The future of the New Zealand plastic surgery workforce

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Abstract

Aims The New Zealand (NZ) plastic and reconstructive surgery (PRS) workforce provides reconstructive plastic surgery (RPS) public services from six centres. There has been little analysis on whether the workforce is adequate to meet the needs of the NZ population currently or in the future. This study analysed the current workforce, its distribution and future requirements.

Methods PRS manpower data, workforce activities, population statistics, and population modelling were analysed to determine current needs and predict future needs for the PRS workforce. The NZ PRS workforce is compared with international benchmarks. Regional variation of the workforce was analysed with respect to the population’s access to PRS services. Future supply of specialist plastic surgeons is analysed.

Results NZ has a lower number of plastic surgeons per capita than comparable countries. The current NZ PRS workforce is mal-distributed. Areas of current and emerging future need are identified.

Conclusions The current workforce mal-distribution will worsen with future population growth and distribution. Up to 60% of the NZ population will be at risk of inadequate access to PRS services by 2027. Development of PRS services must be coordinated to ensure that equitable and sustainable services are available throughout NZ. Strategies for ensuring satisfactory future workforce are discussed.

New Zealand (NZ) currently has 4.3 million citizens\(^1\) and 57 specialist plastic surgeons.\(^2\) By 2027 the NZ population will reach 5 million.\(^1\) Mean age will rise to 40 and 20% will be aged over 65, an increase from 13% in 2011. Demand for plastic and reconstructive surgery (PRS) services increases with age and is predicted to increase by 49% by 2027.\(^3\) Surgical workforce planning is challenging due to rapid and complex changes in population size, demographics, service delivery, and advances in technology.

Previous estimates of surgical need have been based on historic service use or current number of surgeons with extrapolation based on population growth alone.\(^4\) These methods do not account for current unmet needs, unequal and poor access\(^5\) due to current funding and service delivery model with an inadequate number of service providers. They also do not account for future increase in per-capita disease burden due to rising disease complexity with increased age\(^6\) and co-morbidities.\(^7\)

PRS provides both reconstructive plastic surgery (RPS) services and aesthetic plastic surgery (APS) services. Six of NZ’s 20 District Health Boards (DHBs) directly provide some RPS services funded through the public health system. These services are delivered through RPS centres ranging from a single part-time surgeon to comprehensive regional centres with part-time and/or full time surgeons, including
one centre with 16 surgeons. Supra-regional co-operation for burns, vascular anomalies, laser and craniofacial surgery is well-established.

Five regional centres provide elective and 24-hour acute RPS services. An unknown volume of elective RPS services are provided by surgeons in part-time or full-time private practices, mostly based around the six DHB-based RPS centres. These surgeons who are either in sole or group practices also provide APS services. No data is available on the volume of APS provided by these surgeons in the private sector.

In 2012, 2.5 million of NZ’s 4.3 million citizens are dependent on outreach services for outpatient assessment and/or travelling inter-district to access these services. By 2027 this number will rise to nearly 2.9 million (60%) unless the service delivery model is changed. Transition to a less centralised model with an increased number of service centres closer to the populations that preserves and strengthens links to the existing tertiary hub across the regions and supra-regional cooperation, requires support and facilitation.

Currently, the DHB-based RPS centres provide a diverse range of services and there is significant regional variation in what is provided by PRS or other surgical specialties outside of these centres based on local skill mix, population need and historical service development.

Although workforce analysis and planning discussions have increased recently in NZ these have largely focused on the entire medical workforce. Little analysis and forecasting of the NZ PRS workforce has occurred. The analysis presented in this paper extends previous work examining the PRS workforce and identifies populations which have lower access to PRS and models how this may evolve in future. A discussion of PRS public services in relation to the NZ government’s Health Targets is presented.

Methods

New Zealand population and demographic analysis—Current population data and forecast of population growth, demographic mix, age distribution of the population, and the proportion of elderly New Zealanders were collected from Statistics New Zealand.

Current and historic workforce capacity—Registration and workforce demographic data were collected from the Medical Council of New Zealand workforce surveys. Census and modelling data from Statistics New Zealand allowed calculation of population normalised surgeon ratios.

International benchmarks and targets for provision of PRS services—A literature search was undertaken using Medline, PRS journals, surgical college and government publications related to PRS workforce needs and forecasting in similar countries.

Future workforce needs calculations and distribution—International benchmarks of surgeon to population ratios were compared with predicted NZ specific need based on age specific PRS intervention rates. These were used to estimate current and future needs for the PRS workforce and its distribution.

Calculation of plastic surgical workforce training needs—Age at completion of plastic surgical training, mean age of practicing population and estimated age of retirement are used to calculate the current and future rate of training required to maintain a sustainable workforce. A survey of post-FRACS fellowships undertaken by NZ plastic surgeons 2001 - 2011 was used to estimate the time out of the NZ workforce.
Results

New Zealand population and demographic analysis

NZ currently has a population of 4.3 million which is estimated to increase to 5 million by 2027. This growing population is also aging with the mean age increasing from 36 in 2009 to 40 by 2031. The proportion of the population aged over 65 has risen from 8.8% in 1976 to 13% in 2009 and will rise to 20%, of the population by 2027 (Table 1).

Table 1. New Zealand population and age demographics

<table>
<thead>
<tr>
<th>Year</th>
<th>Population size</th>
<th>Mean age (years)</th>
<th>Percentage aged over 65 years</th>
<th>Number aged over 65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>3,100,000</td>
<td>26.0</td>
<td>8.8</td>
<td>273,000</td>
</tr>
<tr>
<td>2009</td>
<td>4,300,000</td>
<td>36.6</td>
<td>13</td>
<td>550,000</td>
</tr>
<tr>
<td>2027</td>
<td>5,000,000</td>
<td>40.0</td>
<td>20</td>
<td>1,000,000</td>
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<tr>
<td>2041</td>
<td>5,400,000</td>
<td></td>
<td></td>
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</table>

Current and historic workforce capacity

NZ has a total medical workforce of 11,478 doctors in 2010. The 53 registered specialist plastic surgeons constitute 0.46% of the entire medical workforce. This gives an overall ratio of 206 doctors per 100,000 population and one plastic surgeon for each 83,019 people living in NZ. Between 1997 and 2006 the number of plastic surgeons decreased slightly from 33 to 29. From 2007 to 2011 the number of registered plastic surgeons increased to 53 (Figure 1). 43 (81%) of these surgeons have an appointment within the public service.

Figure 1. Number of New Zealand Specialist Plastic and Reconstructive Surgeons by Year
International benchmarks and targets for provision of PRS services

NZ currently has a plastic surgeon to population ratio of 1:83,000. This compares well with France, Sweden and Australia (1:80,000), but is below that of Canada (1:72,000) and well below Switzerland (1:58,000) and the USA (1:50,000).

Future workforce needs calculations and distribution

Model 1—If NZ’s current ratio of one plastic surgeon to 83,000 population is simply maintained, a total of 60 plastic surgeons will be required by 2027.

Model 2—If the increasing disease complexity of the NZ patient population and increased age related demand for PRS services was taken into account, an increase by 49% would be required by 2027. Raymont and Simpson use age specific surgical intervention rates to arrive at their estimated 49% increase in PRS service provision, as PRS provides treatment across a wide spectrum of ages it is markedly affected by population aging including the increasing incidence of complex cutaneous malignancy. This prediction can be used to estimate the number of plastic surgeons needed by 2027. It gives a range of 79-84 surgeons needed depending on whether 2011 (when there were 53 registered plastic surgeons) or 2012 (when there were 57 registered plastic surgeons) is chosen as the baseline.

These predictions give an approximate surgeon to population ratio of 1:63,000 - 1:59,000, by dividing the number of surgeons by the predicted population in 2027.

Currently the DHBs in NZ are responsible for the healthcare of populations of 32,700 to 537,100 (Table 2). The size of these populations will increase to 37,470 - 614,911 by 2027. In 2012 there were 57 registered plastic surgeons practising within 11 of the 20 health districts.

If the population is divided into the six regions served by DHBs providing RPS public services the surgeon to population ratios would range from 1:56,846 (for the Counties-Manukau health district) to 1:157,350 (for the Northland health district). If the plastic surgeon need in 2027 was approximately one surgeon per 60,000 population the need for surgeons in each health district would range from 0.6 (West Coast) to 10.2 (Waitemata).

If it was assumed that a sustainable service centre requires three or more participating surgeons then up to 12 potential health district groupings could support a RPS public service locally (Table 2). Figure 2 provides a graphical representation of potential RPS public service centres by 2027.
In 2012, there were four regional PRS centres in NZ. In 2012, there are six PRS service centres including five regional centres. By 2027, 12 PRS service centres may be required to efficiently deliver PRS services to the entire NZ population.

In 2012, the 2.5 million New Zealanders who do not reside within one of the six DHBs hosting a RPS centre rely on out-reach clinics and/or having to travel to a regional centre for RPS services. If the service delivery model remains unchanged this will rise to 2.9 million, that is, 60% of the population by 2027.

**Calculation of plastic surgery workforce training needs**

To calculate the number of newly qualified plastic surgeons required annually to provide a sustainable workforce it is necessary to estimate the mean age of qualification of new plastic surgeons, mean age of retirement, and estimate time spent out of the NZ workforce. No published figures exist for NZ but estimates may be made.

76% of NZ medical students enter directly from school and take a 6-year degree, at entry their mean age is 18.7 years. The remaining 24% are graduate entrants who take a 5-year degree with a mean age of 22.3 years on entry to medical school. This gives a mean age of graduating medical students of 25.3 years \( \left( \frac{18.7+6.0}{2} \times 0.76 + \frac{22.3+5.0}{2} \times 0.24 \right) \).  \(^{30}\)

Surgical Education and Training (SET) in PRS through the Royal Australasian College of Surgeons is a 5-year programme that starts after a minimum of two post-graduate years but more frequently after four post-graduate years. This gives a mean age of the newly qualified plastic surgeon of 34.3 years (25.3+4+5).

NZ plastic surgeons commonly undertake a period of post-FRACS fellowship training overseas. Between 2001 and 2011 the 32 graduating NZ plastic surgeons had undertaken 71 such fellowships totalling 66.5 working years. This gives a mean of 2.1 years of working life outside of NZ, per surgeon.
No data exists for the age of retirement of NZ plastic surgeons. United States data shows a mean intended age of retirement of age 66 years with an actual mean age of retirement at age 61.8 years. This data accounts for lost working years by choice or due to ill health.

Estimated surgical practicing life may therefore be estimated by subtracting the mean age of completion of post-FRACS fellowship training overseas from the estimated mean retirement age. This formula yields a mean practicing life of 25.4 years $[61.8-(34.3+2.07)]$.

If NZ requires 83.3 practising plastic surgeons by 2027, then 3.3 new surgeons per year will be required. This figure is derived by dividing the number (83.3) of surgeons required by the mean practice (25.4 years) per surgeon.

**Discussion**

NZ has an equal or lower plastic surgeon to population ratio than comparable countries. With the aging population and increasing disease complexity there will be a marked increase in the need for PRS services and hence the number of plastic surgeons.

Estimating an increase in the number of plastic surgeons to be directly proportional to the population growth will be inadequate as the need for PRS interventions rises markedly in later life. It also appears that the current training intake of the SET programme is sufficient to achieve a sustainable PRS surgical workforce with 83 surgeons by 2027. This differs from a recent Health Workforce New Zealand report on the 2011 Prioritisation of Medical Disciplines for funding of training positions which identified plastic surgery as the third lowest priority. However, since the publication of that report some revisions by the Ministry of Health have occurred resulting in a decision to maintain funding of existing PRS training positions for 2013.

The presented training model is based on the assumption that sufficient opportunity for graduating plastic surgeons exists to allow return to practise in NZ. If the duration of active practise in NZ is reduced by emigration, parental leave or early retirement, training numbers will need to be increased. If undergraduate medical training moves towards graduate entry practicing years may be decreased. If retirement age is earlier than that of the United States the practicing life would also decrease.

Table 2 shows the current mal-distribution of the PRS workforce with respect to the distribution of the population. Current PRS services are mainly clustered in a small number of tertiary (regional) centres with reduced accessibility of these services by populations residing away from these centres.

If the current service delivery model remained unchanged, then by 2027 nearly 2.9 million (60%) of the population will rely on visiting services for clinic appointments and/or travel to one of the six PRS centres for treatment. The risk of under serving these populations will increase further if the current model of service delivery is unchanged.

Communities in peripheral areas currently bear the cost of transport to access PRS services but also the opportunity costs associated with the lost productive time of both patient and family members associated with transport and time required to access distant services. Approximately 60% of RPS services (unpublished data) that patients currently travel to access in existing tertiary (regional) centres do not require high cost equipment and could be efficiently delivered at appropriately resourced peripheral locations.
The presence of a local PRS service would also provide improved accessibility of the service by other disciplines especially in management of trauma and elective management of many common conditions. These include facial trauma, minor burns, acute and elective hand surgery, breast reconstruction surgery and skin cancer surgery.

When population growth and PRS surgical needs predictions are combined it is evident that by 2027 there are up to 12 health district groupings could benefit from, and sustain, its own local PRS service of a general nature (Table 2). However, any change in the service delivery model will require detailed analysis of what type of service can be appropriately provided locally closer to the populations while maintaining highly specialised care of less common conditions at the regional (tertiary) hubs (Figure 2). This type of analysis and planning has recently occurred in NZ for South Island Neurosurgical services. 

An optimal model of service delivery would ensure equity of access is likely to require a regionally distributed service with new on-site RPS ‘nodes’ in the growing peripheral regions that provide RPS services of a general nature. These peripheral ‘nodes’ are integrated and networked with existing regional (tertiary) ‘hubs’ which provide RPS service of the general nature to their local populations but continue to provide tertiary services for the entire region to ensure efficiency of all levels of service provision.

There is an opportunity to develop integrated, coordinated PRS services that serve multiple health districts where assessment and procedures may occur at a number of peripheral ‘nodes’ with a ‘hub’ providing tertiary RPS to avoid duplication of high cost equipment or low volume sub-speciality services.

These regionally distributed services would most likely develop from existing regional centres. The current four regional centres would likely to continue as tertiary ‘hubs’ for the peripheral ‘nodes’ by providing burn surgery, cleft lip and palate surgery, head and neck and skull base surgery, and hypospadias surgery. Current coordination of supra-regional services such as craniofacial surgery, burns surgery, vascular anomalies and laser surgery would be maintained and strengthened.

Clinical leadership is required within PRS to provide vision and direction that ensures sustainable, efficient and equality of access to quality PRS services that meets future needs of the NZ population. The proposed model of service delivery that is networked nationally would ensure delivery of the National Health targets. These new and existing connected RPS centres require surgeons with leadership and management skills who must be developed from the current cohort of surgeons and trainees.

Planning and implementation of the change in the model of service delivery must occur at both the professional and DHB administrative governance level to ensure that appropriate infrastructure is available to deliver service peripherally while avoiding unnecessary duplications, and that strong links are constructed and maintained to ensure strong collaboration across the entire region. This will also provide opportunities for graduating surgeons and decreases the risk of loss of educational investment in SET graduates.

Forward planning and managed development of PRS services is key to the fulfilment of the vision of providing sustainable and equitable access to quality services efficiently across the entire country. Preservation and strengthening of supra-regional co-operation by a strong, unified and collegial profession will ensure the connectedness of the services that would benefit the entire NZ population.
An adequate and sustainable PRS workforce that is properly distributed to support a service delivery model of the future are the key ingredients that will meet the National Health Strategy trifecta of “better”, “sooner” and “more convenient”.

Note: Part of this paper was presented as an E-poster at the Royal Australasian College of Surgeons’ 81st Annual Scientific Meeting in Kuala Lumpur, Malaysia, May 6–10, 2012.

Competing interests: Nil.

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