

**NATIONAL WORKFORCE & SERVICES REPORT**

**The National Standards Committee of the Canadian  
Orthopaedic Association 2004**

Ted Rumble & Hans J. Kreder (Co-chairs)

**June 2004**

# National Standards Committee Report COA 2004 Meeting

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY</b> .....	4
<b>FUTURE GOALS &amp; OBJECTIVES (Action Plan)</b> .....	7
<b>NEW MANDATE REQUESTED BY BOARD</b> .....	7
Preamble .....	8
Committee Infrastructure .....	8
NSC Membership.....	8
Meetings.....	8
Governance .....	8
Mandate of the NSC.....	8
<b>CURRENT MEMBERS</b> .....	9
<b>CURRENT PRIORITIES</b> .....	9
Workforce: .....	9
Resources: .....	9
<b>HOW MANY SURGEONS DO WE NEED IN CANADA</b> .....	9
Introduction:.....	9
The Effect of Population Demographics.....	10
<b>HOW MANY SURGEONS DO WE HAVE IN CANADA?</b> .....	11
Introduction:.....	11
Should the COA generate its own number?.....	12
Which number should we use? .....	12
CIHI Estimates of Orthopaedic Workforce and Activity.....	12
Orthopaedic Surgeons “Available”.....	12
Orthopaedic Surgeons in Active Practice: .....	12
Orthopaedic Surgeons in Full Time Practice .....	13
Orthopaedic Surgeon Full Time Equivalents.....	13
Orthopaedic Surgeons per 100K Population.....	13
Activity Ratio.....	14
<b>TRENDS IN ORTHOPAEDIC WORKFORCE RESOURCES</b> .....	14
Raw Number of Surgeons and FTE .....	14
Surgeons per 100K Population .....	16
Activity Ratio.....	17
<b>HOW MANY ORTHOPAEDIC SURGEONS ARE ADDED EACH YEAR?</b> .....	18
Training Programs .....	18
Immigration.....	18
<b>HOW MANY ORTHOPAEDIC SURGEONS ARE LOST EVERY YEAR?</b> .....	19
Emigration .....	19
Retirement .....	20
<b>WHAT IS THE NET GAIN / LOSS IN ORTHOPAEDIC SURGEONS EACH YEAR?</b> .....	21
<a href="#">Projections Model</a> .....	22

<b>WHAT IS THE CURRENT SHORTAGE OF ORTHOPAEDIC SURGEONS? ....</b>	<b>28</b>
<b>Raw Numbers &amp; FTEs .....</b>	<b>28</b>
<b>Operating Time per 100K Population.....</b>	<b>28</b>
<b>FUTURE DIRECTIONS.....</b>	<b>29</b>
Refinement & Updates of Workforce & Resource Requirements:.....	29
Practice Requirements: .....	29
Quality of Care.....	29
<b>APPENDIX:.....</b>	<b>30</b>
<b>FTE Calculations .....</b>	<b>30</b>

## **EXECUTIVE SUMMARY**

The National Standards Committee has undertaken to evaluate current and future orthopaedic workforce requirements using the best available data from Canadian, US and international sources. The following conclusions are supported:

- 1. The Canadian population is severely under-serviced with respect to Orthopaedic services**
  - a. Waiting times for elective orthopaedic consultation and surgery are the longest of any surgical specialty. There is evidence that the population demands for orthopaedic services will grow significantly in the future due to:
    - i. Ageing of the population (older individuals require more orthopaedic services such as hip and knee replacement surgery
    - ii. Unmet need for certain services such as hip and knee replacement has been demonstrated even in areas where a high population rate of joint replacement surgery is carried out.
    - iii. Expanding indications for orthopaedic surgical procedures. For example, joint replacement is now offered to an increasing number of individuals at the extremes of age (both older and younger).
- 2. Population under-servicing is primarily due to resource restrictions; especially operating room resources**
  - a. *The current workforce could be used more efficiently.* While more orthopaedic surgeons are needed, the current workforce could be used more efficiently to improve patient access to orthopaedic services if more resources were made available. In Canada, orthopaedic surgeons spend only 1/3 of their time operating, with 2/3 of their time taken up by services that could be provided by less expensive healthcare professionals. The main limiting resource is access to the operating room for the provision of surgical care, which is the main service that orthopaedic surgeons provide that cannot be delegated to other healthcare providers.
  - b. *Orthopaedic surgical skills are under-utilized.* As a community, orthopaedic surgeons are working at only 85% of FTE capacity on average due to resource restrictions. While a few surgeons are working at above one FTE, an ever increasing number of surgeons are working at well below a full time equivalent level.
  - c. *Improving resource availability would have a positive effect on surgeon retention in Canada.* Resource access is listed as the primary reason for surgeons leaving Canada to practice in the US.
- 3. More operating time and associated resources are needed to meet population demands**
  - a. Over 5000 additional operating hours per 100K population per year are required to adequately service the Canadian population.
  - b. Thus each FTE surgeon needs to have the resources to operate an additional 4 hours per week to meet the current needs of the population. This estimate considers only what we need to prevent the situation from getting worse. It does not take into consideration the existing backlog that needs to be cleared.

**4. The current critical shortage of Orthopaedic surgeons is getting worse, with ever worsening access to orthopaedic care expected unless something is done to change the trend :**

- a. Canada ranks near the bottom of our peer countries with respect to the number of Orthopaedic surgeons per population, and while more surgeons are definitely needed the most significant barrier for patients in accessing orthopaedic care is the availability of resources.
- b. Projections show that the number of orthopaedic surgeons per population is continuing to shrink over time from the current 3.6 practicing surgeons per 100K population to 3.1 practicing surgeons per 100K population over the next 10 years.
- c. To serve the population needs, an additional 440 orthopaedic surgeons are needed immediately in Canada with sufficient resources to practice at a full time equivalent level.

**Strategies for improving access to elective orthopaedic care must include:**

*Short Term*

1. More elective operating resources to serve the Canadian population
  - a. Run existing rooms longer or on weekends
  - b. This will improve access to care immediately
  - c. By making it more attractive for surgeons to stay in Canada, the workforce shortage will also be improved
  - d. Potential barriers include:
    - i. Operating room nurses are in short supply
    - ii. Anaesthetists are in short supply
    - iii. Competition with cardiac and general surgical services as well as urgent and emergent fracture care.
  - e. Dedicated funding for priority underserved procedures such as total hip and knee replacements where costs are relatively predictable.
2. Better utilization of the existing workforce
  - a. Physician assistants would allow the existing workforce to be more productive by freeing up surgeons to operate.
  - b. Surgical technician assistants trained specifically to assist in orthopaedics could be utilized to maximize efficiency of the operating room at reasonable cost.
  - c. Nurse anaesthetists could be utilized for routine anaesthesia procedures
3. Better utilization of other existing resources
  - a. Care pathways for common procedures such as hip and knee replacements
    - i. Potential for cost saving with homecare support versus inpatient rehabilitation
  - b. Local referral partnerships to send tertiary care cases to appropriate centres, and other cases to community centres
    - i. Potential for regionalized waiting lists for certain procedures such as total joint replacement surgery
    - ii. Follow example of “criticall” for specialty fractures such as pelvic and spine fractures

- iii. Establish community based regional centres for common fractures such as hip fractures with streamlined geriatric and homecare support for maximal efficiency.
- 4. Bringing more trained surgeons into Canada
  - a. Training more surgeons in Canada takes time. By increasing the number of qualified immigrant orthopaedic surgeons, immediate improvement in access to care will be achieved.
  - b. Adequate operating room time and associated resources need to be made available to all surgeons to improve orthopaedic service provision to the Canadian population.

*Long Term*

- 1. More Orthopaedic training positions need to be added immediately to ensure availability of Canadian trained surgeons in the future.
  - a. Even if residency positions were doubled immediately, the need for surgeons now would not be met for many years. More training positions must be considered in the long term strategy however, and should be introduced immediately.
  - b. Training more surgeons will not provide better service to the community unless all surgeons have adequate operating room time and associated resources made available to them.

**Evaluation of Initiatives:**

Implementation of short and long term plans must be monitored to determine the effectiveness of the intervention.

- 1. The number of hours elective operating time /100K population must be monitored over time to ensure that resources are being allocated appropriately.
- 2. The number of FTE surgeons / 100K population should also be monitored using CIHI data, with appropriate adjustment to the future projections to ensure appropriate supply (avoid under-supply and potential over-supply) of surgeons into the future.
- 3. Waiting times and length of stay following treatment for certain sentinel services should be monitored over time:
  - a. Waiting times for elective orthopaedic consultation (OJRR wait times for consultation re: total joint replacement)
  - b. Waiting times for elective surgery (OJRR wait times for total joint replacement from time of decision for surgery)
  - c. Wait times for “elective” fracture surgery (hip fracture, ankle fracture, specialty fractures such as pelvis and spine)
  - d. Inpatient length of stay for sentinel services (percentage of outpatient surgery for certain procedures such as ankle and wrist fractures)
- 4. Quality of care and complications
  - a. Patient function after total joint replacement (OJRR)
  - b. Complications including readmission for sentinel services.
- 5. Cost
  - a. Healthcare expenditures for the various initiatives versus benefits

### **FUTURE GOALS & OBJECTIVES (Action Plan)**

Having submitted its report to the COA Board, the implementation of the suggestions above is left to the Board, however the National Standards Committee undertakes to monitor the effect of initiatives aimed at improving provision of orthopaedic services to the Canadian population as noted above, and in so doing will continuously update and refine the model of service and workforce projections in conjunction with the Canadian Medical Association.

The National Standards Committee has identified several action items dealing with the issue of the orthopaedic workforce, which will be addressed further:

1. **Model Refinement;** In conjunction with the Canadian Medical Association, and with the assistance of Lynda Buske, the NSC will help to refine the workforce projections model by considering surgical activity FTEs separate from consultations and other non-surgical services. This will allow a more accurate reflection of retirements from surgical activity, and the amount of surgical time available to those in active practice. At present, all surgeons who bill the provincial plans are counted as active, even if they do not provide surgical services to the community. David Pitman will be pursuing this analysis. CIHI may request reimbursement for providing this data.
2. **Physician extenders / assistants;** Dr. Stothers will put together an ad hoc committee to address this issue, and report to the NSC.
3. **France as a case study of resources versus surgeon supply;** The importance of resources versus simply more surgeons is underscored by the French situation. Despite having fewer surgeons per population than Canada, France does not have a waiting list problem. Committee members familiar with the situation in France felt that this was due to the large amount of operating time available to surgeons in France. Sweden apparently faces the opposite situation with a very large number of surgeons per population but with little operating time per surgeon. Dr. Fallah will look into this issue further through colleagues in France. David Pitman will obtain more data on Sweden and other countries with respect to operating time per population and per surgeon.

### **NEW MANDATE REQUESTED BY BOARD**

Further clarification will be sought from the Board regarding the new mandate. The Board has requested that the NSC address the issue of benchmarks for waiting times of certain operative procedures. A draft research methodology for this mandate has been drafted and will be circulated to the NSC members for refinement and then to the Board for approval before proceeding.

## **TERMS OF REFERENCE REVIEW (adopted Jan 2002)**

### **Preamble**

The National Standards Committee (NSC) shall formulate policy recommendations with respect to acceptable national standards related to the practice of Orthopaedic Surgery. The best available scientific evidence will be considered in the development of these recommendations. Committee performance will be measured by the achievement of goals and objectives within specified timelines.

### **Committee Infrastructure**

The NSC will guide and supervise the collection and synthesis of data by research scientists. The committee will synthesize this information into recommendations to be presented to the COA Board.

### **NSC Membership**

The committee shall consist of approximately eight members that are representative of rural and urban, teaching and non-teaching practice settings. Committee members, including a chair (and possibly a vice-chair), are appointed by the COA executive to a six year term. One of the committee members shall serve as chair for a term of two years, with an internal review after one year. For the first six years of the committee's existence, members may rotate off the committee between three and six years to stagger membership for the sake of continuity, provided that at least four of the original members remain.

### **Meetings**

The National Standards Committee will meet a minimum of four times per annum, usually by teleconference, but on at least one occasion in person at the Annual General Meeting of the Canadian Orthopaedic Association. The committee will schedule meetings and/or telephone conference calls as deemed necessary to meet the timelines.

### **Governance**

The members of the National Standards Committee will report to the Chair (and Vice Chair), and through him/her to the Board on at least a semi-annual basis, normally at the time of the Annual General and Mid-year Meetings.

### **Mandate of the NSC**

- Linkages with other COA committees to maximize efficient use of resources for the acquisition and synthesis of data.
- The committee shall develop and continuously update a two-year plan for research priorities for the development of standards regarding surgeon supply, resources and working conditions, surgeon responsibilities, and evidence based practice.
- The committee undertakes to supervise the conduct of research necessary to develop recommendations regarding priority issues

- The committee undertakes to evaluate and present the level of scientific evidence along with any recommendations it makes to the Board regarding standards.
- The committee will submit a budget to the COA executive on an annual basis to secure the resources needed to achieve the committee's objectives and mandate.

## **CURRENT MEMBERS**

Hans J. Kreder & Ted Rumble (co-chairs), Andrew Berkshire; Brendan Lewis; Keith Stothers; Michael Dunbar; Michel Fallaha; Nizar Mahomed; Peter MacDonald

## **CURRENT PRIORITIES**

### **Workforce:**

- How many Orthopaedic surgeons do we need in Canada?
- How many Orthopaedic surgeons do we have in Canada?
- What is the net gain or loss each year?
  - How many are added each year?
  - How many are subtracted each year?
- What will be the projected situation over the next 20 years?
- What can we do now?
  - To address the immediate shortfall?
  - To address the future needs?

### **Resources:**

- What resources are required for orthopaedic services in Canada?

## **HOW MANY SURGEONS DO WE NEED IN CANADA**

### **Introduction:**

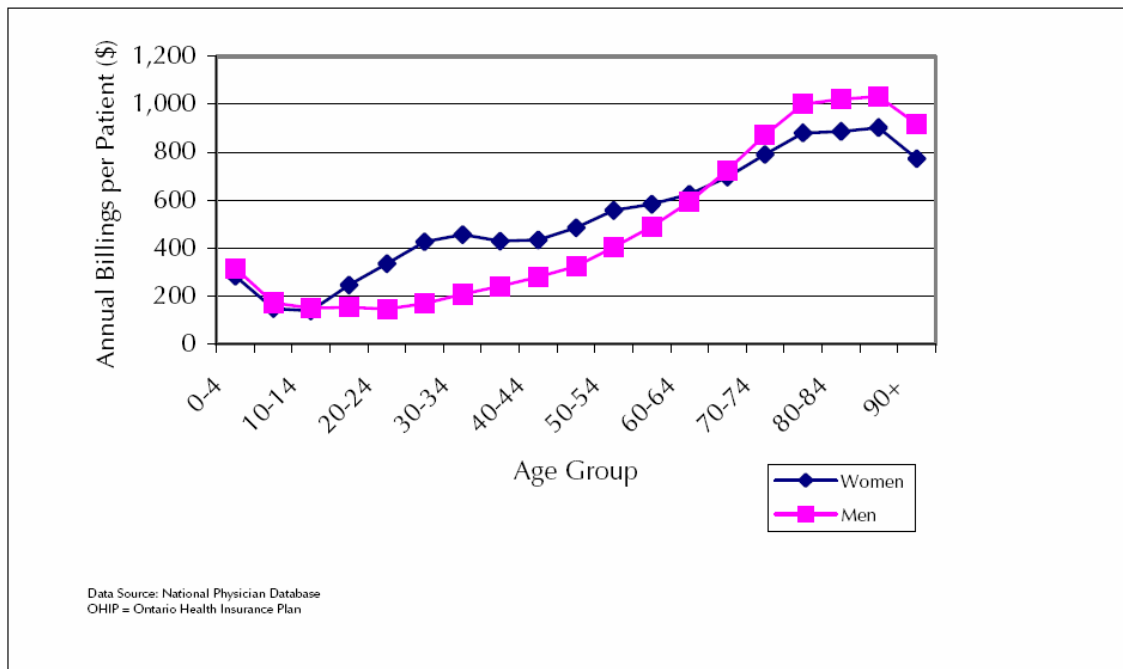
The answer to the question of how many surgeons we need in Canada depends on the availability of resources and the practice decisions of individual surgeons. Given more elective operating hours and all of the associated perioperative resources, a given number of surgeons are capable of providing more surgical services to the population, with a consequent impact on long waiting lists. We must consider, however that Orthopaedic surgeons do not only provide elective surgical services, but also consultations and reviews, on call services, and a variety of administrative, teaching and other non-clinical services. Moreover, surgeons may choose a non-operative practice, or even a part-time practice for reasons of health, age or lifestyle. Previous studies have found no association between the raw number of surgeons and surgery rates (Roos, Fransoo, 2001). We have chosen therefore to consider service requirements from the population perspective and to then model the workforce and resource requirements accordingly. This provides for more flexibility in the system, retains surgeon choice regarding the type of preferred practice

and could be applied in both teaching and non-teaching environments. This novel concept is being addressed with a CHSRF grant, however it is clear that we need to provide some data before this project has come to fruition. The model will be updated as more precise scientific data is available, however the information presented below represents the best possible estimate of various parameters as well as the consensus of the NSC based on a review of the available data.

### The Effect of Population Demographics

Population demands for healthcare services vary by age and gender as shown in the simple relationship of Ontario billings to population age and sex.

Exhibit 2: Age/Sex-specific Average Annual OHIP Billings per Patient, 1997/98



Using a model of demand for various orthopaedic services by age and gender distribution, Lee (Lee et al., 1998) suggested that the US population demand for orthopaedic services in 1998 was:

**Between 5.4 and 5.6 FTE surgeons per 100K population.**

This calculation included:

Between 3.3 and 3.4 operative FTEs per 100K population

Between 2.0 and 2.1 medical FTEs per 100K population

One total FTE was defined as a surgeon with an average of 2200 hours annually of direct patient care. Thus a population of 100,000 population would require approximately  $5.5 \times 2200 = 12,100$  hours of direct orthopaedic patient care per year. 62% of this time is operative. Thus **7502 operative orthopaedic hours annually are required per 100K population.**

Given the changing population demographics, the demand for orthopaedic services in 2010 is estimated to be slightly greater, especially in operative time requirements. The 2010 estimate is that the US will require:

**Between 5.4 and 5.6 FTE surgeons per 100K population**

Between 3.4 and 3.5 operative FTE per 100K population

Between 2.0 and 2.1 medical FTE per 100K population

We feel that future projections in Canada based on current utilization are probably a severe under-estimate of true need for the following reasons:

1. Current utilization does not reflect need. There is unmet need in the community with respect to orthopaedic services (Hawker et al., 2001; Hawker et al., 2002; Hudak et al., 2002).
2. The population is ageing and therefore will require more services simply because there are more aged individuals to care for (StatsCan 2001 Catalogue: 96F0030XIE2001002).
3. Orthopaedic services are being extended into older and younger age groups all the time, leading to more service requirements for a given population (ICES arthritis Atlas 1998).
4. The orthopaedic workforce is ageing and the older surgeons perform at less than 1 FTE (Chan, B.; What Happened to Canada's Physician Workforce in the 1990s?, CIHI 2002).
5. There are a slow but ever increasing number of female orthopaedic surgeons entering practice. Previous research has shown that women do not function at 1 FTE during their practice lifespan for a variety of reasons (Chan, B.; What Happened to Canada's Physician Workforce in the 1990s?, CIHI 2002).

## **HOW MANY SURGEONS DO WE HAVE IN CANADA?**

### **Introduction:**

There are many provincial and national organizations (CMA, CMPA, OMA Provincial medical and Orthopaedic Associations, RCPS & other colleges, Provincial MOH, Southam, CIHI, OPHRDC & other provincial bodies) that have estimates of the number of orthopaedic surgeons; however there is no single authoritative number.

Conceptually, how many surgeons are required to serve the population depends on how much work each surgeon is able to do. A raw "head count" of all qualified Canadian orthopaedic surgeons includes individuals who are retired, working part-time, or in practice outside Canada. Ideally one would consider each surgeon's FTE time spent on consultative work, on elective surgery, on call and emergency work, etc. when considering orthopaedic surgeon workforce resources. The amount of FTEs for each of these activities changes over the course of a surgeon's career and depends on the type of practice (teaching versus community), and the resources (operating room time in particular) that are made available to the surgeon. The committee considered how the orthopaedic workforce might best be described and how future requirements might be modeled.

### **Should the COA generate its own number?**

The committee decided to recommend against this. While a single cross-sectional survey might generate high quality data regarding workload and FTEs in the various clinical and non-clinical areas, the expense involved in annual tracking of this statistic would be considerable, and whatever number is produced may not be accepted by policy makers.

### **Which number should we use?**

We stipulated the following requirements for a useful number to use:

1. national
2. comparable to other jurisdictions & countries
3. comparable methodology year to year
4. readily accessible
5. acceptable to policy makers

The CIHI methodology of estimation fulfills all of these requirements. Surgeons are counted in several useful ways as discussed below. Although these numbers may represent an over-estimate in some provinces, the number is accepted by policy makers and as will be demonstrated below, still makes the point that we are severely under-resourced and getting worse.

### **CIHI Estimates of Orthopaedic Workforce and Activity**

Orthopaedic Surgeons “Available”:

This category includes the total number of specialists in a given specialty that consider themselves as active or active, not in practice. Theoretically all of these individuals are available to practice in their specialty field. Specialists are defined according to designations by the Royal College of Physicians and Surgeons, the College of Family Physicians of Canada, and the Collège des médecins du Québec. Specialty codes are grouped into various categories for use in CIHI publications on the supply, distribution and migration of physicians. The individual physician record allows for a maximum of four specialties to be coded. If more than one specialty is listed, the specialist is tabulated under the most recently acquired certified specialty on the assumption that it most accurately reflects the current field of practise. Surgeon’s groupings are cross-checked with groupings used by the Canadian Medical Association. *CIHI data shows that 1150 orthopaedic surgeons were “available to practice” in Canada in 2002*

Orthopaedic Surgeons in Active Practice:

Beginning with the total number of available surgeons, and eliminating those who do not bill the provincial plans gives rise to the number of surgeons that are actively practicing fee for service medicine. Surgeons not billing (or shadow billing) fee for service will not be captured using this methodology. Not all of the surgeons billing fee for service in a given year will be “full time” surgeons with respect to elective and emergency and other clinical work. Licensed fellows might bill a few surgical cases, or a semi-retired surgeon might perform a few minor operative procedures, but not really be in full time surgical

practice. *In 2002 there were 1126 orthopaedic surgeons in active clinical practice in Canada.*

#### Orthopaedic Surgeons in Full Time Practice

A count of orthopaedic surgeons in active practice represents a more precise estimate of the surgeon workforce resources available to serve a given population than a count of all certified specialists. The actual clinical activity of active surgeons with respect to various aspects of clinical practice may still be quite variable however. To overcome this problem, CIHI has articulated a standardized method of calculating a full time equivalent value based on each surgeon's clinical activity. The methodology is described in detail in CIHI publications of Full Time Equivalent Physician Activity Reports, and reproduced in part, in the appendix. Essentially a FTE is calculated based on the billings a surgeon generates as a surrogate for work activity. The committee defined Orthopaedic surgeons in full time practice for a given year as those who contributed 1FTE or greater (as defined by CIHI methodology) during that year. *In 2002 there were 585 orthopaedic surgeons in Canada who met these criteria out of the 1126 in active practice.*

#### Orthopaedic Surgeon Full Time Equivalent

Each surgeon is assigned an FTE based on their productivity as described in the appendix. Those surgeons falling within a given activity range are assigned an FTE value of 1. Surgeons with less than 1 FTE activity are contribute the proportional fractional amount to the overall FTE, while surgeons above 1 FTE are counted as the logarithm of their FTE value to avoid over-estimating the FTEs available due to a few high billing surgeons. *In 2002 orthopaedic surgeons contributed a total of 957.31 FTEs.*

#### Orthopaedic Surgeons per 100K Population

This calculation considers the workforce proportionate to the population it serves. Any of the workforce numbers above may be used. The following Surgeon to Population ratio numbers are for 2002.

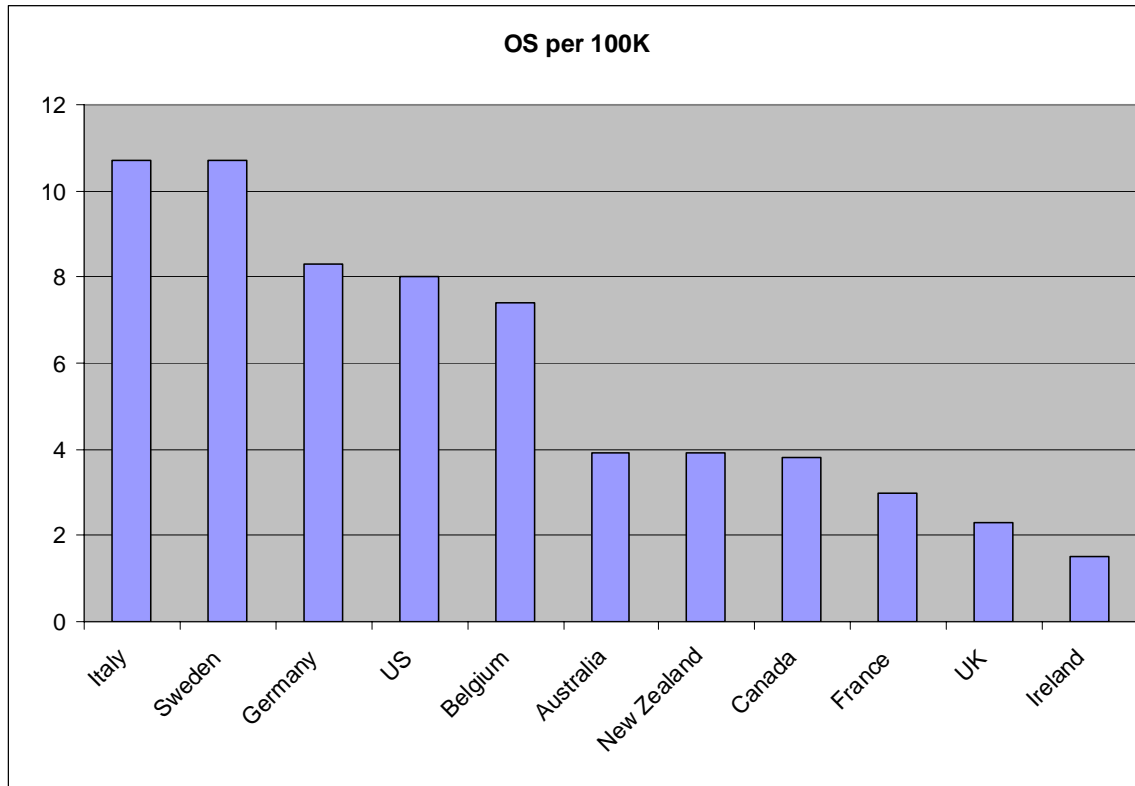
*Surgeons Available per 100K Population: 3.7*

*Surgeons in Practice per 100K Population: 3.6*

*Full Time Surgeons per 100K Population: 1.9*

*FTE Surgeons per 100K Population: 3.1*

We rank well below most other comparable jurisdictions with respect to the size of our orthopaedic workforce. Internationally, the most commonly reported number represents the number of surgeons available to practice. Some comparative data is represented below.



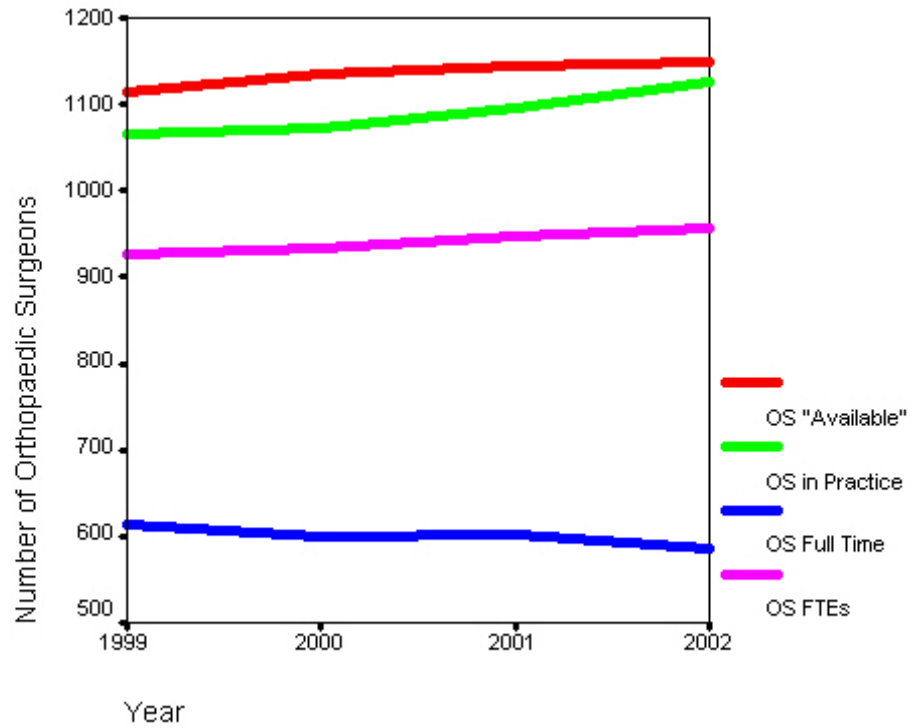
### Activity Ratio

The total FTE per specialty or discipline is an indicator of the total services delivered by the group of physicians who deliver services in that category or discipline. Those services are delivered by a defined number of physicians. The FTE/physician ratio, termed activity ratio, has been used as a measure of an average workload per physician. In 2002 the activity ratio for orthopaedic surgery services in Canada was only .85. *In other words, the average surgeon contributed only 85% FTE effort in 2002.* Again, we feel that this is mainly due to lack of access to resources for orthopaedic surgeons thus limiting their productivity. In 2002, the activity ratio for all surgical specialties was .887. In Ophthalmology, the average surgeon worked at 98.8% FTE. General surgeons worked at an average of 87.5% FTE and obstetricians at 87% FTE.

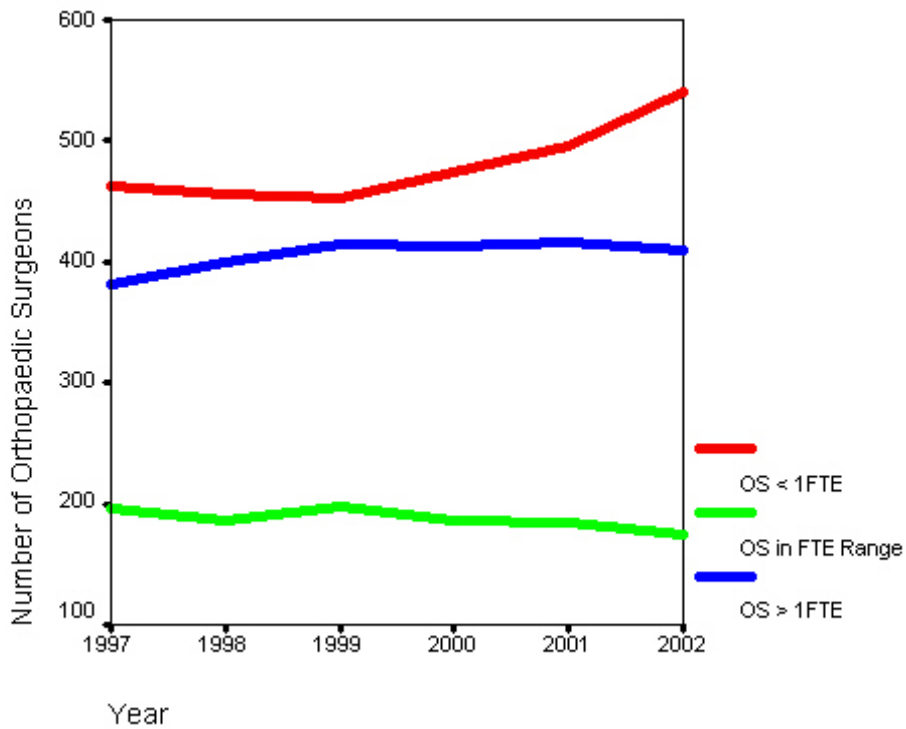
## TRENDS IN ORTHOPAEDIC WORKFORCE RESOURCES

### Raw Number of Surgeons and FTE

Between 1999 and 2002 there has been a minimal increase in the number of surgeons available to practice in Canada (Figure 1). While there has been a gradual increase in the total number of surgeons available to practice and also the number of surgeons in active clinical practice, the proportion of full time surgeons is decreasing over time. Thus the overall productivity of the orthopaedic surgeon workforce is declining. We postulate that this phenomenon is due to the under-resourcing of practicing orthopaedic surgeons with operating room access. The bottom line is that 48% of actively practicing orthopaedic surgeons in Canada are now working below 1 FTE (Figure 2)!



**Figure 1: Recent Orthopaedic Workforce Trends**



**Figure 2: Proportion of orthopaedic surgeons working below, at, or above 1 FTE.**

The trend has been very different for surgical specialties overall prior to 1999 with a gradual increase in providers with a heavy workload above 1 FTE (Figure 36). Around 1999 resource constriction appears to have brought this trend to a halt for orthopaedics.

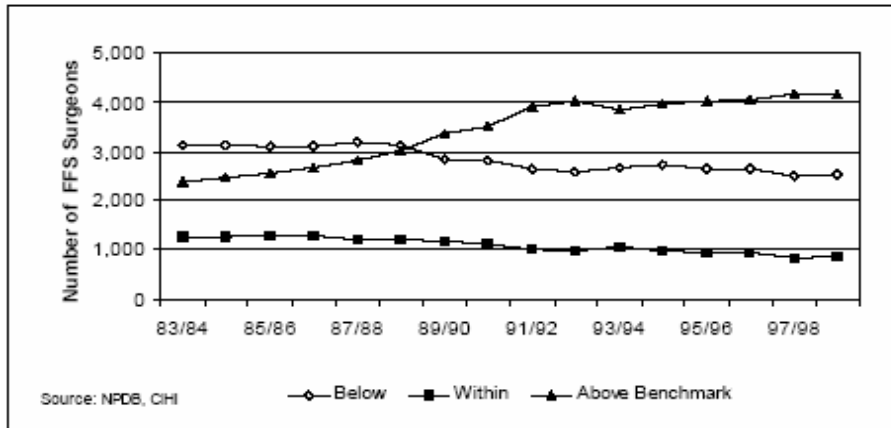


Figure 36. Number of FFS Surgical Specialist by FTE Benchmarks, 10 Provinces, 1983/84 to 1998/99

### Surgeons per 100K Population

The ratio of available orthopaedic specialists to the population has been fairly level over this brief time period, while there has been a slight increase in the ratio of practicing surgeons to the population (Figure 3). Most notably the full time surgeon to population ratio has dropped, but the number of FTEs per population has again been flat. This implies that the population is being served by more and more “part-time” orthopaedic surgeons who could do more if they had the necessary resources.

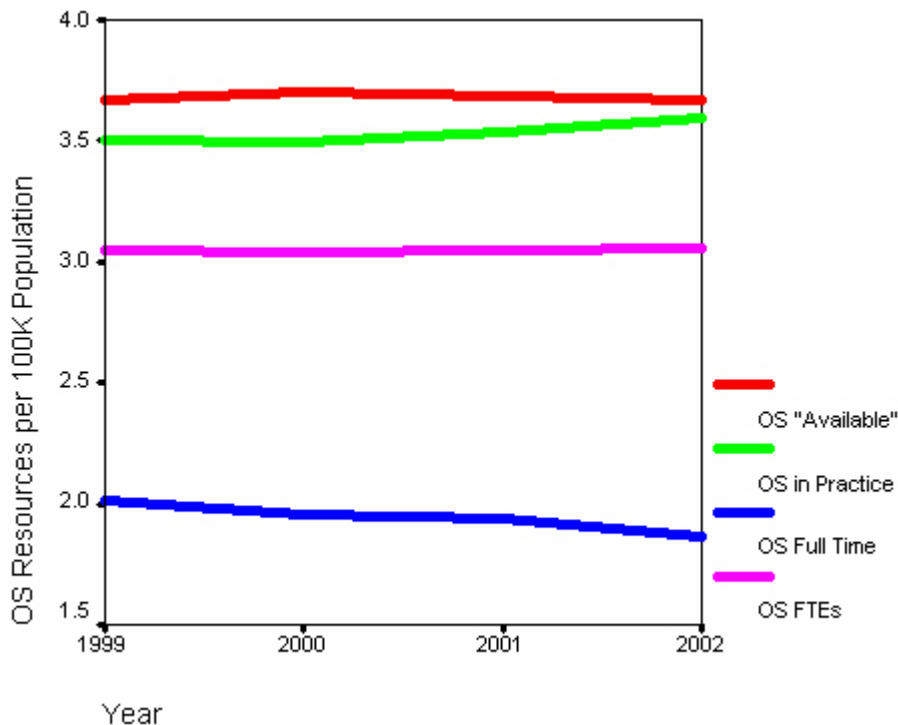
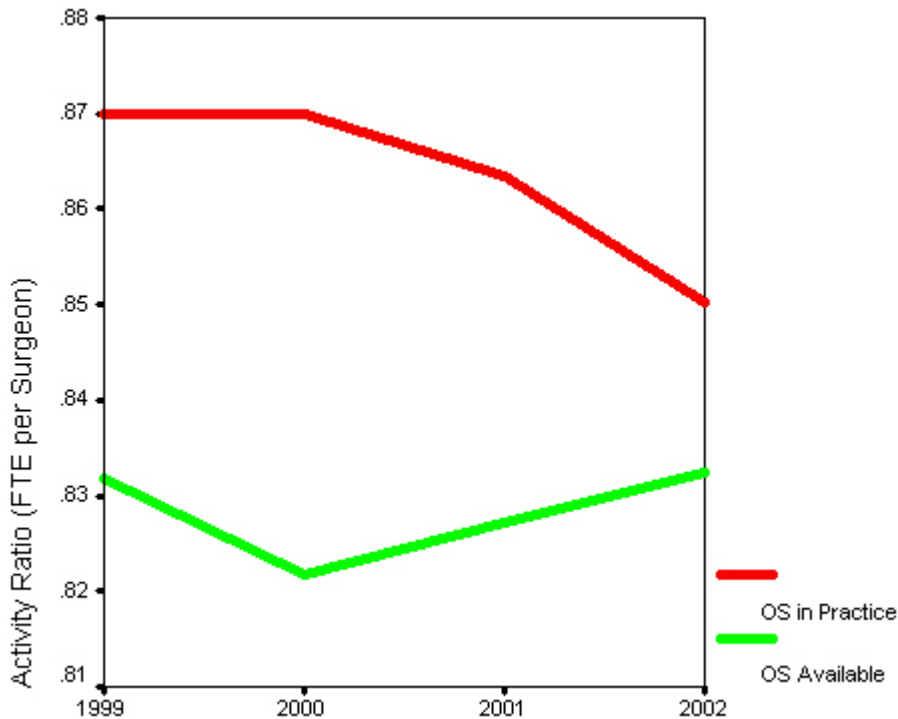


Figure 3: Orthopaedic Surgeons per 100K Population

### Activity Ratio

The total number of FTEs provided to Canadians by orthopaedic surgeons in 2002 amounted to 957.31, up from 905 in 1998. During the same time period the number of orthopaedic surgeons in active practice increased from 1041 to 1126. Thus the activity ratio dropped by 2 percent over this short time from 87% FTE provided by the average practicing orthopaedic surgeon in 1998 to 85% in 2002 (Figure 4). Considering all available orthopaedic surgeons, the activity ratio dropped in 2000 and has since returned to a value between .83 and .84. In this larger pool of surgeons there are obviously many who contribute little or no FTEs to the pool. This current trend for orthopaedics is in sharp contrast to what was happening overall for surgical specialties before 1999. The overall surgical workforce saw a gradual increase in workload to values above 1.0 (i.e. an average surgeon was working at or above 1 FTE) between 1989 and 1999 (Figure 40).



**Figure 4: Activity Ratios Over Time**

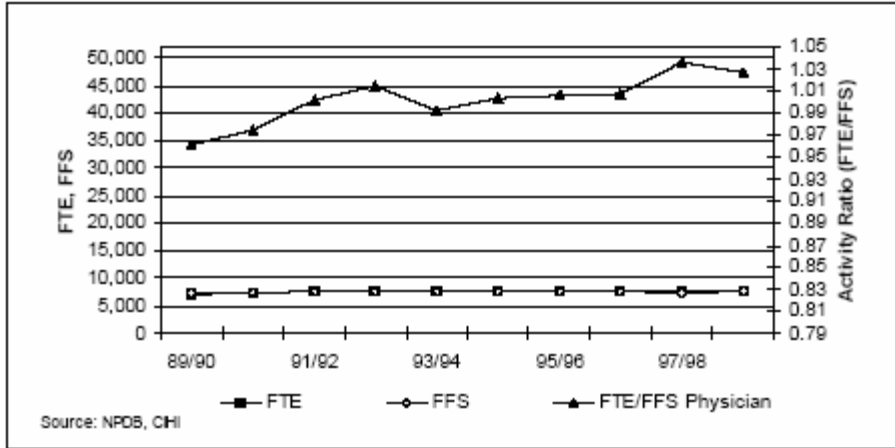


Figure 40. Physician Activity Ratios of Surgical Specialists, Canada, 1989/90 to 1998/99

### HOW MANY ORTHOPAEDIC SURGEONS ARE ADDED EACH YEAR?

It would be ideal if we knew not only how many surgeons were added each year but also what workload they would be able to take on given the available scarce resources. At this point, the best we can do is to estimate the number of additions due to immigration and graduation from the training program. The individuals may or may not represent FTE surgeons.

#### Training Programs

The average number of Orthopaedic Surgeons produced each year by Canada’s training programmes is:

45

PGY 5 (will start practice in 2003)	49
PGY 4 (will start practice in 2004)	42
PGY 3 (will start practice in 2005)	45
PGY 2 (will start practice in 2006)	46
PGY 1 (will start practice in 2007)	43
Average	45

[Data from CAPER Canadian Post MD Education Registry.

#### Immigration

The average number of Orthopaedic Surgeons that *immigrate* to Canada each year is:

9

This number is an average, and includes 7 Canadians who have returned home (e.g. did training abroad (residency or fellowship) and 2 foreigners who have trained abroad, and have qualified in Canada.

Actual numbers:

1999	9
2000	7
2001	9
2002	10

[Data from CIHI]

### **HOW MANY ORTHOPAEDIC SURGEONS ARE LOST EVERY YEAR?**

The main pathways for loss of orthopaedic surgeons are emigration and retirement. We have not attempted to model deaths during practice although this clearly does occur.

#### **Emigration**

The average number of Orthopaedic Surgeons that *emigrate* from Canada each year is

28

Actual Numbers

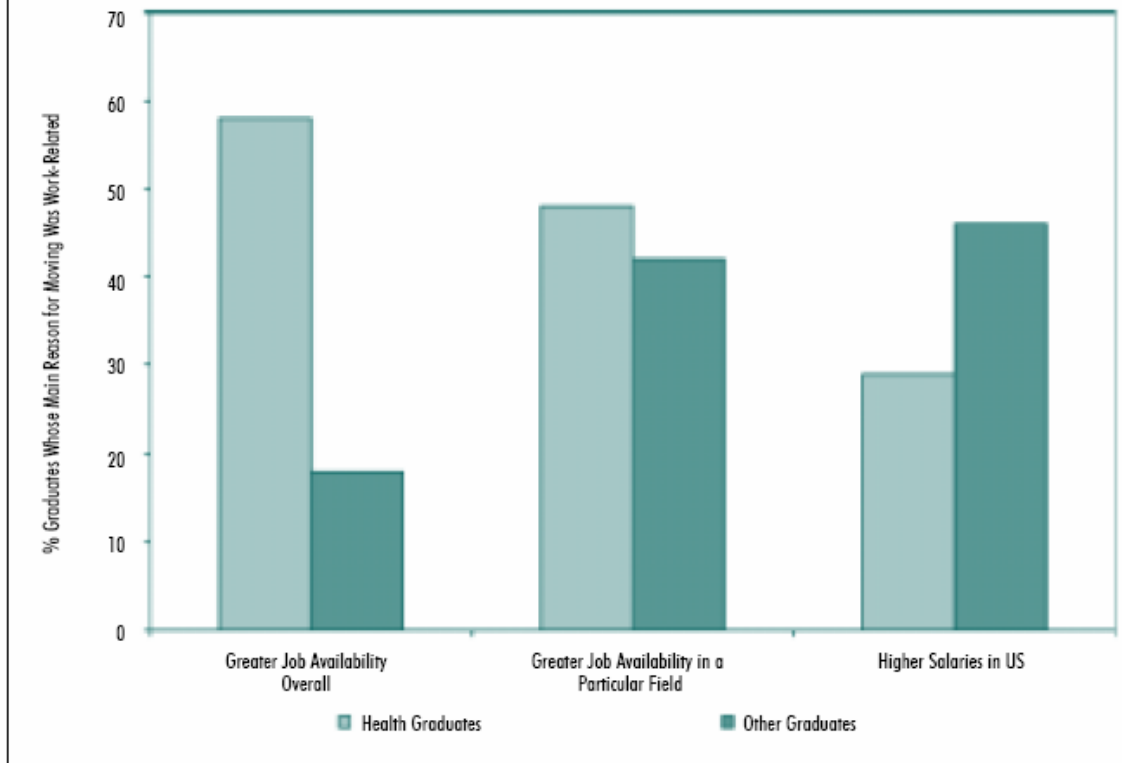
1999	31
2000	15
2001	32
2002	31

[Data from CIHI]

It seems clear that most surgeons leave because of work related issues and not higher salaries.

## Why Health Grads Went South

Over 85% of health grads from the Class of 1995 who moved to the United States did so mainly for work-related reasons. Their main reasons for moving (compared with those of graduates in other fields who moved for work-related reasons) are shown below.



Source: Frank J, Belaire E. (1999). *South of the Border*. Ottawa: Statistics Canada and Human Resource Development Canada.

## Retirement

Retirement was modeled in three different ways. The assumption for each model was that age 65 was to be considered retirement from FTE clinical practice.

**Model 1:** Since the average orthopaedic surgeon begins work at approximately age 32 and retires at 65, the average practice span is 33 years. If the age distribution is even, approximately 1/33 or 3% will retire each year.

**Model 2:** Using the actual age data compiled by the COA on active Canadian members and estimating retirement at age 65 over the next 20 years given this distribution.

**Model 3:** Using the COA dataset for all active and associate Canadian orthopaedic surgeons and estimating retirements based on age 65 over the next 20 years.

**Model 4:** Using retirement data from the CMA Masterfile.

Fortunately all four models lead to similar trends, demonstrating that our model is relatively robust. Projected orthopaedic surgeon densities from models 3 & 4 are especially close to each other. As a result, Model 4 results have not been graphed separately.

### **WHAT IS THE NET GAIN / LOSS IN ORTHOPAEDIC SURGEONS EACH YEAR?**

By modeling the dynamic additions to the pool from training programs and immigration, and the loss from the pool due to emigration and retirement, we can model the gains / losses from the pool on an annual basis (see below).

## Projections Model

Orthopaedic Manpower Projections

Year	Additions		Subtractions				
	+ PGY5s	+ immigration	model1 - retirement 3%	model2 - retirement COA (1)	model3 - retirement COA (2)	model4 - CMA retirements	
2002							
2003	49	9	34	24	22	23	28
2004	42	9	34	17	15	23	28
2005	45	9	34	19	17	21	28
2006	46	9	33	17	15	17	28
2007	43	9	33	21	16	24	28
2008	45	9	33	26	22	30	28
2009	45	9	33	22	22	27	28
2010	45	9	33	26	21	28	28
2011	45	9	32	25	20	29	28
2012	45	9	32	26	14	30	28
2013	45	9	32	24	19	21	28
2014	45	9	32	35	29	40	28
2015	45	9	32	16	13	15	28
2016	45	9	31	27	19	23	28
2017	45	9	31	22	14	23	28
2018	45	9	31	32	25	32	28
2019	45	9	31	31	27	37	28
2020	45	9	31	43	29	42	28
2021	45	9	31	27	19	26	28
2022	45	9	31	35	28		28
2023	45	9	30	39	29		28
2024	45	9	30	33	25		28
2025	45	9	30	31	28		28
2026	45	9	30	29	19		28
2027	45	9	30	30	24		28
2028	45	9	30		21		28
2029	45	9	30		25		28
2030	45	9	30				28
2031	45	9	29				28
2032	45	9	29				28

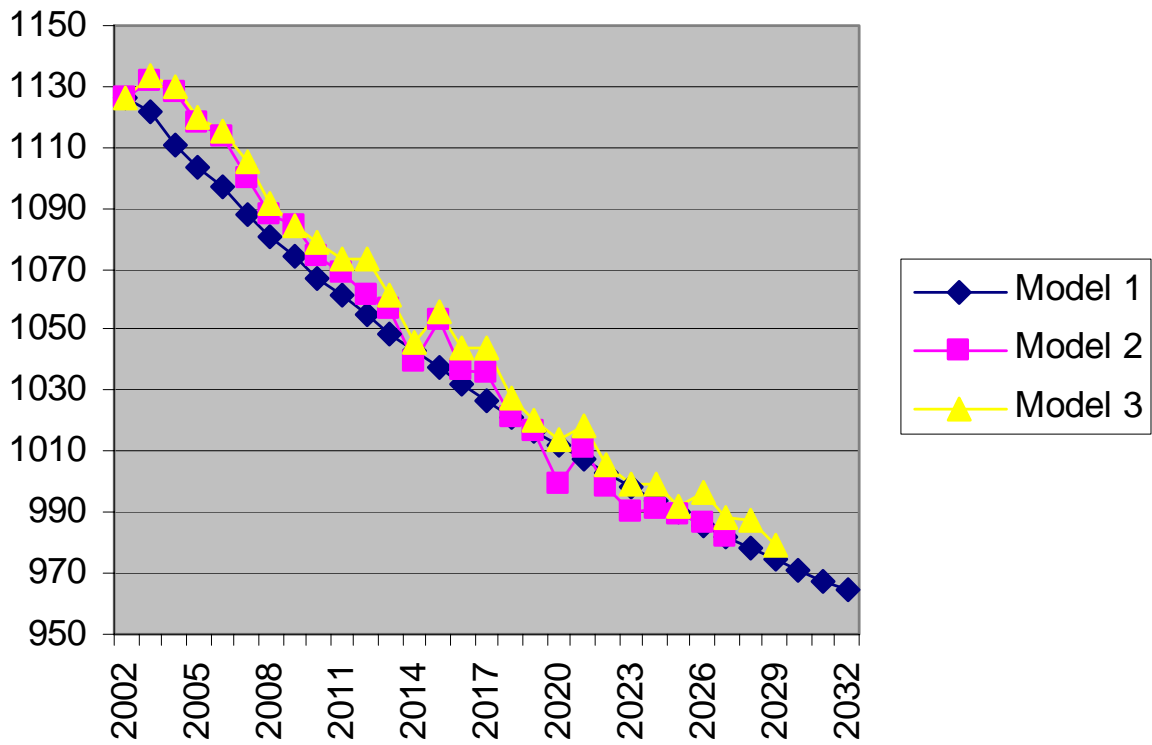
Orthopaedic Manpower Projections

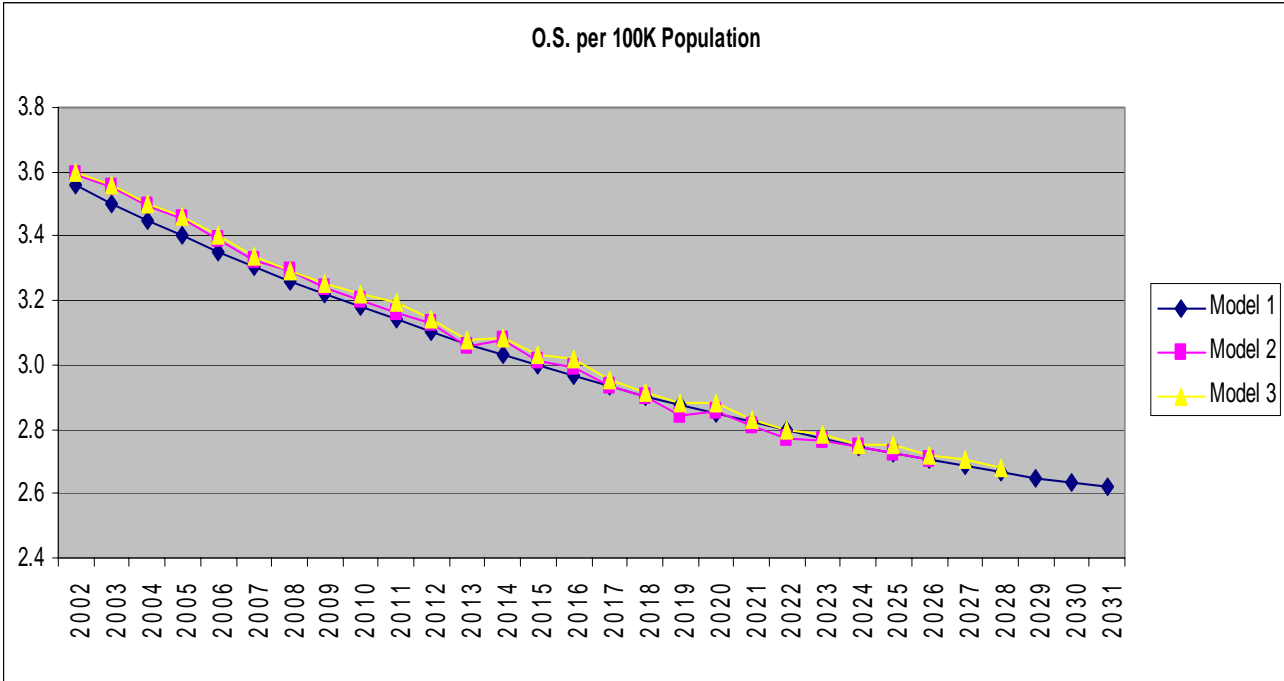
Year	model1		model2 (COA(1))		model3 (COA(2))		model4 (CMA)	
	Pool	net gain/loss	pool	net gain/loss	pool	net gain/loss	pool	net gain/loss
2002	1126		1126		1126		1126	
2003	1122	-4	1132	6	1134	8	1133	7
2004	1111	-11	1128	-4	1130	-4	1122	-11
2005	1103	-8	1118	-10	1120	-10	1116	-6
2006	1097	-6	1113	-5	1115	-5	1113	-3
2007	1088	-9	1100	-13	1105	-10	1097	-16
2008	1081	-7	1088	-12	1092	-13	1084	-13
2009	1074	-7	1085	-3	1085	-7	1080	-4
2010	1067	-7	1074	-11	1079	-6	1072	-8
2011	1061	-6	1068	-6	1073	-6	1064	-8
2012	1055	-6	1061	-7	1073	0	1057	-7
2013	1049	-6	1057	-4	1062	-11	1060	3
2014	1043	-6	1040	-17	1046	-16	1035	-25
2015	1037	-6	1053	13	1056	10	1054	19
2016	1032	-5	1036	-17	1044	-12	1040	-14
2017	1027	-5	1036	0	1044	0	1035	-5
2018	1022	-5	1021	-15	1028	-16	1021	-14
2019	1017	-5	1017	-4	1021	-7	1011	-10
2020	1012	-5	1000	-17	1014	-7	1001	-10
2021	1007	-5	1011	11	1019	5	1012	11
2022	1003	-5	998	-13	1005	-14		
2023	998	-4	990	-9	1000	-6		
2024	994	-4	991	2	999	0		
2025	990	-4	989	-2	992	-7		
2026	986	-4	987	-2	997	5		
2027	982	-4	982	-5	988	-9		
2028	978	-4			987	-1		
2029	975	-4			979	-8		
2030	971	-4						
2031	968	-3						
2032	964	-3						

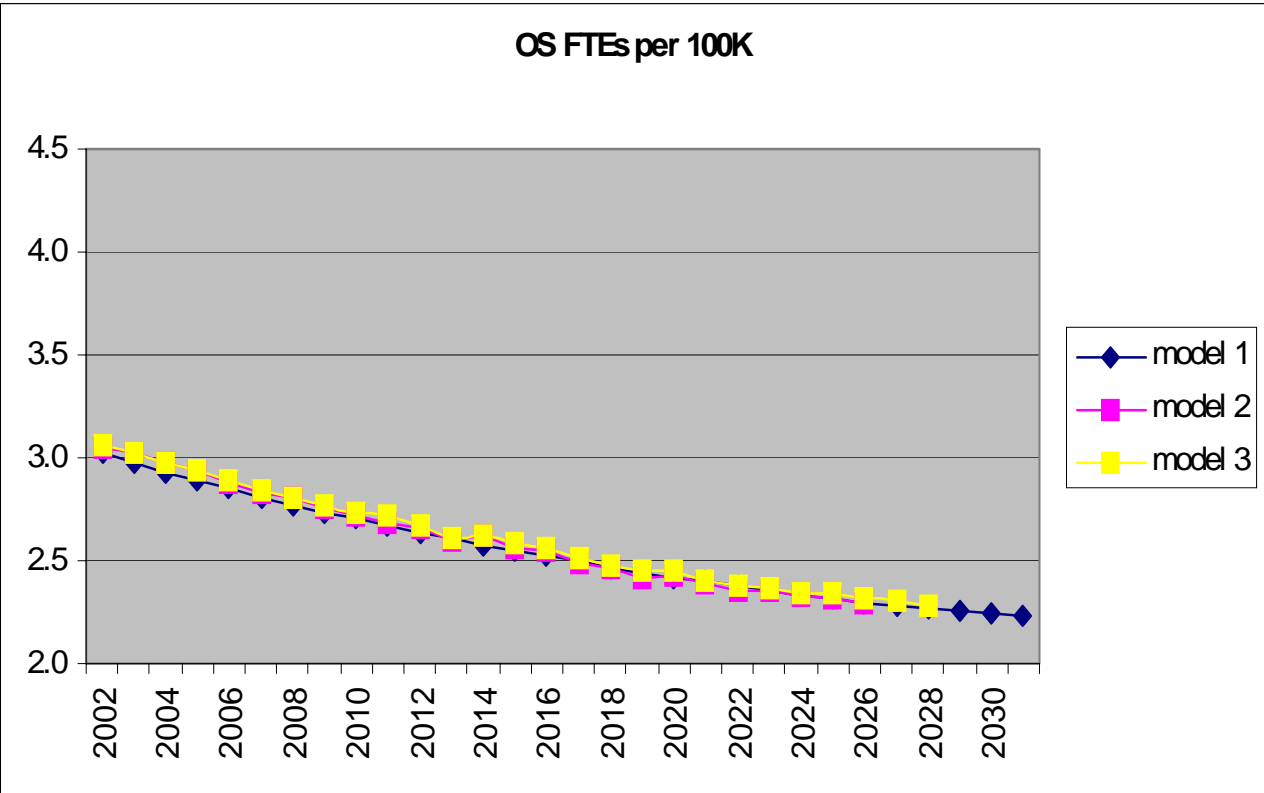
Orthopaedic Manpower Projections

Year	FTE factor	Canadian population	model 1		model2 COA(1)		model3 COA(2)		model4 CMA	
			Phys/100K	FTE/100K	Phys/100K	FTE/100K	Phys/100K	FTE/100K	Phys/100K	FTE/100K
2002		31,257,100								
2003	0.85	31,506,700	3.6	3.0	3.6	3.1	3.6	3.1	3.6	3.1
2004	0.85	31,751,600	3.5	3.0	3.6	3.0	3.6	3.0	3.5	3.0
2005	0.85	31,992,100	3.4	2.9	3.5	3.0	3.5	3.0	3.5	3.0
2006	0.85	32,228,600	3.4	2.9	3.5	2.9	3.5	2.9	3.5	2.9
2007	0.85	32,461,600	3.4	2.8	3.4	2.9	3.4	2.9	3.4	2.9
2008	0.85	32,691,300	3.3	2.8	3.3	2.8	3.3	2.8	3.3	2.8
2009	0.85	32,917,700	3.3	2.8	3.3	2.8	3.3	2.8	3.3	2.8
2010	0.85	33,141,200	3.2	2.7	3.2	2.8	3.3	2.8	3.2	2.7
2011	0.85	33,361,800	3.2	2.7	3.2	2.7	3.2	2.7	3.2	2.7
2012	0.85	33,579,400	3.1	2.7	3.2	2.7	3.2	2.7	3.1	2.7
2013	0.85	33,794,200	3.1	2.6	3.1	2.7	3.1	2.7	3.1	2.7
2014	0.85	34,006,000	3.1	2.6	3.1	2.6	3.1	2.6	3.0	2.6
2015	0.85	34,214,600	3.0	2.6	3.1	2.6	3.1	2.6	3.1	2.6
2016	0.85	34,419,800	3.0	2.5	3.0	2.6	3.0	2.6	3.0	2.6
2017	0.85	34,621,300	3.0	2.5	3.0	2.5	3.0	2.6	3.0	2.5
2018	0.85	34,818,700	2.9	2.5	2.9	2.5	3.0	2.5	2.9	2.5
2019	0.85	35,011,600	2.9	2.5	2.9	2.5	2.9	2.5	2.9	2.5
2020	0.85	35,199,500	2.9	2.4	2.8	2.4	2.9	2.4	2.8	2.4
2021	0.85	35,381,700	2.8	2.4	2.9	2.4	2.9	2.4	2.9	2.4
2022	0.85	35,557,800	2.8	2.4	2.8	2.4	2.8	2.4		
2023	0.85	35,727,200	2.8	2.4	2.8	2.4	2.8	2.4		
2024	0.85	35,889,500	2.8	2.4	2.8	2.3	2.8	2.4		
2025	0.85	36,044,100	2.7	2.3	2.7	2.3	2.8	2.3		
2026	0.85	36,190,600	2.7	2.3	2.7	2.3	2.8	2.3		
2027	0.85	36,325,500	2.7	2.3	2.7	2.3	2.7	2.3		
2028	0.85	36,448,700	2.7	2.3			2.7	2.3		
2029	0.85	36,560,200	2.7	2.3			2.7	2.3		
2030	0.85	36,660,200	2.6	2.3						
2031	0.85	36,748,700	2.6	2.2						
2032	0.85	36,826,200	2.6	2.2						

### O.S. Number Projections







## **WHAT IS THE CURRENT SHORTAGE OF ORTHOPAEDIC SURGEONS?**

### **Raw Numbers & FTEs**

Using the most conservative model, we have 1130 active orthopaedic surgeons in practice in Canada in 2004, providing a surgeon to population ratio of 3.6 active surgeons per 100K population. Each of these surgeons contributes 85% FTE on average providing for 3.1 FTEs per 100K population. The shortage can be computed as follows:

1. US Recommendations for 5.6 FTE per 100K population:  $5.6 - 3.1 = 2.5$  FTE per 100K population. Given a 2004 population of 31,714,637 this represents a raw total of 793 FTEs. If sufficient resources were made available for a full 1FTE practice per surgeon, only 793 surgeons would need to be hired, but since each surgeon contributes only an average of .85FTE, we would need 933 surgeons right now!
2. The US projections are probably an over-estimate. We feel that 4.5 FTE per 100K population is a reasonable estimate of requirements given global statistics:  $4.5 - 3.1 = 1.4$  FTE per 100K population or a total of 444 FTE or 522 85% FTE surgeons!

### **Operating Time per 100K Population**

US estimates suggest that 7502 orthopaedic operating hours per 100K population per year are required. At best, if we consider US FTE operating access as similar to Canada's we would have 3.1FTE surgeons per 100K population providing 2200 hours each of annual direct patient contact (2/3 of which is operating time in the US but only @ 1/3 of which is operating time in Canada). Operating equals  $6820 \times 3.1 \times 1/3 = 2273$  OR hours per 100K population, or a shortfall of 5229 OR hours per 100K population per year. This translates roughly into a current deficit of 3.3 operating hours per week per FTE surgeon in Canada.

The fact is, however, that in Canada we probably have only 8.2 half days per week per 100K population (Shipton et al., 2003) or  $8.2 \times 4 \text{ hours} \times 52 \text{ weeks} = 1706$  OR hours per 100K per year. Given the estimated need of 7502 OR hours/100K/yr, we would have a shortfall of 5796 OR hours/100K population/year. This translates into a current deficit of 3.7 OR hours per week per FTE surgeon in Canada.

## FUTURE DIRECTIONS

### **Refinement & Updates of Workforce & Resource Requirements:**

- More accurate data to allow better modeling.
- Updates of the model over time.
- Discussions with CMA ongoing regarding their workforce projections and modeling.

### **Practice Requirements:**

What resources should an “average” Orthopaedic surgeon be able to demand as a minimum when starting practice?

### **Quality of Care**

- Safety Issues: Signing surgical site, etc
- Evidence based guidelines: ? thromboprophylaxis for total joints (yes / no)

## Reference List

1. **Hawker, Wright JG, Coyte PC, Williams JI, Harvey B, Glazier R, Wilkins A, Badley EM.** Determining the need for hip and knee arthroplasty: the role of clinical severity and patients' preferences. *Med.Care* 2001; 39:206-216
2. **Hawker, Wright JG, Glazier RH, Coyte PC, Harvey B, Williams JI, Badley EM.** The effect of education and income on need and willingness to undergo total joint arthroplasty. *Arthritis Rheum.* 2002; 46:3331-3339
3. **Hudak, Clark JP, Hawker GA, Coyte PC, Mahomed NN, Kreder HJ, Wright JG.** "You're perfect for the procedure! Why don't you want it?" Elderly arthritis patients' unwillingness to consider total joint arthroplasty surgery: a qualitative study. *Med.Decis.Making* 2002; 22:272-278
4. **Lee, Jackson CA, Relles DA.** Demand-based assessment of workforce requirements for orthopaedic services. *J.Bone Joint Surg.Am.* 1998; 80:313-326
5. **Roos, Fransoo R.** How many surgeons does a province need, and how do we determine appropriate numbers? *Healthc.Manage.Forum* 2001; 14:11-21
6. **Shipton, Badley EM, Mahomed NN.** Critical shortage of orthopaedic services in Ontario, Canada. *J.Bone Joint Surg.Am.* 2003; 85-A:1710-1715

## APPENDIX:

### FTE Calculations

#### *Conceptual Model*

All measures of full-time equivalence are to some degree arbitrary, in the sense that there is no best measure to be derived through statistical techniques. The choice of a measure was therefore determined by the objectives, and by data availability. The measure developed by the Working Group was based on the following conceptual model.

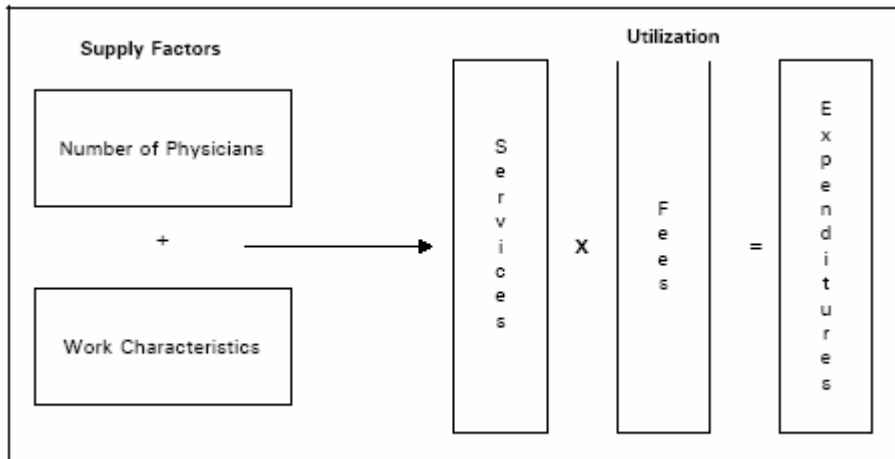


Figure 1. Relationship between income and FTE values

In an economic context, physicians and hours of work are seen as measures of supply. Services produced by physicians are the most basic measure of utilization, while expenditure is the product of services and fees. The relationship between these three variables is illustrated in Figure 1. The realistic choices for estimation of full-time equivalence were:

(1) hours of work, (2) services provided, and (3) payments.

An internal study indicated a high degree of variability in income per hour worked by fee-for-service physicians, after standardizing for specialty. Consequently, a FTE measure based on hours of work would not provide accurate estimates of the *potential output* (in terms of clinical services) of the physician population. As FTE measures are used most often in a context where output or expenditure is an important consideration, it was decided that a measure of output would be preferable to hours of work, which is essentially an input measure. Although services are measures of output, they are not weighted for intensity or value. Expenditure measures services weighted by fees. Payments to physicians were therefore chosen as the most appropriate measure of output with which to determine full-time equivalence.

#### *Rationale*

In the model adopted, gross income per physician is used to measure output or workload. As there is a wide range of output among physicians within the same specialty, a single cut-off to measure full-time equivalence status did not seem appropriate. It was therefore decided to use a range of output that would be realistic for a typical full-time physician.

It was essential that this range could be defined statistically, and after some experimentation the 40th to 60th percentiles of fee adjusted, nationally defined payment distributions were chosen as the benchmarks within which to measure full-time equivalence. Simulations of alternative percentiles indicated that the FTE counts were relatively insensitive to different benchmark ranges, as long as those ranges were symmetric (e.g. the 30th to 70th percentiles yielded approximately the same total counts as the 40<sup>th</sup> to 60th percentiles).

### *Comprehensiveness*

CIHI's current FTE methodology is designed to provide a weighted count of all physicians providing fee-for-service care under the Canadian medicare system. Physicians with payments less than the lower benchmark are counted as fractions of a FTE; physicians within or equal to the benchmarks are counted as one; and physicians above the benchmark are counted as more than one FTE. The decision to count physicians above the benchmark as more than one FTE was based on a recognition that many physicians have large workloads and the FTE measure should reflect this. At the same time, an algorithm incorporating logarithms was used to prevent high-income physicians from having a very large FTE (for example, a physician whose income is three times the upper benchmark will have a FTE of 2.1, while a physician whose income is four times the upper benchmark will have a FTE of 2.4). The relationship between income and FTE count is illustrated in Figure 2.

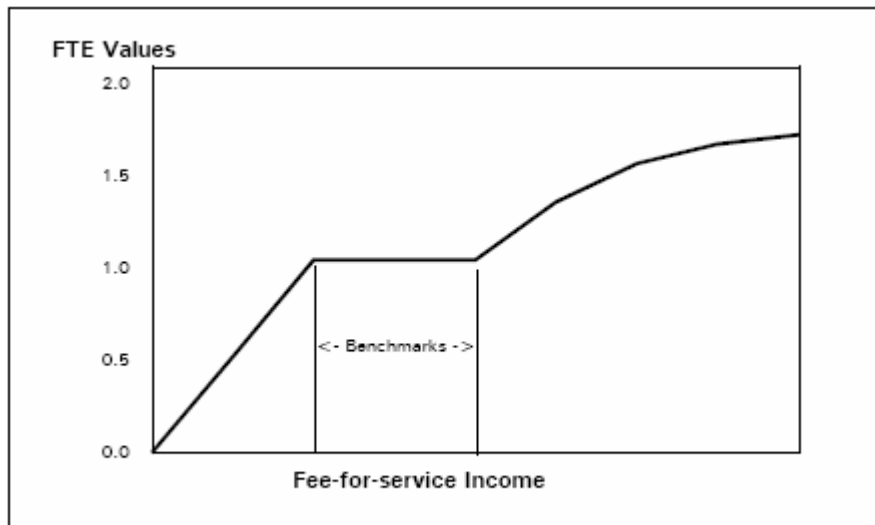


Figure 2. Relationship between income and FTE values

### *Consistency*

In order to provide consistency across provinces and through time, it was necessary to remove the effects of different fee levels on physician income. The methodology adopted allowed payments to each physician to be standardized for interprovincial fee differences in order to compute national benchmarks for a base year. The national benchmarks were then converted to provincial values. Each year, the provincial benchmarks are indexed by specialty specific fee increases or decreases. Benchmark values and FTE physician

counts vary depending on the base year used for analysis. As of 2001, CIHI's full-time equivalent physician reports, including the current report, use 1995-1996 utilization data to establish a base year for implementing the FTE methodology. Earlier reports used 1985-1986 utilization data. A complete description of how base year changes can affect benchmarks and FTE counts is given in Appendix G of the *Full-time Equivalent Physicians Report, Canada, 1996/97 to 1998/99*,

### *Counts*

All counts are based on the number of physicians receiving payments from each provincial plan on a fee-for-service basis. Canada totals represent the sum of the provincial numbers. Concurrently registered physicians will appear as separate physicians in each province, and will be double counted at the national level.

### *FTE Measure*

1. Select a base year for estimation. The current base year is 1995-1996.
2. Create a national base year FTE database.
  - a. Select from the NPDB all the records for physicians who received at least one fee payment during each quarter of the base year for services provided within the physician's province of residence to in-province patients.
  - b. Create for each province and each specialty of physician, a data set that includes each physician's total payments in this fiscal year.
  - c. To eliminate the interprovincial differences in payments that are due to differences in fee levels, adjust the gross income of each physician by the relevant Physician Services Benefit Rates (PSBR) index.

**Note:** FTE statistics are not calculated for physicians in the specialties of radiology or laboratory medicine. Physicians who received payments under more than one specialty during the year are assigned to the specialty under which they received the majority of their payments.

3. Calculate base year lower and upper benchmarks.
  - a. Within each specialty, rank order the payment amounts and establish the distribution of physicians by payment levels.
  - b. Label the payment value corresponding to the 40th percentile rank as the national lower benchmark and that of the 60th as the national upper benchmark.
  - c. To calculate the provincial lower and upper benchmarks, adjust the national benchmarks by the PSBR index.
4. Calculate the benchmarks for years other than the base year.
  - a. Inflate (or deflate for years prior to the base year) the provincial benchmarks for each specialty by the specialty specific annual fee increase percentages.
5. Create FTE database for estimation.
  - a. Select from the NPDB, all the records for physicians who received at least one fee payment during a fiscal year for services provided within the physician's province of residence to in-province patients.
  - b. Create for each province and each specialty of physicians, a data set that includes each physician's total billing in the fiscal year.

6. Calculate the FTE statistics.
  - a. Count physicians with payments within or equal to the benchmarks as 1 FTE.
  - b. Count physicians with payments below the lower benchmark as a fraction of a FTE equal to the ratio of his/her payments to the lower benchmark.
  - c. Count physicians with payments above the upper benchmark using a log-linear relationship, i.e. as 1 FTE plus the logarithm of the ratio of his/her payments to the upper benchmark.