Challenges and strategies for determining workforce requirements in plastic surgery

Kevin Cheung MSc MD¹, Arthur Sweetman PhD², Achilleas Thoma MD MSc FRCSC¹

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BACKGROUND: Accurate projections of the future plastic surgeon workforce are essential to provide a high standard of care and to properly allocate scarce health care resources. This is not a straightforward task. Longstanding concerns over physician surpluses have been replaced by fears of physician shortages.

METHODS: A review of previous efforts to predict future plastic surgeon workforce requirements highlights the challenges associated with deriving a solution. Physician workforce is dependent on numerous factors, including both physician-supply factors, such as practice patterns and age, and population-demand factors including disease burden and socioeconomic factors. Factors unique to plastic surgery, such as overlap with other specialties and performance of uninsured services, must also be considered. Previous strategies from other areas of medicine are described with associated strengths and weaknesses. These strategies include needs- and demand-based approaches, economic analysis and benchmarking. Finally, the need for appropriate outcomes from which to assess adequacy of physician supply is discussed.

CONCLUSIONS: Projections of future plastic surgeon workforce requirements must not only consider a multitude of physician supply and population demand factors, but also factors unique to plastic surgery. Future strategies to predict workforce requirements should balance the strengths and weaknesses of each approach with the data and outcomes available in plastic surgery.

Key Words: Methodology; Number of plastic surgeons; Physician workforce; Projection

A n adequate supply of well-trained health care providers is essential to meet current and future health needs. Plastic surgery is no exception. Accurately predicting future physician workforce requirements, however, is not a straightforward task. Longstanding concerns of impending physician surpluses have been replaced with a growing belief that there are physician shortages across all fields of medicine (1-4).

Accurately predicting future workforce requirements in plastic surgery requires an understanding of the complexity of this problem and the challenges associated with deriving a solution. We highlight previous reports that have shaped the current physician workforce and identify the unique challenges in projecting future plastic surgery workforce requirements. Finally, we evaluate the methodological techniques that have been used to address this problem and discuss the importance of selecting appropriate outcomes against which to measure the adequacy of physician supply.

PREVIOUS WORKFORCE PROJECTIONS

In the 1980s and early 1990s, several major studies and medical associations concluded that a physician surplus was looming. The controversial Barer-Stoddart (5) report had wide-sweeping implications for the current face of health care in Canada. Selectively reading the report's conclusions and facing appreciable budget shortfalls, provincial governments decreased medical school enrollment by 10% (6).

Des défis et des stratégies pour déterminer les besoins de main-d'œuvre en chirurgie plastique

HISTORIQUE : Il est essentiel de projeter avec précision les futurs effectifs en chirurgie plastique pour assurer des normes de soins élevées et bien affecter les rares ressources en santé. Il ne s'agit pas d'une tâche simple. Les préoccupations de longue date à l'égard des surplus de médecins ont été remplacées par la crainte de pénuries de médecins.

MÉTHODOLOGIE : Les chercheurs présentent une analyse des efforts passés pour prédire les futurs besoins d'effectifs en chirurgie plastique et font ressortir les défis associés à la découverte d'une solution. La maind'œuvre de médecins dépend de multiples facteurs, y compris à la fois les facteurs liés à l'offre en main-d'œuvre, tels que les profils de pratique et l'âge, et les facteurs liés aux exigences de la population, y compris le fardeau de la maladie et les facteurs socioéconomiques. Il faut également tenir compte de facteurs propres à la chirurgie plastique, tels que le chevauchement avec d'autres spécialités et la prestation de services non assurés. Des stratégies déjà utilisées dans d'autres domaines de la médecine sont décrites, ainsi que leurs forces et faiblesses. Ces stratégies tiennent compte des approches liées aux besoins et à la demande, ainsi que d'une analyse économique et comparative. Enfin, les chercheurs abordent la nécessité d'issues pertinentes à partir desquelles évaluer s'il y a suffisamment de médecins.

CONCLUSIONS : Les projections à l'égard des futurs besoins d'effectifs en chirurgie plastique doivent non seulement tenir compte d'une multitude de facteurs liés à l'offre de médecins et aux demandes de la population, mais également de facteurs propres à la chirurgie plastique. Les futures stratégies pour prédire les besoins en main-d'œuvre doivent tenir compte des forces et des faiblesses de chaque approche et des issues disponibles en chirurgie plastique.

Physician supply in Canada is still recovering. In the United States, the Graduate Medical Education National Advisory Committee (GMENAC) report concluded that there would be a surplus of 145,000 physicians by 2000 if no changes were made (7). The Council on Graduate Medical Education (COGME) projected a similar surplus in the early 1990s. Their recommendations led to decreased funding for residency positions and limitations in the number of physicians trained as specialists (1,7,8).

With time, however, expert consensus shifted from belief that there was a physician surplus to concerns of a physician shortage. Cooper et al (9) predicted a demand for 50,000 physicians by 2010, with the demand for specialists exceeding the demand for primary care physicians. More recent reports by the COGME predicted that population growth would exceed growth in the number of physicians resulting in a 10% shortfall of physicians by 2020 (10). In 2006, consequently, the Association of American Medical Colleges recommended that medical schools in the United States increase their enrollment by 30% by 2015 to address the future physician shortage (11).

Conflicting workforce predictions also exist in plastic surgery. In 1993, a study commissioned by the American Society of Plastic Surgeons predicted a 36% increase in plastic surgeons by 2020 despite significant reductions in training and education (12). In 2007, however, Macadam et al (13) surveyed Canadian plastic surgeons to

¹Division of Plastic Surgery; ²Department of Economics, McMaster University, Hamilton, Ontario

Correspondence: Dr Achilleas Thoma, Division of Plastic Surgery, McMaster University, 206 James Street South, Suite 101, Hamilton, Ontario L8P 3A9. Telephone 905-523-0019, fax 905-523-0229, e-mail athoma@mcmaster.ca

TABLE 1

Sources of changes in supply and demand for surgeon services

Supply variables	Demand variables
Physician retirement patterns	Insurance coverage and reimbursement
Sex, age	Health care delivery system
Lifestyle, work hours	New technologies
Length of training	Nurse practitioners
Cost of education and debt	Geographical distributions
IMG importation	Overall economy
Number of medical student/	Population growth rate
residency positions	Health care use patterns
Operating room time	Population age distribution
Hospital beds and nursing staff	Advances in medical care
Nonpatient care activities	
Use of nonphysician services	
(Nurse practicioners, physician	
assistants)	

IMG International medical graduate

determine perceived surgeon supply. Seventy-eight per cent of respondents believed that there were not enough plastic surgeons. The authors hypothesized that to maintain current ratios of plastic surgeons in Canada, surgeon training would have to increase by 10 graduates per year. Similarly, Rohrich et al (14) surveyed American plastic surgeons and found that 74% of academic surgeons believed that the number of residency positions for plastic surgery should be increased. These studies, however, were limited by the subjective nature of the survey and self-report methodology. Furthermore, response rates of 42% in the Macadam et al (13) and 44% in the Rohrich et al (14) studies limit the applicability of the conclusions.

PLASTIC SURGERY WORKFORCE REQUIREMENTS: A MULTIFACTORIAL PROBLEM

Physician workforce requirements are highly dependent on several variables, many of which are poorly understood and themselves dependent on many other factors. Table 1 lists some of the variables that affect physician supply and demand. This is not an exhaustive list. Physician supply is not only dependent on the n umber of physicians but also on their practice structure, productivity and hours of work. Sex, age, debt, financial reimbursement, work satisfaction and desire for work-life balance may influence the number of services provided per year. Adequate physician supply may not be the only limiting factor. Limitations in the health care system, such as operating room time, hospital beds, and nursing and anesthesia staff, may decrease physician service provision or alter the type of services performed.

Demand for physicians is also multifactorial. Population factors, such as age distribution, socioeconomic status, geographical distribution, disease burden and access to the health care system, dictate the demand for physician services. Physician practice patterns, new technologies and insurance coverage may also affect physician demand.

Numerous variables specific to plastic surgery must also be considered. Overlap and competition with other specialties such as ophthalmology or otolaryngology may decrease demand for plastic surgery services (Table 2). Demand for uninsured services, such as cosmetic procedures, varies greatly with geographical region and socioeconomic factors. Surgeons who perform uninsured services may falsely elevate the perceived surgeon workforce because these surgeons perform fewer insured services. Finally, the concept of supply-related demand suggests that these variables are highly dependent on one another.

METHODOLOGICAL APPROACHES

Several different methodological approaches have been used to project physician workforce requirements. These techniques include needsbased approaches, demand-based approaches, economic analysis and

Specialty	Example procedure
Orthopedics	Hand surgery
Ophthalmology	Blepharoplasty
Otolaryngology	Rhinoplasty, rhytidectomy
Neurosurgery	Peripheral nerve
General surgery	Burns
Oral maxillofacial surgery	Mandible and orthognathics

benchmarking. An overview of these techniques and issues from an economic perspective is described by Bärnighausen and Bloom (15). Needs-based approaches, employed in the GMENAC study (16,17), rely on expert opinion to estimate the number of physicians needed to deliver the necessary health services to a population. Although opinion based, the advantage of this technique is that it enables consideration of issues related to under- or overservice.

Demand-based approaches examine health care utilization patterns as a proxy for patient demand. Health care utilization can be determined through national or regional databases. Naive versions of this technique assume that the level of patient demand (medical need) is well estimated by the current level of utilization and only changes as a result of the evolution of the age-sex distribution of patients over time. Future changes in demand are predicted by projecting changes in the population. More sophisticated versions allow for adjustments resulting from expected changes in technology, patient and provider behaviour, base year over- or underutilization, and other factors. Denton et al (18) performed some recent work in this vein for Ontario. In their base model, which allows only for changes in utilization because of demographic factors, such as patient/population aging and immigration, they estimated that a 54.8% increase in the number of plastic surgeons is required by 2031. This is slightly lower than the mean for all physician groups (62% increase required). If the base year is assumed to have been in shortage, as currently estimated, then future requirements need to be adjusted upward. Similarly, if physicians work fewer hours in the future (a trend observed in recent decades), then the growth rate for the demand of additional surgeons may need to be adjusted upward by as much as 1% every four or five years (19).

While being useful in many dimensions, demand-based approaches are limited in a few ways. If management and/or practice patterns vary according to geographical region but estimates are for a larger area (eg, national), then the estimates may be of little value in practice. Utilization rates may also vary significantly if practice patterns vary among surgeons or over time (2). While the majority of hip fractures are managed with surgery, for example, management of back injury varies significantly depending on patient preference, surgeon and regional health care practices. If these are stable over time, demandbased projections may work well, but if they vary in unexpected ways, then the projections fail. Demand-based approaches are similarly criticized for perpetuation of the status quo and the strong association between supply and utilization because naive interpretations are occasionally propounded.

A third technique focuses on the relationship among national economic output, health care spending and physician supply. Cooper et al (9) first performed this as a historical analysis suggesting that the production of physicians should be increased to keep pace with economic growth (9,20).

Conversely, Goodman et al (21) developed a benchmarking model to identify regions of physician shortage and surplus across the United States. Using actual physician deployment, efficient health care settings were identified. These regions were then used as a reference or benchmark for comparison to determine physician requirements in other regions and/or health care delivery systems. Others have performed similar analyses for specialty-specific outcomes (22). Objective criteria to identify the health care settings that should be used as a benchmark, however, are lacking.

OUTCOMES

Selection of an appropriate outcome measure is essential to effectively evaluate the adequacy or inadequacy of physician workforces. Previous studies have measured physician demand based on outcomes such as morbidity and mortality, economic data, physician density, wait times, health care expenditures, historical utilization, and patient and physician satisfaction. Primary outcomes should be objective and clinically relevant. There is little use in drawing conclusions about workforce surplus or shortage based on comparison with arbitrary benchmarks of no clinical relevance.

Wait times may be a potential surrogate for physician workforce demand (23,24). The Pediatric Surgical Wait Times project (25) tracks wait times for pediatric surgery across Canada. Wait time benchmarks were established using a nominal-group technique to build consensus among discipline-specific experts. Thirty-five per cent of pediatric plastic surgery cases exceeded the target benchmarks. These results provided the evidence to prompt additional funding and a redistribution of operating room resources.

The Canadian Society of Plastic Surgeons has established wait time benchmarks (26), and Ontario has recently started tracking patient wait times for numerous services including plastic surgery. Ontario surgeons practicing in publicly funded hospitals are required to track their wait times in the Wait Time Information Service (27). These data may be similarly used to assess service demands. Assessment of the entire referral process, however, is required. Current databases track 'Wait 2' data – the time from decision to treat to the time of surgery (25,27). Consideration of the time from initial referral to consultation ('Wait 1' data) may be more indicative of the demand for plastic surgeons.

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Clear relationships between appropriate physician supply and population health outcomes must be defined (28). The optimal number of physicians for a given population should be based on achievement of an acceptable standard of health care. This may be highly dependent on population, geographical, physician and health care administration factors. Society must decide on the optimal number of physicians based on these outcomes, balancing cost of physician training and practice, and the availability and costs of associated health care resources. These decisions affect both the quantity and quality of care provided to society (28).

CONCLUSIONS

Accurate projections of future plastic surgery workforce requirements necessitate an understanding of the factors that affect physician supply and demand as well as factors specific to plastic surgery. Because of plastic surgery's unique overlap with other specialties and its provision of uninsured services, we recommend that more than one technique, or aspects of several techniques in combination, be used to determine future workforce requirements. For insured services, demand-utilization models based on patient wait times may be feasible with reliable administrative data. Consideration of both the time to consultation and time to surgery (ie, Wait 1 and Wait 2 data), however, are required. Wait-time benchmarks should have clinical relevance. Workforce requirements for uninsured services may be better forecast using market demand analysis techniques (29). Expert opinion or needs-based approaches, however, are also required to forecast deviations that may result from anticipated changes in technology, practice style or other factors that will affect future physician productivity.

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