surgeons and median number of years in practice also remained similar. The availability of orthopaedic surgeons to respond to the anticipated growth in the demand for arthritis-related surgery with the aging of the baby boomer population continues to be of grave concern.

- On average orthopaedic surgeons in Ontario each provided 39 hours of direct clinical care per week: 50% of this time was spent in seeing patients in the office, 30% in the operating room (OR), and 20% working on call. This does not take into account the baseline amount of time worked (e.g. full or part-time practice) nor the amount of time spent on other duties such as administration, teaching or research. Orthopaedic surgeons are already working at full capacity.

- More detailed questions on practice patterns showed that 78%, 65%, and 47% of surgeons reported time spent on administration, teaching and research, respectively. The average time spent on these activities was higher in LHINs with teaching hospitals.

- Ninety percent of surgeons reported seeing mainly adult patients; 6% had a predominantly paediatric practice, and 4% had a mixed practice. A minority spent more that a quarter of their time seeing workers' compensation or medico-legal patients.

- The two most frequently reported types of surgery were 'other hip and knee' (reported by 70% of surgeons – representing a median of 20% of their surgeries time) and hip and knee replacement surgery (reported by 65% - representing a median of 50% of their surgeries time). Spine (neck, back) surgery was only reported by 17% of surgeons.

- Responses to the impact of the Ontario Wait Time Strategy were mixed. More than half of surgeons stated that the amount of OR time available for orthopaedic surgery other than hip or knee replacement was unchanged (52%) or increased (6%), while 42% reported a decrease.

- Overall 98% of surgeons reported a mean of 3.5 barriers to timely orthopaedic surgery. The most frequently reported barriers were lack of resources, particularly OR time, anaesthesia, nursing, and bed capacity.

- Overall orthopaedic surgeons provide a large amount of care for musculoskeletal disorders for the province, the majority of which is ambulatory care. In order to address the critical shortage in the number of orthopaedic surgeons new multidisciplinary models of care need to be established to enhance the ability of surgeons to deliver surgical care, as well as to ensure the availability of necessary resources for surgery.

1.0 Introduction

Arthritis and related conditions are a leading cause of pain, physical disability and health care utilization[1-5]. Arthritis affects nearly 4.5 million Canadians, including 1.8 million people over age 12 years in Ontario[6]. There is no cure for arthritis, but treatments do exist to prevent and minimize disability, maintain function and reduce the pain associated with arthritis[7-12]. Orthopaedic surgery is a frequently used intervention particularly for severe arthritis[7,10,13-17].

As the 'baby boomer' population ages, the prevalence of arthritis is projected to increase to more than seven million Canadians by the year 2026[6]. The demand on the health-care system in Canada is predicted subsequently to grow. The associated increase in the number of people with arthritis will have a significant impact on specialists, such as orthopaedic surgeons. In addition, reports of current orthopaedic surgeon shortages, unmet need for services[18], and long wait times for some orthopaedic procedures such as total joint replacement[19], raise concerns about the ability of the system to meet current and future demand on orthopaedics. Access to effective interventions for arthritis is often insufficient and widely variable across Ontario[20-25]. Orthopaedic surgery, a later stage intervention, is the most common type of surgical intervention for arthritis when non-surgical interventions have failed[7,10,14,16].

The Ontario Wait Time Strategy was developed as a response to public concern about increasing waiting times for total joint replacement and has spearheaded a number of initiatives directed at both improving efficiency and increasing capacity, particularly in the short term, to catch up on the backlog of required surgery[26]. These initiatives include funding for additional hip and knee replacements, investments in home care, public access to wait time information, funding for special innovation and education projects to educate staff about efficient practices and support for hospital innovations. Despite all of these initiatives it remains the case that orthopaedic surgeons are central to the provision of total joint replacement. An essential component of any long-term strategy, therefore, has to consider their availability.

Earlier surveys of orthopaedic surgeons in Ontario were completed in 1997[20] and 2000 [18,24]. In 2000, 94% of orthopaedic surgeons in the province responded to the survey. The results highlighted many challenges facing the orthopaedic community: the aging of orthopaedic surgeons, geographic variation in level of service provision in Ontario, a chronic shortage of women in orthopaedic, and under-servicing of the population in comparison with other countries [18,23,24]. There was considerable area variation in the amount of service provided. An earlier report by the Arthritis Community Research and Evaluation Unit (ACREU) also hinted at the possible importance of the amount of local orthopaedic provision in determining the rate of surgery to the population [21]. Clearly one important component of increasing orthopaedic provision is the recruitment and retention of orthopaedic surgeons. This is an important mission of the Ontario Orthopaedic Association and is outside the scope of this report. The surgical community has also pointed to the need to improve the efficient and effective use of highly skilled orthopaedic resources[27].

Human resource and workload challenges to the orthopaedic community continue today, with increasing pressures to reduce wait times for orthopaedic surgeries and to meet the demands of the population. The Wait Time Strategy is moving to include a greater range of orthopaedic surgeries within its purview. In order to plan for this, information regarding the current level of service provision by orthopaedic surgeons is required. Therefore, the 2006 ACREU Survey of Orthopaedic Surgeons in Ontario was completed to update the results of the 2000 survey and to

provide an overview of orthopaedic surgeons' perceptions of the impact of the Ontario Wait Time Strategy on their practice.

2.0 Purpose and Objectives

The purpose of the Orthopaedic Surgeons' Survey of Ontario 2006 was:

- To examine availability of orthopaedic services geographically by Local Health Integration Network (LHIN).
- To document time trends in provision of orthopaedic services as applicable, using data from the 2006, 2000, and 1997 ACREU Surveys of Orthopaedic Surgeons in Ontario.
- To ascertain the workload and practice patterns of orthopaedic surgeons in Ontario, including time spent in the office, operating room (OR) and working on call.
- To explore perceived impact of the Ontario Wait Time Strategy on access to OR time for surgery other than hip or knee replacement (the two types of surgery currently covered by the strategy).
- To identify perceptions of orthopaedic surgeons in Ontario related to barriers to providing timely orthopaedic surgery.

The findings of this study will be used to inform program and policy development for the provision of orthopaedic services in the province.

3.0 Methodology

The survey was conducted by the Arthritis Community Research and Evaluation (ACREU) in partnership with the Ontario Orthopaedic Association. All practicing orthopaedic surgeons in Ontario were invited to complete a self-administered questionnaire to examine geographic distribution, supply of orthopaedic surgeons, workload (office, surgery and on call time) and practice patterns. Research ethics approval to conduct the study was received from the University Health Network, Toronto, Ontario.

3.1 Study design

The target population for the study was all orthopaedic surgeons actively practicing in Ontario. Orthopaedic surgeons were identified from a directory listing of the College of Physicians and Surgeons of Ontario (CPSO). Surgeons not practicing in Ontario, including those who were retired, on temporary sabbatical leave or worked in a research-only capacity, or had moved out of the province were excluded. Those physicians practicing primarily as workers' compensation or medico-legal consultants were also excluded as they would not be operating or contributing to clinic hours in a "treatment" capacity in the publicly funded health system. Postgraduate fellows were also excluded as they were still undergoing training.

All orthopaedic surgeons were sent 1) an information letter explaining the purpose of the study, signed by the ACREU Investigator who is an orthopaedic surgeon and by the President of the Ontario Orthopaedic Association (Appendix A), and 2) a self-administered and semi-structured survey questionnaire called Ontario Survey of Orthopaedic Surgeons (June 2006), which contained 14 questions to be faxed or mailed back to the ACREU (Appendix B). Response to

the questionnaire implied consent. Participation was voluntary and respondents could refuse to participate at any time.

3.2 Questionnaire

The questionnaire was developed based on the 2000 Ontario Survey of Orthopaedic Surgeons and with further input from orthopaedic surgeons. The questionnaire contained four sections: A) *Background Information*, B) *Geographic Distribution of Clinics*, C) *Practice Patterns*, and D) *Demographic and Other Information*. *Background Information* established whether the surgeon was active or inactive in practice in Ontario. The *Geographic Distribution of Clinics* section included questions regarding the location and length (in hours) of all office, operating room (OR) sessions held by the orthopaedic surgeon as well as time working on call. The *Practice Patterns* section included questions regarding time spent on various non-clinical various activities, type of practice, and perceived impact of the Ontario Wait Time Strategy. *Demographic and Other Information* asked about demographic information and about years in practice and anticipated retirement date. The survey questionnaire was piloted with four orthopaedic surgeons and was revised based on their feedback.

3.3 Data collection and management procedures

As it was necessary to achieve a response rate close to 100% for estimates of supply to be accurate, an extensive reminder system was implemented. A reminder letter (Appendix C) was sent two weeks subsequent to the initial mail-out with a self-addressed envelope, and a telephone follow-up for non-respondents commenced two weeks after the reminder letter (Appendix D -Telephone Script). In instances in which a questionnaire remained outstanding, telephone contact was made with the surgeon's administrative staff to complete the questions on background information (Section A) and geographic location of clinics (Section B) (see below). Finally, an email reminder was sent to those surgeons who could not be contacted after multiple attempts by telephone (Appendix E).

Questionnaires were received by fax and by mail and were dated when received. Questionnaires received were recorded in a Microsoft Access management database. Each questionnaire was reviewed, and in instances in which something was unclear in the *Background Information*, and *Geographic Distribution of Clinics* sections of the questionnaire (Sections A and B, page 1), a research associate attempted to follow-up with the survey participant or his/her administrative staff to clarify the information. After double data entry and verification, data were exported to *SAS version 9.1* for analysis.

3.4 Data analysis

Practice data (for office, surgery/OR and on call sessions) were expressed in number of hours per week. Time working in teaching, administration and research was also expressed in hours per week. Practice patterns were analyzed for the province, as a whole, and geographically by Local Health Integration Network (LHIN) (See Appendix F for an Ontario map of LHIN names and boundaries). LHINs were determined based on postal code data provided by the surgeons, for each practice setting. The provision of office, surgery and on call services within each LHIN was calculated, taking into account surgeons who travel and provide service outside the LHIN of their main practice setting. Practice patterns for administration, research, teaching were analyzed according to the LHIN of the surgeon's primary practice location. The amount of service provided in each LHIN was expressed as amount of service per week per 100,000 population,

using 2005 intercensal population estimates. At the time of analysis, 2006 population estimates were unavailable.

Results from the 2006 survey were compared to the previous 2000 and 1997 surveys as applicable.

4.0 Findings

4.1 Response rate

A total of 494 orthopaedic surgeons were identified in Ontario from the CPSO directory. Based on replies to the initial mailing, 78 were excluded as these surgeons were retired, solely doing research, on a leave of absence, not practicing in Ontario or a postgraduate fellow. Of the 416 remaining potentially eligible questionnaires, 379 were returned (response rate 91.1%) after extensive follow-up. Of these, another 20 were excluded as ineligible (six postgraduate fellows and 14 with a practice of more than 75% workers' compensation or medico-legal patients) leaving 359 questionnaires available for analysis: a 90.7% response rate based on 396 eligible surgeons. Through rigorous follow-up, 100% of the 359 responding orthopaedic surgeons answered the questions on *Background Information* and *Geographic Distribution of Cinics* (practice hours; Sections A and B). Seventy five percent (269) of respondents answered questions in the *Practice Patterns* and *Demographics* parts of the questionnaire, an overall response rate for this section of 68% (269/396), although the response rate varied by question.

To determine whether the sections with fewer questions completed or with more missing information were representative of orthopaedic surgeons in Ontario comparisons of the responses were made between the orthopaedic surgeons who completed the practice patterns questions only and respondents to all sections of the questionnaire (Table 1). There were no substantial differences in responses between respondents and non-respondents to the practice patterns and demographics sections (C and D) with respect to mean hours per week of office/clinic hours or surgery time, or by region of province.

Table 1. Comparison of characteristics of respondents and non-respondents to the 2006 ACREU survey of Ontario orthopaedic surgeons

	Respondents to practice pattern questions only	Respondents to all sections of the questionnaire
Mean Hours per week:		
Office	20.4	19.3
Surgery	10.6	13.1
Number (%) response by grouped* LOCAL HEALTH INTEGRATION NETWORKS		
South and West	24 (26.7%)	77 (28.6%)
GTA	41 (45.5%)	121 (50.0%)
East	16(17.8%)	51 (19.0%)
North	9 (10.0%)	20 (7.4%)
ONTARIO	90	269

*Regions: South and West = Erie St Clair; South West; Waterloo Wellington; Hamilton Niagara Haldimand Brant. GTA (Greater Toronto Area) = Central West; Mississauga Halton; Toronto Central; Central; Central East. East = South East; Champlain. North = North Simcoe Muskoka; North East; North West.

4.2 Service provision

The findings in this section of the report relate to 359 practicing orthopaedic surgeons in Ontario in 2006. Of these, 335 operated (93.3%), the remainder having exclusively ambulatory care practices.

Orthopaedic surgeon provision

The overall provincial per capita provision of surgeons was 2.86 orthopaedic surgeons per 100,000 population. Table 2 shows the number of orthopaedic surgeons responding to the survey by LHIN, as well as the provision per 100,000 population. The absolute number of surgeons was generally highest in the LHINs with teaching hospitals (LHINs that have a university that offers medical training). The LHINs with teaching hospitals are: South West, Hamilton Niagara Haldimand Brant, Toronto Central, South East and Champlain. LHINs that included the parts of the Greater Toronto Area also had a relatively high number of surgeons. The per capita availability of orthopaedic surgeons varied by LHIN from a high of 5.22 per 100,000 population in Toronto Central to 1.57 per 100,000 population in Waterloo-Wellington. Sensitivity analyses taking into account the location of the 37 (9.3%) non-responding surgeons did not alter the overall distribution.

Table 2. Overall number and per capita provision per 100,000 population of practicing orthopaedic surgeons, by Local Health Integration Network in Ontario, 2006

Local Health Integration Networks	Number of Orthopaedic Surgeons	Orthopaedic Surgeons/ 100,000 population
Erie St Clair	14	2.17
South West*	32	3.45
Waterloo Wellington	11	1.57
Hamilton Niagara Haldimand Brant*	44	3.22
Central West	13	1.72
Mississauga Halton	20	1.88
Toronto Central*	60	5.22
Central	31	1.97
Central East	38	2.59
South East*	19	3.94
Champlain*	48	4.06
North Simcoe Muskoka	7	1.65
North East	13	2.29
North West	9	3.74
ONTARIO	**359**	**2.86**

*LHINs with Teaching Hospitals

As some surgeons practice in more than one LHIN, the questionnaire asked surgeons about the location of their practice, as well as the time they spend on three different aspects of clinical practice: ambulatory care, surgery, and working on call in each of their practice locations. This gave a more accurate picture of the type and amount of provision.

The overall amount of direct clinical care provided by orthopaedic surgeons was just over 110 hours per week per 100,000 population. This is made up of 56 office hours, 33 surgery hours and 22 working on call hours per week per 100,000 population (Table 3).

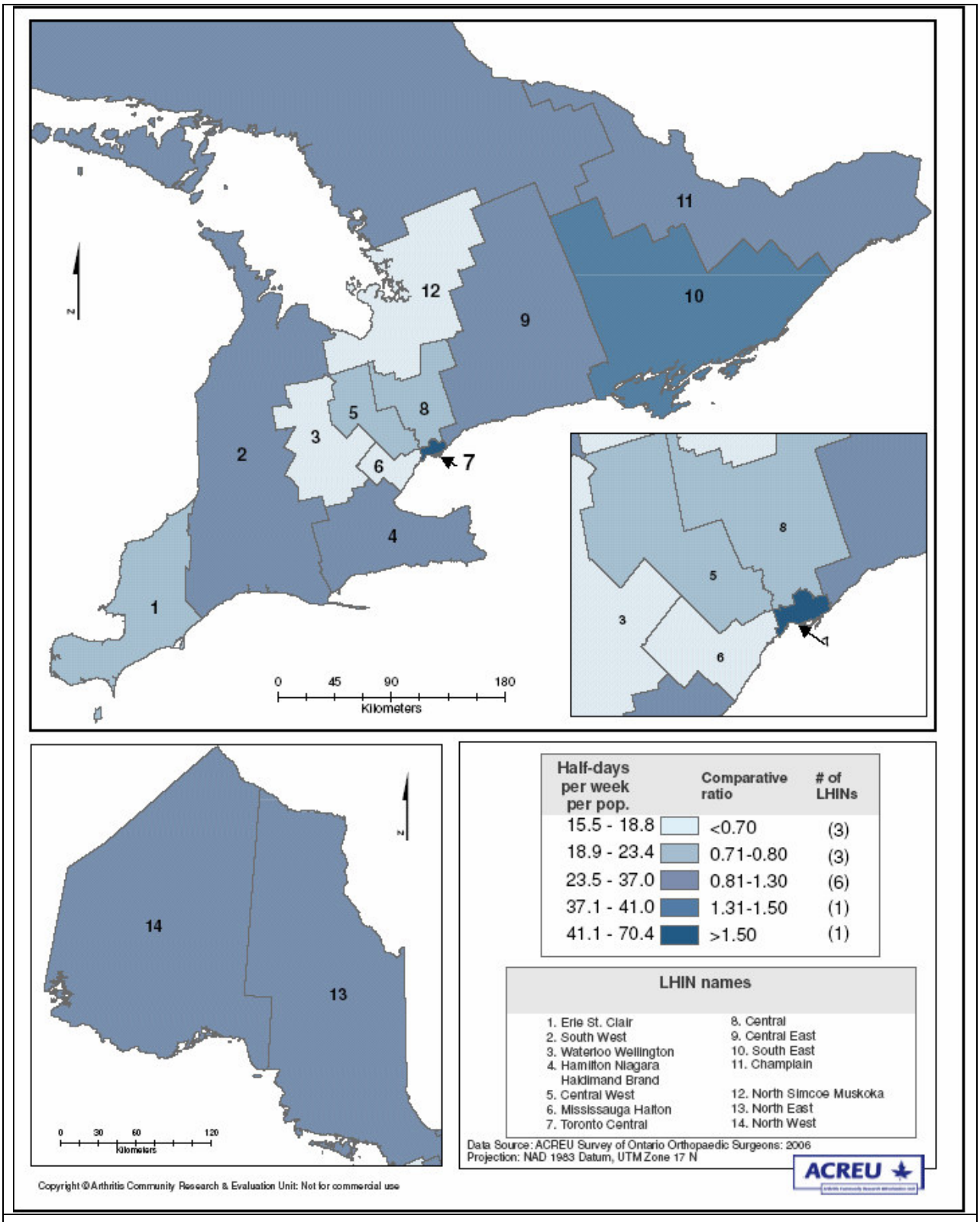
Table 3 shows average direct clinical care hours per week of orthopaedic services: office hours, surgery hours and hours working on call per 100,000 population for each LHIN. There were some variations in per capita provision by LHIN, with provision ranging from 180 hours per week per 100,000 population in Toronto Central to 62 hours per week in North Simcoe Muskoka per 100,000 population. The variation by LHIN is illustrated in Figure 1.

The amount of the inidividual components of direct clinical care also varied slightly by LHIN (Table 3). Per capita weekly office hours were highest for Toronto Central and lowest for North Simcoe Muskoka. Toronto Central also had the highest per capita provision of surgery hours, while Central West, and North West had the least. Hamilton had the most hours working on call per 100,000 population and North Simcoe Muskoka the least.

Table 3. Provision of orthopaedic services by Local Health Integration Network - office hours, surgery time, and time working on call: Hours per week per 100,000 population in Ontario, 2006

	Hours per week of orthopaedic provision per 100,000 population				
Local Health Integration Networks	Office hours	Surgery hours	Time working on call	Office + surgery hours	Total time in direct clinical care
Erie St Clair	44.84	30.73	13.08	75.57	88.66
South West*	59.17	47.74	20.28	106.91	127.19
Waterloo Wellington	37.20	21.48	14.41	58.69	73.10
Hamilton Niagara Haldimand Brant*	71.23	32.07	31.13	103.30	134.43
Central West	32.20	21.03	22.39	53.23	75.62
Mississauga Halton	35.69	22.10	17.09	57.79	74.88
Toronto Central*	84.62	65.68	29.96	150.30	180.26
Central	43.61	23.00	16.73	66.61	83.34
Central East	57.58	24.54	24.60	82.13	106.73
South East*	76.34	52.39	28.14	128.74	156.88
Champlain*	82.59	43.93	20.96	126.53	147.49
North Simcoe Muskoka	24.85	25.43	11.88	50.28	62.15
North East	43.08	22.91	27.84	65.99	93.83
North West	72.45	21.09	26.17	93.53	119.70
ONTARIO	**56.33**	**33.17**	**22.10**	**89.50**	**111.60**

*LHINs with Teaching Hospitals



Map 1. Amount of direct clinical care in half days per week * by Local Health Integration Network in half days per week* per 100,000 population in Ontario, 2006

* a half day per week = 4 hours of service per week

Time trends in provision of orthopaedic services

Table 4 compares findings from the 2006, 2000, and 1997 ACREU surveys of orthopaedic surgeons. There were no substantial changes between the surveys. The mean age of the surgeons, 49 years, was unchanged between 2006 and 2000, and the median number of years in practice was similar. There continues to be a minority of female surgeons. All the measures of per capita provision of service were similar, although it is difficult to make an exact comparison because of minor differences in the survey populations. The 1997 and 2000 surveys were targeted to surgeons who treated arthritis patients, and the 2006 survey included all orthopaedic surgeons, including the minority of surgeons who have non-arthritis practices. The 2006 survey excluded surgeons who had predominantly medico-legal and workers' compensation practices. Once again this is the minority of surgeons.

Table 4. Time trends in orthopaedic service provision, 1997-2006: Arthritis Community Research and Evaluation Unit (ACREU) surveys of Ontario orthopaedic surgeons

Year of survey	Mean age (years)	Median years in practice	Percent female	Provision per 100,000 population			
				Number of Surgeons	Office half days/week*	Surgery half days/ week*	Office + surgery half days/week*
2006	49	15	6	2.9	14.1	8.3	22.4
2000	49	14	6	2.9	15	8.2	23.2
1997	45	13	6	3.0	15.4	8.9	24.3

*a half day/week = 4 hours of service per week

The work week of surgeons

Overall half of an orthopaedic surgeon's time is spent in clinic/office (Figure 2), 30% is spent in surgery and another 20% working on call. On average, orthopaedic surgeons in Ontario each provided 39 hours of direct clinical care per week (Table 5). This does not take into account the amount of time worked (e.g. whether the surgeon had a full or part-time practice) or other duties such as administration, teaching or research. Surgeons reported 19.7 office hours per week, 11.6 surgery hours and 7.7 hours working on call. In addition they reported an overall average of 30.9 hours per week per surgeon when they needed to be available on call. There was a relatively small amount of variation in the hours per week provided by the surgeons working in each LHIN (Table 5)

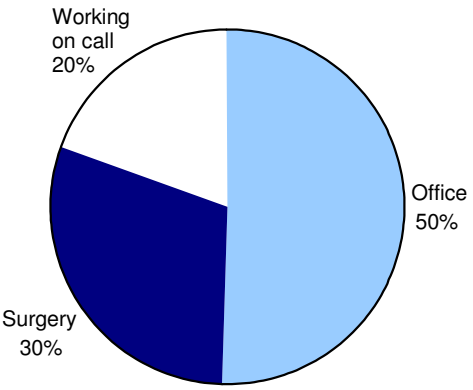


Figure 1. Distribution of direct patient care reported by orthopaedic surgeons in Ontario, 2006: Proportion of time spent in office, in surgery and working on call

Table 5. Average weekly workload of orthopaedic surgeons¶ by Local Health Integration Network - office hours, surgery time, and time working on call in Ontario, 2006

Local Health Integration Networks	Average weekly workload of surgeons (in hours)¶				
	Office hours	Surgery hours	Time working on call	Office + surgery hours	Total time in direct clinical care
Erie St Clair	20.70	14.19	6.04	34.89	40.9
South West*	17.17	13.86	5.89	31.03	36.9
Waterloo Wellington	23.64	13.65	9.16	37.28	46.4
Hamilton Niagara Haldimand Brant*	22.09	9.94	9.65	32.03	41.7
Central West	18.67	12.19	12.98	30.86	43.8
Mississauga Halton	18.96	11.73	9.08	30.69	39.8
Toronto Central*	16.20	12.58	5.74	28.78	34.5
Central	22.17	11.69	8.50	33.87	42.4
Central East	22.20	9.46	9.49	31.67	41.1
South East*	19.35	13.28	7.13	32.64	39.8
Champlain*	20.33	10.82	5.16	31.15	36.3
North Simcoe Muskoka	15.09	15.44	7.21	30.54	37.7
North East	18.82	10.01	12.16	28.83	41.0
North West	19.39	6.25	7.00	25.03	32.0
ONTARIO	**19.68**	**11.59**	**7.72**	**31.27**	**39.0**

¶ Does not take into account amount of time worked (e.g. full time versus part time practice) or other duties such as administration, teaching or research.
*LHINs with Teaching Hospitals

4.3 Practice Patterns

The findings in this section are based on the responses of the 269 practicing orthopaedic surgeons in Ontario who answered more detailed questions on practice patterns (see section 4.1 on *Response rate*).

Teaching, administration and research time

Sixty-five percent of orthopaedic surgeons reported time spent teaching, 78% reported administration activities, and 47% reported doing research. Of those surgeons who indicated any hours for teaching, administration and research the median number per week of hours was four, four and five respectively. Surgeons in teaching LHINs with a university that offers medical training spent more time in research and teaching compared with surgeons in non-teaching LHINs. Table 6 shows the average number of hours per week spent by surgeons in teaching and non-teaching LHINs.

Table 6. Mean hours per week teaching, doing administrative work, and on research, by orthopaedic surgeons in Ontario, 2006

Local Health Integration Network	Mean hours per week		
	Teaching	Administration	Research
With Teaching Hospitals	5.5	5.5	4.8
Other	1.4	3.7	0.8
ONTARIO	**3.8**	**4.8**	**3.1**

Practice characteristics

Ninety percent of orthopaedic surgeons spent at least three-quarters of their time with adult patients, and nearly 30% of orthopaedic surgeons saw adult patients exclusively. Only six percent had a predominantly paediatric practice, reporting spending at least 75% of their time seeing children. The remaining 4% of surgeons had a mixed practice seeing substantial proportions (more than 25%) of both adults and children.

Only a minority of surgeons (13.7%) spent more that 25% of their time seeing workers' compensation patients, and only 5.3% spent more than 25% of their time seeing medico-legal patients.

Elective surgery

Orthopaedic surgeons were asked what proportion of their elective surgeries were hip and knee replacement, other hip or knee, upper extremity, spine (neck, back), foot or ankle, or 'other' surgery. There was considerable variability. Figure 3 shows the percent distribution of the different types of elective surgery. Not all surgeons reported doing every kind of surgery.

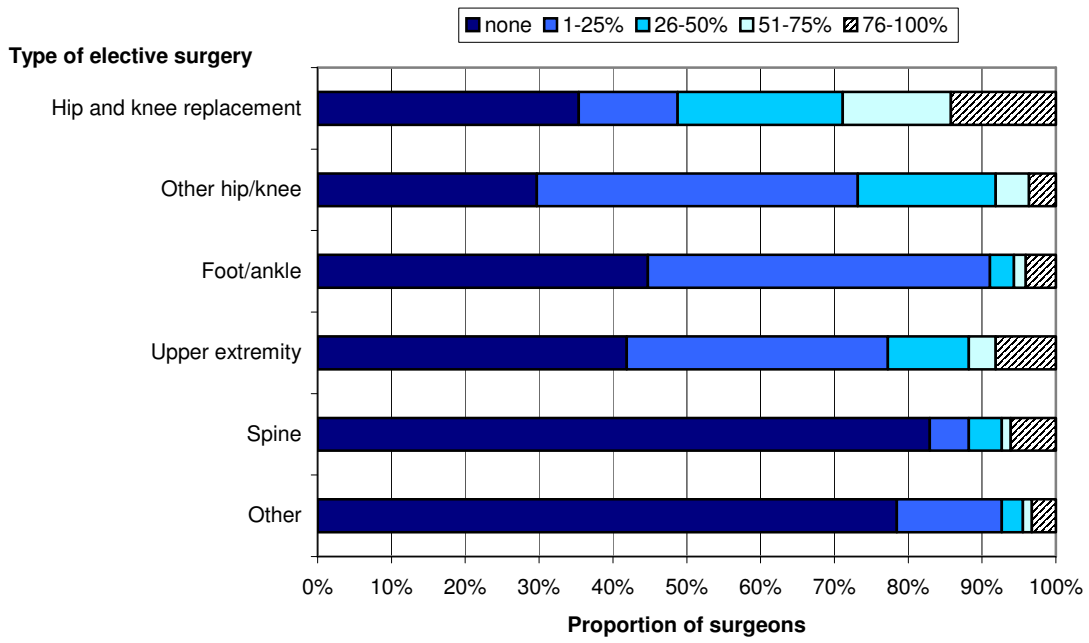


Figure 2. Reported percent distribution of elective surgeries performed by orthopaedic surgeons by type of surgery in Ontario, 2006 (n=242)

The most frequently performed type of surgery is 'other hip/knee', reported by 70% of surgeons, and this represented a median of 20% of all their surgeries. The next most frequent type was hip and knee replacement surgery, which was reported by 65% of all surgeons. For those orthopaedic surgeons that did joint replacements, this represented a median proportion of 50% of all their surgeries. The least frequently reported type of surgery was spine surgery, which was reported by only 17% of surgeons, for whom this comprised a median of 50% of their workload. Relatively few surgeons reported doing more than 75% of any type of surgery, ranging from 14.2% of surgeons for joint replacement to 3.7% of surgeons for other hip/knee surgery. The most frequently mentioned type of 'other surgery' was trauma surgery.

Impact of Ontario Wait Time Strategy

Orthopaedic surgeons were asked to comment on the impact of the Ontario Wait Time Strategy on the amount of OR time available for orthopaedic surgeries ***other than*** hip and knee replacement (Table 7). Half of all surgeons (52.4%) stated the amount of OR time available for these types of survey was unchanged; 6% reported an increase. Two fifths (41.6%) reported that since the Ontario Wait Time Strategy was implemented they perceived a decrease in the amount of OR time available for orthopaedic surgeries other than hip and knee replacement.

Table 7 also shows the responses by LHIN. The data from LHINs with fewer than ten surgeons responding have been combined with adjacent LHINs as indicated in the table. Surgeons in five LHINs only indicated an increase in OR time, three of which were teaching LHINs (i.e. LHINs that have universities that offer medical school training), including Toronto Central, the LHIN with the greatest number of orthopaedic surgeons.

Table 7. Proportion of orthopaedic surgeons reporting increase, decrease, and no change in surgery time available for orthopaedic surgeries other than hip and knee replacement since the implementation of the Ontario Wait Time Strategy in Ontario, 2006

Local Health Integration Networks	Number of surgeons	Time available for non-hip/knee replacement surgery		
		Increased (%)	Unchanged (%)	Decreased (%)
South West + Erie St Clair*	32	0.0	56.3	43.7
Hamilton Niagara Haldimand Brant + Waterloo Wellington*	39	15.4	64.1	20.5
Central West	10	0.0	40.0	60.0
Mississauga Halton	16	6.3	43.8	50.0
Toronto Central*	46	4.4	65.2	30.4
Central	18	0.0	50.0	50.0
Central East	25	8.0	36.0	56.0
South East*	11	0.0	63.6	36.4
Champlain*	35	11.4	42.9	45.7
North Simcoe Muskoka + North East + North West	18	0.0	38.9	61.1
ONTARIO	**250**	**6.0**	**52.4**	**41.6**

*LHINs with Teaching Hospitals

Barriers to timely orthopaedic surgery

Overall, more than 98% of surgeons reported experiencing at least one barrier to timely orthopaedic surgery, with the mean number of barriers reported per surgeon being 3.5. The most frequently reported perceived barriers were related to lack of resources (Figure 4). In decreasing order of frequency the resource barriers were lack of OR time indicated by 79.8% of surgeons, insufficient anaesthesia resources (61.9%), insufficient nursing resources (60.3%), lack of bed capacity (53.2%) and restrictions on implant budget (19.8%). Additional barriers indicated were already working at full capacity (36.1%) and backlog in clinic/office (28.2%). 'Other' barriers were mentioned by 10.3% of surgeons, the most frequent being lack of orthopaedic surgeons. Only 1.6% of surgeons indicated no barriers to providing timely care. There was some variation by LHIN in the frequency of reported barriers (Table 8), but no discernable differences between LHINs with and without teaching hospitals.

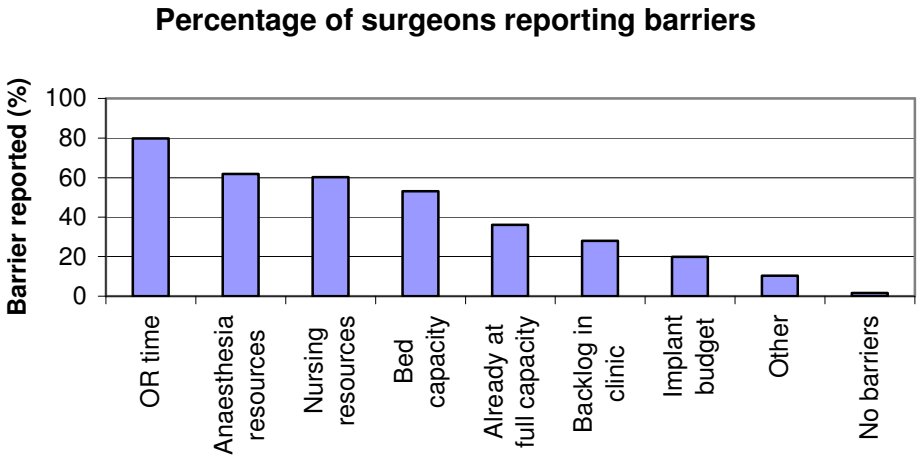


Figure 3. Percentage of orthopaedic surgeons reporting various barriers to providing timely orthopaedic surgery in Ontario, 2006

Orthopaedic workforce characteristics

Most orthopaedic surgeons were male (94.0 %). The median time that orthopaedic surgeons in Ontario had been in practice was 15 years (mean = 16 years). The median age of surgeons was 48 years (mean age = 49.2 years), with the youngest being 31 years and the oldest being 81 years of age. The median expected year of retirement was 2019.0 (mean = 2019.6) with the earliest expected retirement date being 2007 and the most distant being 2039. As this question had a low response rate (34%), we examined the respondents and non-respondents to the question for potential bias and determined that there was no difference in age of the respondents/non-respondents. Therefore, one would conclude this was a reasonable estimate of potential retirement despite the low response rate to the question.

Table 8. Proportion of orthopaedic surgeons reporting various barriers to providing timely orthopaedic surgery in Ontario, 2006

Local Health Integration Network	No of surgeons	No barriers (%)	Resource barriers					Additional barriers		
			OR time (%)	Bed capacity (%)	Anaesthesia (%)	Nursing (%)	Implant budget (%)	Already at full capacity (%)	Backlog in clinic (%)	Other (%)
South West+Erie St Clair*	32	0.0	72.1	63.6	60.1	63.6	15.2	36.4	27.3	15.3
Hamilton Niagara Haldimand Brant +Waterloo Wellington*	40	0.0	77.5	72.5	70.0	67.5	25.0	35.0	35.0	5.0
Central West	10	10.0	90.0	40.0	60.0	60.0	20.0	50.0	0.0	20.0
Mississauga Halton	16	0.0	81.3	62.5	75.0	68.8	18.8	50.0	18.8	6.3
Toronto Central*	45	6.7	62.2	33.3	35.6	35.6	20.0	35.6	22.2	17.8
Central	18	0.0	83.3	38.9	83.3	66.7	0.0	33.3	27.8	0.0
Central East	24	0.0	95.8	41.7	62.5	58.3	25.0	25.0	16.7	8.3
South East*	13	0.0	84.6	53.9	53.9	53.9	23.1	53.9	53.9	15.4
Champlain*	35	0.0	97.1	48.6	80.0	77.1	25.7	37.1	34.3	2.9
North Simcoe Muskoka + North East+North West	19	0.0	68.4	73.7	47.4	57.9	15.8	21.1	36.8	15.8
ONTARIO	**252**	**1.6**	**79.8**	**61.9**	**60.3**	**53.2**	**36.1**	**28.2**	**19.8**	**10.3**

*LHINs with Teaching Hospitals

Raw percentages do not add to 100% as surgeons could indicate more than one barrier

5.0 Discussion

Recent federal and provincial interest in wait times for joint replacement surgery has focused attention on the work of orthopaedic surgeons. The Ontario Wait Time Strategy has facilitated initiatives to increase the efficiency of the health care system, and this has shown some positive results in decreasing wait times[28,29]. However, a critical resource that may limit what can be done is a supply of orthopaedic surgeons. Overall, the results of the 2006 ACREU Survey of Orthopaedic Surgeons in Ontario were similar to those of the 2000 and 1997 surveys, although exact comparisons are difficult. The lack of an increase in the number of surgeons over the past five years is of concern in light of the aging population and the increasing demand for orthopaedic surgery. The survey conducted by ACREU in 2000 highlighted that the orthopaedic workforce was already working at full capacity, and that there was little improvement over the 1997 data in the disparity of orthopaedic services across Ontario [18,23,24]. The 2000 survey estimated that the supply of orthopaedic surgeons in Ontario was 2 full time equivalents per 100,000 [18]. It was noted Ontario's supply falls short of the requirements calculated in the U.S. of 5.6 full time equivalents per 100,000 estimated by Lee and colleagues [30]. The 2006 data provide a similarly bleak picture. While things have not necessarily got worse, there has been little improvement.

Given the stagnation in the provision of orthopaedic surgeons in Ontario and the fact that a substantial proportion of surgeons are close to retirement age, in the short term at least, any increase in the capacity of surgeons to carry out joint replacement will need to come from adjustments in current practice patterns. In the longer term, one possible solution to the shortage of orthopaedic surgeons is to address the lack of gender diversity in orthopaedic residency training programs [31]. Although there are increasing numbers of women entering surgical fields, female orthopaedic surgeons remain underrepresented. While the number of women compared with men entering medical school over the years has increased dramatically, the percentage of women in orthopaedics has increased by a much smaller rate with no change in percentage over the past 20 years. Orthopaedic residencies have the lowest percentage of women compared with all other primary surgical specialties [32]. Recruitment efforts need to address potential biases and stereotypes related to orthopaedics and women that may make it an unattractive option for women and thus contribute to this currently low rate of female participation in this specialty [33].

Surgery is only one component of the work of orthopaedic surgeons. Orthopaedic surgeons in Ontario spend approximately half of their clinical time seeing patients in an office setting, and about one third in surgery [21]. The ratio of office to surgical time was the same in 2006 as in 2000, and approached a ratio of two to one for office hours to surgery time. This suggests that orthopaedic surgeons provide important non-surgical care to people with arthritis. This is confirmed by ACREU's analyses of health service databases to look at the information on ambulatory and surgical care provided by orthopaedic surgeons [34,35]. The variety of conditions seen by orthopaedic surgeons point to the important contribution that orthopaedic surgeons make in providing advice and medical management for a wide range of musculoskeletal and traumatic conditions. Further examination of the nature of this workload shows that only about a quarter of patients seen have osteoarthritis, the most frequent reason for total joint replacement. Surgeons also carry out a wide range of surgical procedures. This is discussed further below.

The services provided by orthopaedic surgeons also include on call work. Inclusion of an estimate of time working on call enables a more comprehensive picture of the orthopaedic workload, and, for the first time, the 2006 survey provides estimates of the total hours per week devoted to direct patient contact. Direct patient contact has been defined by Lee et al as also 'including reviews of laboratory tests and documentation in the chart' [30]. It is unclear to what extent these activities were taken into consideration in the surgeons' frequency estimates of time spent in providing care; the overall estimate provided here may be an underestimate. The time spent working on call represents about one fifth of the total time spent on direct patient care. The time spent working on call only partially captures the commitment of the surgeon and should be viewed against the background of 30 hours per week spent on call, and therefore being available if needed. The relatively low variability across the LHINs in the hours of direct care provided by each surgeon is a further indication that the profession is nearing capacity.

There was considerable variation in the reported provision and availability of various orthopaedic services across the LHINs of Ontario. The variation across LHINs in the per capita amount of direct patient care time is greater than that for the number of hours per week worked per surgeon, even when no allowance is made for other duties. This suggests that a determining factor in providing care is the number of surgeons in a LHIN. This is confirmed by ACREU's findings of substantial correlations across the LHINs in rates of ambulatory encounters and of number of surgeries with the number of surgeons in the LHIN[35].The LHIN variation is important as it raises questions related to rural service provision, including recruitment and retention of surgeons. This issue has been noted in the research literature to be of particular concern as the population ages and physicians retire without subsequent replacements [36,37].

The restructuring of Ontario's health care system and the introduction of LHINs means that it is not possible to make comparisons of the regional availability of surgical services, with the earlier ACREU surveys. However, in all of the surveys the highest concentration of orthopaedic surgeons was found in areas with established medical schools. There was very little change in regional availability between 1997 [20] and 2000 [24], and given the comparability of the overall findings with the current survey, it is likely that the same regional variability in availability of services persists.

The LHINs with medical schools continue to have a higher per capita provision of surgeons. However, in these areas the surgeons also are more likely to devote time to other duties such as administration, teaching and research. In addition, these LHINs often act as regional centres for more complex surgical cases. Aspects of the relationship between per capita provision of orthopaedic services and access to surgery are explored elsewhere [35].

Total joint replacement surgery is only one component of surgical time. Only 65% of orthopaedic surgeons in Ontario reported this type of surgery and, for those that did so, this represented a median of 50% of their workload. Findings from analyses of health service data show that total joint replacement represents only about 25% of all the surgeries carried out by orthopaedic surgeons[35]; it is likely these analyses underestimate the total proportion of time spent on this relatively lengthy procedure.

The 2000 ACREU survey also asked about what proportion selected procedures were of all elective surgeries [23]. The proportion of surgeons reporting doing no hip or knee

replacement surgery, no upper extremity surgery or no spine (axial) surgery was greater in 2006 than in 2000. On the other hand, a larger proportion of surgeons in 2006 reported that these surgeries represented more than 75% of their total elective surgery. Spine surgery continues to be carried out by only a minority of surgeons, and these are mainly in the teaching centres [35].

Surgeons' opinions about the impact of the Ontario Wait Time Strategy on OR time for surgery other than hip and knee replacement were mixed. While more than half reported either no impact or an improvement, the finding that more than 40% of surgeons perceived that since implementation of the Wait Time Strategy the amount of OR time for surgeries other than hip and knee replacements had decreased is notable. The results of the present survey are consistent with the Ontario Medical Association (OMA) survey results of almost 640 Ontario doctors, released on February 2007. The OMA survey reported that while the Wait Time Strategy has been having a positive impact on targeted surgeries, physicians surveyed identified there were unintended negative consequences on procedures not being measured, which, according to the OMA, means that patients are waiting longer. Specifically, the OMA survey found that 35% of doctors perceived that they were providing fewer services in areas not targeted by the Ontario government's Wait Time Strategy. Forty-six percent of specialists who perform targeted hip and knee replacements responded that they had to adjust their practice to accommodate Wait Time Strategy services. As stated by the OMA, it is important that wait times for all procedures be assessed to ensure wait times for procedures that are not targeted have not increased [38]. It would be of interest to see whether perceptions of decreased amount of time for non-hip/knee replacement surgery is associated with a decrease in surgical volumes in those LHINs with a higher proportion of surgeons reporting this type of impact. Other work looking at overall time trends in surgical rates in Ontario suggest that the 40% increase in overall rates of total joint replacement since the inception of the Wait Time Strategy in 2002 have not been accompanied by a decrease in other types of surgery [34,39]. However, this may hide regional differences.

Almost all surgeons reported barriers to providing timely orthopaedic surgery, most notably resource barriers relating directly to the ability to carry out surgery. Barriers varied across LHINs. Lack of OR time, insufficient anaesthesia resources and insufficient nursing resources were the three barriers expressed most consistently. These barriers are of concern particularly when combined with the fact that orthopaedic surgeons in Ontario are currently working at full capacity [18]. As the population ages and the demand for orthopaedic services increases, this creates higher wait times and other barriers to access of care, particularly for women [17,40-42]. In addition, studies have shown that as competition and financial costs of orthopaedic services increase, hospitals are more likely to restrict budgets, decrease operating room time and limit bed availability [43]. This further exacerbates the barriers to providing timely and effective health care.

6.0 Conclusion

As the demand for orthopaedic services is likely to grow, the shortage in the orthopaedic workforce in Ontario becomes an increasing concern. The existing orthopaedic workforce in Ontario may not adequately meet the current demand for orthopaedic services. Shortages of surgeons are compounded by variability in local availability. There is little room to maneuver to expand the capacity for total joint replacement surgery, and at the same time maintain services for trauma and other musculoskeletal conditions. Long wait times have become an increasing problem that threatens the gains a patient receives as a result of surgery[44]. Given the increase in the aging population, addressing potential shortages is important. While the Ontario Wait Time Strategy attempts to reduce wait times for key surgeries and procedures, such as hip and knee replacements, its implementation has highlighted additional issues. For example, wait times for other surgeries need to be examined.

Given the long time frames involved in recruiting more orthopaedic surgeons one needs to explore other strategies. Increasing resources and improving efficiency at the system level such as more OR time, enhanced bed capacity and reduced shortages of health human resources other than surgeons (e.g. anesthesia and nursing) are important considerations. In addition, enhanced training in ambulatory care of musculoskeletal conditions for other health professionals, including primary care physicians may help to reduce the demand on surgeons for routine ambulatory care. Expanded use of other health professionals, for example, in triaging patients for surgery may be one way to resolve the issue of timely access as care is prioritized and given to those in greatest need [45,46]. Models of care such as specialized arthritis programs, expanded role models, models to promote access in rural or remote communities and community based models of care may be further effective means of addressing barriers to musculoskeletal care and appropriate orthopaedic surgery [45,47].

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8.0 Appendices

Appendix A. Information Letter

Date

Dr. XXXX
Address

Dear Dr. XXXX,
The Arthritis Community Research and Evaluation Unit (ACREU) in partnership with the Ontario Ministry of Health and Long-Term Care and the Ontario Orthopaedic Association is continuing to carry out research with the goal of reducing the impact of arthritis on individuals, their families, and the population. As part of our work to document the gaps and needs in services to people with arthritis enclosed is a brief questionnaire on practice patterns and clinic locations of all orthopaedic surgeons in the province.

The data collected will be used to develop an up-to-date picture of musculoskeletal services across Ontario so that gaps in services may be identified. As results may have potential implications for the future planning of health services in Ontario, your response to this questionnaire is very important to us.

We appreciate that your time is valuable. For this reason, the questionnaire includes only the most essential questions and should take you no more than a few minutes to complete. All information gathered will be held in *strict confidence* and will be stored in a locked filing cabinet accessible only to the researchers in this study. You will not be identified in any publication resulting from this research. If you wish, a copy of the study's findings will be made available to you.

There are no expected risks to your involvement in this study. Although your participation in this study may not benefit you directly as an individual, it is anticipated that your contributions will have an impact on the planning and delivery of health care services for persons in Ontario.

We would greatly appreciate if you could complete this questionnaire and return it promptly to the attention of Paula Veinot, Study Coordinator, at our **FAX** number **416-603-6288**. If you have any questions or comments regarding this survey, please contact Paula Veinot at 416-603-2273 or toll free 1-866-724-0003 or by email pveinot@uhnres.utoronto.ca. Once again, thank you for your assistance and support in this very important research endeavour.

Sincerely,

Nizar Mahomed, MD ScD FRCS(C)
Orthopaedic Surgeon
Investigator, ACREU

Peter Schuringa, MD
Orthopaedic Surgeon
President, Ontario Orthopaedic Association

Appendix B. Self-Administered Survey Questionnaire

Arthritis Community Research and Evaluation Unit
Ontario Survey of Orthopaedic Surgeons
(June, 2006)

Version 1.1

Surgeon ID #:

Please complete this questionnaire and return it to: *Paula Veinot* Fax #: *416-603-6288.* Unless otherwise specified, please mark the correct response box for each question.

A. Background information

1. Are you currently in clinical practice?
   - ☐1 Yes
   - ☐2 No - on temporary leave (e.g. sabbatical) Please indicate duration: _____
   - ☐3 No - not at all (e.g. retired, research only)

If you responded "No - not at all" to Question 1, please *do not* complete this questionnaire, but fax it to the number provided above. Otherwise, please proceed with the following questions.

2. Do you operate?
   ☐1 Yes ☐2 No

B. Geographic Distribution of Clinics

3a. Where is your major practice located? _____
Hospital/clinic
_____ _____
City/Town Postal Code

3b. Please indicate the **location (community) of all *office or clinic sessions, operating room (OR) sessions* and *on call sessions*** in which you participate. This includes your **major practice** and **any other practice/clinic locations**, e.g., satellite clinics, fracture clinics. If you have more than three locations, list them on a separate sheet. Please indicate the amount of time devoted to each:

	A. Office Sessions	B. OR Sessions	C. On Call Sessions	D. Working on Call
Please indicate the locations of your office or clinic sessions, and all orthopaedic OR and on call sessions (if applicable). Name **city or town where they are located**.	**Amount of office or clinic time devoted to treating patients** *Express in number of **hours per week**. Otherwise, express as hours per month or per year.*	**Amount of devoted elective OR time** *Express in number of **hours per week.** Otherwise, express as hours per month or per year.*	**Amount of time spent on call** *Express in number of **hours per week.** Otherwise, express as hours per month or per year.*	**Amount of time "working" on call** *Express in number of **hours per week.** Otherwise, express as hours per month or per year.*
1. _____ City/Town _____ Postal Code	_____ **hours per week** _____ hours per month _____ hours per year	_____ **hours per week** _____ hours per month _____ hours per year	_____ **hours per week** _____ hours per month _____ hours per year	_____ **hours per week** _____ hours per month _____ hours per year
2. _____ City/Town _____ Postal Code	_____ **hours per week** _____ hours per month _____ hours per year	_____ **hours per week** _____ hours per month _____ hours per year	_____ **hours per week** _____ hours per month _____ hours per year	_____ **hours per week** _____ hours per month _____ hours per year
3. _____ City/Town _____ Postal Code	_____ **hours per week** _____ hours per month _____ hours per year	_____ **hours per week** _____ hours per month _____ hours per year	_____ **hours per week** _____ hours per month _____ hours per year	_____ **hours per week** _____ hours per month _____ hours per year

C. Practice Patterns

4. In addition, how many hours per week do you spend on the following activities?
   Teaching _____hours per week
   Administration _____hours per week
   Research _____hours per week

5a. What proportion of your practice is:
   Adult patients? _____% Paediatric patients? _____%

5b. What proportion of your practice is:
   Workers' compensation _____% Medico-legal _____%

5c. What proportion of your ***elective surgeries*** are:
   (i) Hip and knee replacement _____%
   (ii) Other hip/knee _____%
   (iii) Upper extremity _____%
   (iv) Spine (neck, back) _____%
   (v) Foot/ankle _____%
   (vi) Other, please specify_____ _____%

6. In your experience, since implementation of the Ontario Wait Times Strategy has the amount of OR time available for orthopaedic surgeries ***other than*** hip and knee replacement:
   ☐$_1$Increased
   ☐$_2$Decreased
   ☐$_3$Remained unchanged

7. What do you think are the barriers to providing timely orthopaedic surgery in your practice? (Check all that apply):
   ☐$_1$ No barriers
   ☐$_2$ Lack of OR time
   ☐$_3$ Lack of bed capacity
   ☐$_4$ Insufficient anaesthesia resources
   ☐$_5$ Insufficient nursing resources
   ☐$_6$ Restrictions on implant budget
   ☐$_7$ Already working at full capacity
   ☐$_8$ Backlog in clinic/office
   ☐$_9$ Other - Please specify _____

D. Demographic and Other Information

8a. Years in practice as an orthopaedic surgeon: _____ years

8b. Expected year of retirement: **20**_____ ☐$_{88}$Don't know

8c. Gender
   ☐$_1$ Male
   ☐$_2$ Female

8d. Date of birth: _____/____/____
   Year/ Day/ Month

This completes all of our questions. *Thank-you very much* for your help with this study. We appreciate that your time is valuable. If you are interested in a copy of the study results, please call us at *(416) 603-6269*.

Please return this questionnaire by *FAX (416) 603-6288* or in the enclosed self-addressed stamped envelope to: Arthritis Community Research and Evaluation Unit, *Attention*: Paula Veinot, Toronto Western Hospital, 399 Bathurst Street - MP10-316, Toronto, ON, M5T 2S8

Version 1.1

Appendix C. Reminder Letter

Dr. XXXX
Address

Re: Ontario Survey of Orthopaedic Surgeons of Ontario, 2006 – Reminder Letter

Dear Dr. XXXX,

A couple weeks ago you should have received a brief questionnaire on clinic locations and practice patterns of orthopaedic surgeons in Ontario. This survey is being conducted by The Arthritis Community Research and Evaluation Unit (ACREU), in partnership with the Ontario Ministry of Health and Long-Term Care and the Ontario Orthopaedic Association. The data collected will be used to develop an up-to-date picture of musculoskeletal services across Ontario.

Your response to this questionnaire is very important and may contribute to the planning and delivery of health care services in Ontario. It should take only a few minutes of your time. For your convenience, I have included another copy of the questionnaire. We would greatly appreciate if you could complete this questionnaire and return it promptly to the attention of Paula Veinot, Study Coordinator, at our **FAX** number **416-603-6288**. If you have any questions or comments regarding this survey, please contact Paula Veinot at 416-603-5800 ext. 2273 or toll free 1-866-724-0003 or by email pveinot@uhnres.utoronto.ca. If you have already returned your completed questionnaire, thank you.

Sincerely,

Nizar Mahomed, MD ScD FRCS(C)
Orthopaedic Surgeon
Investigator, ACREU

Peter Schuringa, MD
Orthopaedic Surgeon
President, Ontario Orthopaedic Association

Appendix D. Telephone Script

Telephone contact is to be made with the Administrative Staff two weeks following the reminder letter.

Script

A couple weeks ago Dr. XXXX should have received a brief questionnaire on clinic locations and practice patterns of orthopaedic surgeons in Ontario. This survey is being conducted by The Arthritis Community Research and Evaluation Unit (ACREU), in partnership with the Ontario Ministry of Health and Long-Term Care and the Ontario Orthopaedic Association. The data collected will be used to develop an up-to-date picture of musculoskeletal services across Ontario.

To date we have not received a response from Dr. XXXX. His/Her response to this questionnaire is very important and may contribute to the planning and delivery of health care services in Ontario. It should take only a few minutes of his/her time.

We would greatly appreciate if you could remind him/her to complete this questionnaire and return it promptly to the attention of Paula Veinot, Study Coordinator, at our ***FAX*** *number* ***416-603-6288****. If he/she has any questions or comments regarding this survey, please contact Paula at 416-603-5800 ext. 2273 or toll free 1-866-724-0003 or by email pveinot@uhnres.utoronto.ca .*

Appendix E. Email Reminder

Dear Dr. XXXX,

Within the past few months you were mailed a brief questionnaire from the Arthritis Community Research and Evaluation Unit (ACREU) in partnership with the Ontario Ministry of Health and Long-Term Care and the Ontario Orthopaedic Association. The questionnaire asks about practice patterns and clinic locations to develop an up-to-date picture of orthopaedic services across Ontario so that gaps in services may be identified.

I appreciate that your time is valuable. However, your participation in this study may have an impact on the future planning and delivery of health care services for persons in Ontario, in particular orthopaedic surgery. I would greatly appreciate if you could complete the questionnaire (attached to this email) by **Date**. Please return it to Paula Veinot, Study Coordinator, FAX number 416-603-6288.

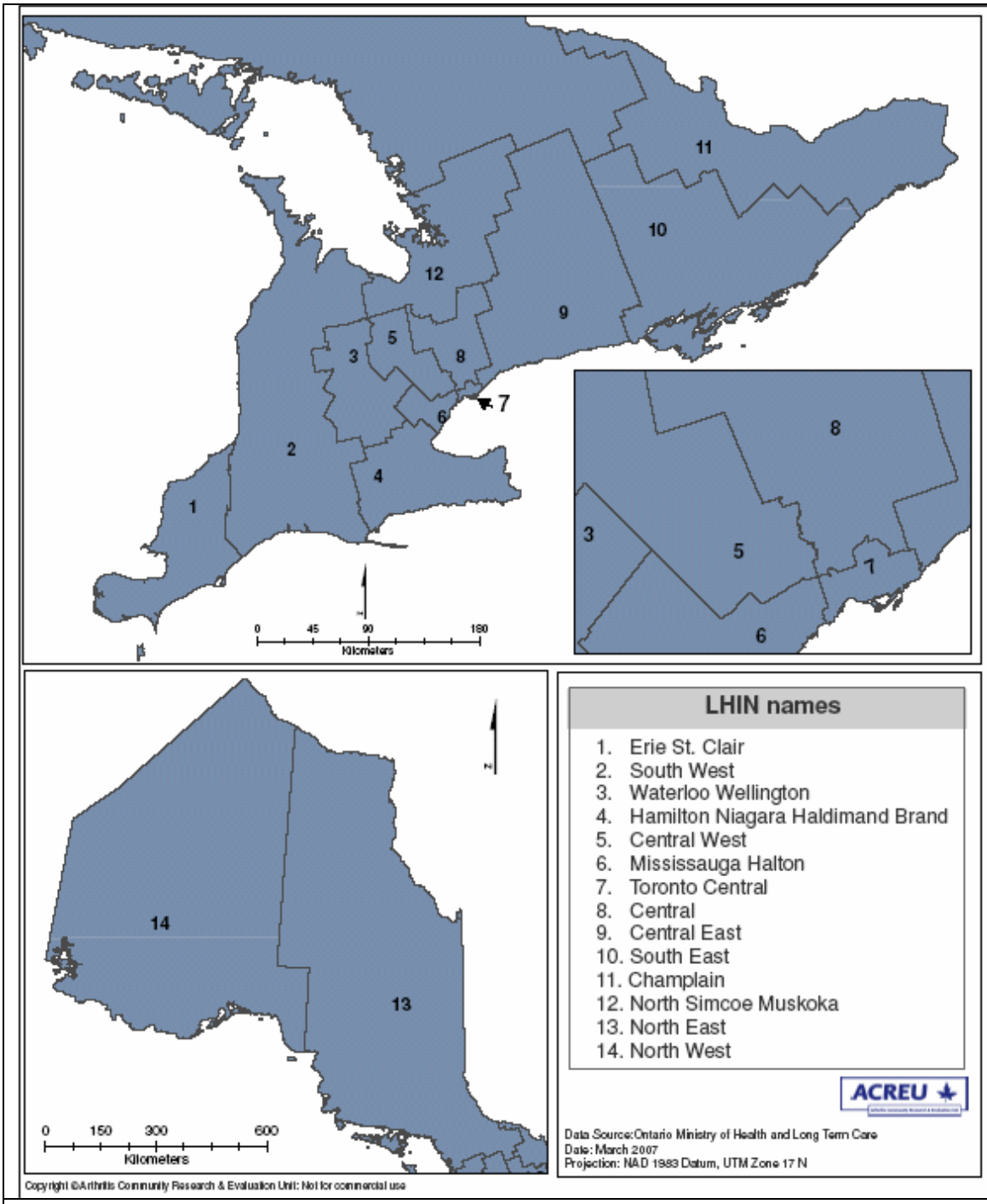
If you have any questions or comments regarding this survey, please email me at Nizar.Mahomed@uhn.on.ca or contact Paula Veinot at 416-603-2273 or toll free 1-866-724-0003 or by email pveinot@uhnres.utoronto.ca.

Thank you for your support in this very important research endeavour.

Sincerely,

Nizar Mahomed, MD ScD FRCS(C)
Orthopaedic Surgeon
Investigator, ACREU

Appendix F. Ontario Map of Local Health Integration Network (LHIN) Boundaries



Map of Ontario with Local Health Integration Network boundaries