# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table of Contents</td>
<td>2</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>3</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>8</td>
</tr>
<tr>
<td>2. Methodology</td>
<td>9</td>
</tr>
<tr>
<td>3. Plastic Surgery in New Zealand</td>
<td>10</td>
</tr>
<tr>
<td>4. The Vision</td>
<td>10</td>
</tr>
<tr>
<td>5. The Proposed New Model</td>
<td>11</td>
</tr>
<tr>
<td>6. A Regional Focus on Hawke’s Bay</td>
<td>12</td>
</tr>
<tr>
<td>7. Vignettes</td>
<td>13</td>
</tr>
<tr>
<td>8. Discussion</td>
<td>17</td>
</tr>
<tr>
<td>9. Conclusion</td>
<td>19</td>
</tr>
<tr>
<td>10. Recommendations</td>
<td>20</td>
</tr>
<tr>
<td>11. Background Paper</td>
<td>22</td>
</tr>
</tbody>
</table>

**Appendices**

- Appendix 1: NZMJ Article
- Appendix 2: Membership of the Plastic Surgery Workforce Service Forecast Group
- Appendix 3: Financial Modelling for Demonstration Site
Executive Summary

The Health Workforce New Zealand Plastic Surgery Workforce Service Forecast was carried out between July and November 2013. The aim of the forecast is to develop a vision and direction of the relevant health service and workforce for 2020 and beyond, and a possible model or models of care that are patient-centred, team based with services delivered close to the population wherever appropriate. The model proposed is consistent with the principles and approach being taken by the Central Region: Regional Services Plan.

During the process, the Health Workforce New Zealand Plastic Surgery Workforce Service Forecast Group (the Group) held three face-to-face meetings at Hawke’s Bay District Health Board (HBDHB), with group members carrying out tasks in between meetings.

Unlike many of the other workforce service forecasts, it was agreed beforehand that although the Group would make recommendations applicable at a national level, the Group would focus on the development of a regional service based in Hawke’s Bay, which would act as a demonstration site for the proposed new service delivery model. This approach was taken to ensure that any changes would be complimentary to existing regional and national cooperation in delivery of reconstructive plastic surgery (RPS) services. The Group was structured to include clinicians of various medical disciplines, nursing and allied health professions and people with operational, planning and funding roles from HBDHB and Hutt Valley DHB (HVDHB), to ensure that realistic forecasting could be carried out to ensure the viability of the proposed model.

At the start of the process, the Chair, Professor Swee Tan, representing the New Zealand Association of Plastic Surgeons, presented a paper to the Group that was published in the April 2013 issue of the NZMJ entitled The future of the New Zealand plastic surgery workforce (Appendix 1). The paper, co-authored by Mr Brandon Adams (another forecast group member), Mr Michael Klaassen and Prof Tan, analysed the change in the Plastic surgery workforce over the last decade, the current Plastic Surgery workforce, its distribution and future requirements. The paper highlights the mal-distribution of the current workforce, the limitations this places on accessing RPS services and the need for a new coordinated and more efficient model to be put in place to ensure equitable and sustainable service provision. The paper underscores the difficulties with the existing RPS service delivery model which causes inequality of access to services. This combined with the predicted population growth and distribution and demographic change including the aging population, is predicted to intensify inequality of access if the services delivery model remains unchanged. It also identifies Hawke’s Bay as a priority area within the Central region, as its aging and increasing predicted population, will require the service of up to 3 plastic surgeons in 2027.

1 http://journal.nzma.org.nz/journal/126-1372/
The Group has extended the usual 2020 date of other Workforce Service Forecasts, in favour of 2027, which is when a prospective Plastic Surgeons entering medical school now, would start practicing.

The vision that the Group has developed for Plastic Surgery in 2027 is:

*Equitable, patient-centred, integrated care, as close to home as possible, through regional networks, which cooperate nationally.*

The principle underlying this is ‘locally, unless it cannot be done efficiently, safely and sustainably’.

The model proposed by the Group is based on the findings of further research by Mr Adams and Prof Tan, in collaboration with the New Zealand Association of Plastic Surgeons. Their research found that the current model of delivering RPS services is out-dated and over centralised, which leads to inequalities of access with associated costs to the DHBs, patients and their families, and poorer outcomes for some patients. The Group tabled a number of vignettes or scenarios, describing patient journeys for a range of conditions requiring RPS services, which highlight the inefficiencies and unnecessary costs involved in the current system. These were then reviewed against the new proposed model, demonstrating the advantages that this provides for patients, clinicians, DHBs and the community at large.

The proposed model is based on a regional RPS services delivered closer to home, whenever this can be done safely and efficiently thus reducing the proportion of work done in the existing five tertiary ‘hubs’ currently delivering the bulk of RPS services and establishing provincial ‘nodes’, where on-site services are provided. Plastic Surgery is a relatively low cost specialty. Establishing provincial on-site services would require a minimum of capital expenditure as part of a regional service, linking the ‘hub’ and ‘nodes’. The costs involved in employing Plastic Surgeons at the ‘node’ are off set against cost savings by reducing unnecessary travel for the patients and families, medical staff, and reduced excessive in-patient time and improved outcomes of patients.

The ‘hubs’ would continue to deliver low volume, highly complex procedures as well as providing all services to their local or sub-regional communities. The ‘nodes’ would provide higher volume, lower complexity procedures as part of the regional RPS service through multi-disciplinary teams. Taking a regional approach means that the Plastic Surgeons working at a ‘node’ is part of the team delivering services at the ‘hub’, and will be involved in on-going reviews of patients, education, training and audit. Developing local multidisciplinary teams, led by the Plastic Surgeons, also provides opportunities for up-skilling of GPs, nursing and allied health staff as well as extending the capabilities of other surgical specialties, such as general surgery,

2 Middlemore, Waikato, Lower Hutt, Christchurch, Dunedin
orthopaedics and ENT surgery, through improved access to on-site plastic surgeons and through inter-disciplinary and multidisciplinary collaboration.

The Central Region was selected as the focus for the Workforce Service Forecast as a priority area, following an analysis of service provision by the New Zealand Association of Plastic Surgeons. Within the region, Hawke’s Bay was chosen as a priority area, with high volumes of patients travelling to HVDHB for treatment, leading to high costs and inefficiencies in service delivery. It is estimated that up to 74% of PRS procedures could potentially be safely delivered in a ‘node’ at Hawke’s Bay as part of an integrated regional service, with HVDHB continuing to host the ‘hub’.

Although not currently identified as a priority area under the Central Region’s Regional Services Plan 2013-2014\(^3\), the proposed Plastic Surgery delivery model is aligned with the principles expressed on page 23 of the plan:

**Clinical:**
1. Patient experiences and outcomes can be demonstrably improved.
2. The service can be made more sustainable by developing greater critical mass.
3. The right care can be delivered in the right place at the right time.
4. The service can be delivered more efficiently and effectively.

**Administrative:**
1. It can be delivered at lower cost.
2. It can be delivered more efficiently.
3. It can be delivered more effectively.

The Group also has involvement in another new, but closely aligned piece of work being undertaken in Hawke’s Bay – the Skin Lesions Pathways Group and fully supports the work that this Group is doing.

The proposed new model has also received the support of both CEOs of HBDHB and HVDHB.

**Recommendations**

**At A National Level**

1. **HWNZ supports the model proposed by the Plastic Surgery Workforce Service Forecast**
   
   a. Maintaining the existing regional ‘hubs’ – which deliver low volume, high complexity services and the lower level and high volume services to the local/sub-regional populations, and provide support to the provincial ‘nodes’.
   
   b. Establishing provincial ‘nodes’ – which deliver higher volume, lower

complexity services for the local populations.
c. Supporting the development of integrated, multi-disciplinary teams to support those working in the ‘nodes’.
d. Supporting equitable distribution of plastic surgeons across New Zealand to enable delivery of the new proposed model.
e. Support clinical leadership and regional and national networks to ensure best-practice through collaboration, education and audits.
f. Supporting and building on educational opportunities and up-skilling of other clinical disciplines including General Practice, nursing and allied health staff.
g. Support the development of strong pathways to ensure consistency at the national level.
h. Providing Plastic Surgery patient coordinators to manage the flow and increased volume and to link services (which need a person with clinical experience and ability to communicate with all involved in patient care).

2. **HWNZ supports and retains the current levels of training places for plastic surgeons, with regular reviews of the predicted needs.**

3. **Due to the increasing incidence of non-melanoma skin cancer (NMSC) in New Zealand, that HWNZ urgently convenes a group to report on sustainable and equitable access to quality care for NMSC. The group should include Plastic Surgeons, General Surgeons, Dermatologists, General Practitioners, Radiation Oncologists and support personnel such as nurses and IT specialists.**

This group will consider and report on:

- The standard of care.
- The concept of a multidisciplinary team.
- An integrated model of service delivery.
- Clinical and patient pathways.
- Access criteria.
- Scopes of practice and credentialing of participating clinicians - *who does what and where?*
- Databases and audit.
- The use of technology.

**At A Central Regional Level**

Given the current limited access to RPS services in Hawke’s Bay, the size of the population and the distances, time and costs incurred in travelling to access these services at the regional ‘hub’, HBDHB has been identified as a priority for service development under the new proposed model.

1. **HWNZ supports the establishment of a demonstration site at HBDHB for the local population.**
   a. By supporting the current Group to continue as the implementation group for
the project.
b. By providing evaluation or project management support (funding application to the Innovations Programme to be completed).
c. By supporting the on-going work of the Clinical Skin Lesion Pathways Group at HBDHB and involvement of a Plastic Surgeon in this work immediately.
d. By supporting centralising administration and utilising CRISP (Central Regional Information Sharing Plan) to share patient information.
e. Ensuring costs are as effective and efficient as possible and preventing discussions over funding from getting in the way of clinical decisions.
f. Developing clear pathways for GPs and supporting the development of primary care.
g. Ensuring that IT systems work to enable and support the model, though access to patient information, creation of databases, allowing for referrals etc.
h. Ensuring that the infrastructure is in place to support the model, including operating theatre, outpatient and inpatient facilities, equipment, and up-skilling of nursing and allied health staff.
Introduction

The Workforce Service Forecasts are to provide important input into Health Workforce New Zealand (HWNZ) planning and decision-making around workforce purchasing intentions and other workforce initiatives.

In July 2013, Professor Swee Tan (Director of Gillies McIndoe Research Institute; Professor in Plastic Surgery of University of Otago; and Plastic & Cranio-Maxillofacial Surgeon and Director of Surgery of Hutt Valley DHB) representing the New Zealand Association of Plastic Surgeons was invited to form a Workforce Service Forecast Group to investigate the future needs for Reconstructive Plastic Surgery (RPS) services in New Zealand. It was agreed that the Group would consider RPS at a national level, but would limit its scope to the Central Region and focus on Hawke’s Bay DHB (HBDHB) as a demonstration site for a new proposed RPS service delivery model. Members of the Group were therefore selected to contribute knowledge and skills not only from Plastic Surgery, but also other medical disciplines, nursing and allied health, but also of operational and planning and funding requirements (Appendix 2).

The aim of the forecast was to develop a vision of the relevant health service and workforce for 2020 and beyond, and possible model or models of care that are patient-centred, team based and build in primary care where appropriate.

In developing the vision and model the forecast group needs to take into consideration:

- That the outcomes from this forecast are applicable to the delivery of RPS services nationally across New Zealand.
- A likely doubling of health service demand but only a 30-40% increase in funding over the next ten years.
- That the population of Hawke’s Bay is increasing and ageing.
- Maintenance and improvement of access to quality services that is sustainable.
- A continued need to address inequalities in access of the services.
- The interface with other clinical disciplines including General Practice, General Surgery and Dermatology, particularly in relation to Non-Melanoma Skin Cancer (NMSC).
- A reduction in duplication of services.
- The ‘triple aim’ of:
  - An improvement in individuals’ experience of their health care and better individual health outcomes.
  - An improvement in the health and well-being of communities.
  - A reduction in the per-capita costs of health care.
- That the status quo is only acceptable if there are no superior alternatives.

The process began in July 2013 and was completed by the end of November 2013.
Methodology

Three meetings of the Plastic Surgery WSF Group were held, all at Hastings Hospital, HBDHB. A part-time project manager was employed by HWNZ to assist with the process.

At the first meeting of the Group, Prof Swee Tan gave a PowerPoint presentation, based on published research carried out by Mr Brandon Adams and himself, which provided the context for the work of the Group. The presentation covered the scope of Reconstructive Plastic Surgery (RPS), how RPS is currently delivered in New Zealand, the Central Regional and Hawke’s Bay, and the future of RPS in New Zealand.

The proposed model, of a regional service with a central ‘hub’ based at Hutt Valley DHB (HVDHB) and a regional ‘node’ at HBDHB, was tabled and was agreed upon by the Group. Also at the first meeting, the Group developed their vision for Plastic Surgery in New Zealand and this was refined at the following meeting.

The second meeting involved group members tabling scenarios, which described current patient journeys within the Central Region and then discussed the same patients’ experiences under the new proposed model for service delivery.

The Group then went on to define the range of RPS services that could potentially be safely and efficiently provided at the Hawke’s Bay ‘node’ and which should remain at the regional ‘hub’, as well as describing stakeholder groups affected by the change, funding and governance relationships required to support the model, barriers and mitigating factors to implementation. A process for coordinating the service transformation was also discussed.

The third meeting reviewed information on the number of RPS procedures currently carried out both in and out of the HBDHB region. Based on this, a detailed financial model was prepared by one of the group members, which conclusively demonstrates the cost effectiveness of the new proposed model, by reorganising the service delivery with a significant proportion of the RPS services provided at the ‘node’ based at HBDHB.

The Group also discussed the recommendations that would be put forward to HWNZ and briefing papers for the CEOs of HVDHB and HBDHB.

The overlap with Dermatology Workforce Service forecast was discussed and while there is agreement that urgent work is required at a national level to address the increasing numbers of people presenting with NMSC, the Group felt that it would be better not to include melanoma in this discussion, at least initially, as the priority is to address the high and rapidly increasing numbers of NMSC and that melanoma currently follows a different clinical pathway.
Plastic Surgery in New Zealand

Plastic Surgery is a specialised branch of surgery dedicated to the restoration of functions and correction of deformities resulting from birth anomalies, cancer and trauma including burns. It is a broad specialty and is not restricted to a specific region of the body or age group. There are currently 57 registered specialist plastic surgeons working in public and private practice in New Zealand. It is predicted that 80 plastic surgeons will be required to serve the New Zealand population by 2027.

Under the current model of service provision, only six District Health Boards provide some on-site RPS services, meaning that over half the population do not have access to RPS services without outreach services or inter-district travel. This creates unequal access to RPS services, especially for older, less mobile patients. It is predicted that by 2027 up to 12 population centres will require local on-site RPS services.

RPS services include plastic surgery of a general nature and 17 sub-specialties. As a collaborating specialty, RPS also enhances the work of other clinical disciplines including orthopaedic surgery, breast surgery, general surgery, skin cancers and trauma management. It is a surgical discipline that is well suited to being provided in provincial settings and to support and enhance the work of other surgical services.

The Vision

The vision for Plastic Surgery in New Zealand in 2027 is equitable, patient-centred, integrated care, as close to home as possible, through regional networks, which cooperate nationally.

A demonstration site at HBDHB is proposed to show how the vision can be fulfilled in practice. It is intended that this model could then be adopted in other regions of New Zealand to realise the vision at a national level. Funding for project management and/or for evaluation of the demonstration site, will be sought from the HWNZ Innovation Programme, to assist with this.

Maintaining an equitable distribution of the Plastic Surgery workforce across New Zealand through an integrated network of ‘hubs’ and ‘nodes’ is also necessary to providing an equitable, efficient and sustainable RPS services in 2027 and beyond.
The Proposed New Model

The new model proposed is an integrated regional service in which the on-site plastic surgeons based at the ‘node’ are a integral members of the regional RPS service and that they are supported by the ‘hub’. The plastic surgeons based at a provincial ‘node’, is part of a multi-disciplinary team locally, delivering a large proportion of the RPS services currently carried out at a regional ‘hub’.

It is predicted that by 2027 there will be 12 population centres of more than 180,000 people that would warrant such a ‘node’.

In addition to the appointment of Plastic Surgeons at the ‘node’, infrastructural support (including dedicated access to operating theatre, out patient and inpatient facilities, and equipment), as well as up-skilling the nursing, allied health and other support staff, especially a patient coordinator, will be required as the service evolves.

Figure 1: Proposed new model

A large proportion of RPS procedures have been identified that could be safely provided at the ‘nodes’. These include higher volume and lower complexity procedures and avoid unnecessary costs. Procedures that are low volume, more complex, often requiring expensive equipment and appropriately trained staff are retained at the regional ‘hub’, which also provides the ‘lower’ level RPS to its local and/or sub-regional populations.
Procedures carried out at the ‘node’ which require low capital investment include:

- General plastic surgery
- Melanoma and non-melanoma skin cancer surgery
- Breast reconstruction
- Ear splinting
- Lower limb reconstruction
- Oculoplastic surgery
- Maxillofacial trauma
- Acute and secondary hand surgery
- Minor burns

Procedures that would continue to be delivered at the hub include:

- Cleft lip and palate surgery
- Craniofacial surgery
- Ear reconstruction
- Laser
- Vascular anomalies
- Hypospadias
- Plus those outlined above for the ‘nodes’ for the local or sub-regional populations

Developing a regional RPS quality service that is efficient, safe, and sustainable through collaboration underpinned by a culture of pride and teamwork, is the characteristic of this proposed new model.

**A Regional Focus on Hawke’s Bay**

As shown in the background section below, the Wellington Region Plastic, Maxillofacial and Burns Unit based at HVDHB provides RPS services to 993,000 people in 7 DHBs. 85% of this population live outside of the HVDHB catchment. HBDHB serves the largest population within the Central Region, with very large distances required to access RPS services. Travel of almost 8 hours (600km) for day case RPS procedure is common and adds substantially to the true (community and DHB) cost to providing the service. From 2005 to 2010 more than PRS 3,000 procedures were performed at Hutt Hospital for people living within the HBDHB catchment. It is estimated that up to 74% of these procedures could be effectively and safely delivered in Hawke’s Bay. This identifies HBDHB as a priority area for service development and therefore was selected to be the demonstration site for the forecast.

The Group has identified which of the RPS procedures currently being delivered at HVDHB could be safely delivered at HBDHB and developed a model to consider the financial implications of the proposed change. By comparing the costs involved in employing a 1.0 FTE Plastic Surgeon with the costs currently incurred relating to the
outflow of HBDHB patients who underwent plastic surgery procedures outside the DHB, the Group found that this was at worst cost neutral and at best, reducing current expenditure (Appendix 3).

The main challenge to implementing the proposed new model will be getting access to theatre space, which is currently already under pressure at HBDHB. However, based on the modelling carried out, it was noted that an additional 500 theatre hours (approximately 1 day per week) would be needed and that opportunities to extend the current levels of theatre productivity could be explored; by extending the hours of theatre utilisation per day, and/or by utilising Friday afternoons, and/or by utilising the theatre space at the local private hospital.

The Group agreed to remain as the implementation group for the proposed new model, offering a range and complementary skills and experience. A project manager would be required to ensure that the work remains on track. Funding could be sought for this from the HWNZ Innovations Fund.

Attracting Plastic Surgeon(s) to the post was discussed and ensuring that the position is an integral part of regional RPS team is seen as a positive to recruitment and retention. Ensuring that other stakeholders and, in particular, other specialties, are aware of the opportunity that the proposed new model provides, including enhancing the services they offer to patients, up-skilling the workforce including GPs and providing a collaborative response to the increasing workload, was also seen as important to the success of the model. A sustainable RPS service ‘node’ would involve more than one on-site plastic surgeon to fill the 1.0 FTE position to reduce institutional risk from annual and educational leave, succession, and ensure collegial support, audit and quality processes.

Local GPs strongly support the implementation of the proposed new model of RPS delivery.

The current work to develop a regional information sharing system – Central Region Information Sharing Plan (CRISP) is also seen as vital to the success of the proposed model. Providing easily accessible and complete patient records including photographic images, at both the ‘hub’ and ‘node’ is regarded as important.

**Vignettes**

A range of clinical vignettes of common clinical problems were presented by members of the Group, which illustrated the inefficiencies and inequalities of access to services and patient dissatisfaction resulting from the current service delivery model of RPS provision in the Hawke’s Bay region. These vignettes were then explored under the proposed new model of service delivery to demonstrate the benefits to patients and their families and community and the service funders and more effective utilisation of the workforce.
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. A patient with hand injury requiring hand surgery at HVDHB on different occasions. The patient had known mental health issues and was required to be away from family and the local social support system. Travel and accommodation costs were incurred by the patient and family, and the DHB of domicile. | - The treatment was not a one-off event, but rather required on-going care to rehabilitate the hand.  
- Hand therapy was an important and integral aspect of the treatment programme and this should be done in a multidisciplinary setting including the plastic surgeon and hand therapist closer to home.  
- Multiple journeys were made to access surgical care, surgical follow-up, nursing care and hand therapy.  
- There were communication and process issues.  
- Out of town patients usually remain longer as in-patients.  
- Discharge delayed due to difficulties of organising local support from a distance. | - The patient could have all the treatment provided locally.  
- CRISP should provide complete patient records to aid communication and transfer of care.  
- Continuity of care and established local relationships and supports are not disrupted. | - Improved relationship between collaborating clinical specialties and allied health professionals.  
- Multidisciplinary management plan developed.  
- Quality of care improved through involvement of local mental health team and social support.  
- Strengthened, integrated support for access to secondary services.  
- Regional decision making on best care options. |
| 2. A female patient with breast cancer requiring breast cancer surgery and immediate breast reconstruction. Fast decision process was required. The local general surgeon was required to travel with | - No relationship between patient and plastic surgeon at HVDHB.  
- Relationship dependant on general surgeon travelling as at present.  
- Assessment done twice as no shared records. | - Continuity of care and local support.  
- Better outcomes emotionally and psychologically which build confidence through existing relationships. | - Short and long-term planning and follow up arranged by a local multidisciplinary team.  
- GPs as part of the local collaborative team.  
- More effective use of clinicians’ |
| 3. A patient with motor neuron disease developed a pressure sore. The patient was well known to local primary care services and did not wish to be away from local area. Long delay on waiting list at HVDHB. | - No holistic overview of patient care.  
- Surgical treatment of the pressure sore is only a small part of the overall care of pressure sore.  
- Processes to deal with other wider causes and issues that lead to pressure sore were disconnected.  
- Lack of confidence in the system and changes in relationships with health professionals. | - Treatment provided locally closer to the local support system including the prevention strategies and plan.  
- Allows for maintenance of existing social and support networks including nursing, allied health and primary health.  
- Builds confidence in the whole health system.  
- Shorter hospital stay. | - Provides an integrated, long term care with prevention being key.  
- Involves local multidisciplinary approach.  
- Provides continuity of care through a collaborative team. |
| 4. A patient with a malignant melanoma required 5 surgical interventions. Able to afford private treatment and therefore could be treated locally. | - Private treatment not available to all patients.  
- Treatment could be provided at any hospital with the right staff and infrastructure.  
- No clear pathways for melanoma treatment in HBDHB currently.  
- Decisions based on speed rather than on location. | - Able to access publicly funded treatment locally.  
- Timely access through clear pathway.  
- No travel or accommodation costs.  
- Continuity of care and close to family. | - Capacity for treatment provided locally.  
- Plastic Surgeon can lead the development of processes from skin cancer treatment.  
- Triage process would improve from GPs to secondary services. |
| 5. A frail elderly patient with limited | - Long waiting times between | - Regular screening leads to earlier | - Reduced costs for travel and |

patient to HVDHB to carry out mastectomy and therefore cancelled the outpatients clinic at HBDHB. Support person travelled with the patient and stayed in Wellington during the inpatient care.

- Need repeat visits to Hutt Hospital if problems occur.  
- Costs of travel/accommodation.  
- Possibility of two opinions from different specialists.  
- Avoids unnecessary travels for the patient, family and surgeon.  
- Local travel only.  
- Reduced in-patient time.

- Specialists can better build relationships with patients and families.
support requiring skin cancer treatment. No family member could provide long distance travel.

diagnosis and treatment.
- Necessity of return travel to HVDHB.
- Repeated pre-admission assessment.
- No, or limited follow up from surgeon carrying out procedure.

detection.
- Local day surgery with no overnight stay.
- Follow up with local team.

accommodation.
- Easier access to other support services as needed.

6. A young patient with a compound fracture of the lower limb, waited 5 days for a bed at HVDHB

- Delays in wound closure lead to inferior results with high risks of chronic osteomyelitis.
- Travel funding changes 24hrs post accident, from ACC to DHB
- Avoidable, unnecessary in patient stay waiting for transfer and/or surgical care.
- Delays in receiving rehabilitation
- Away from family and local support systems.

- Waiting times eliminated.
- Bone healing improved and risk of chronic osteomyelitis markedly reduced through timely wound closure.
- Rehabilitation started sooner.
- Avoids dislocation from family and local support systems.

- Improved outcomes for patient with faster recovery and return to work and reduced risk of chronic osteomyelitis.
Discussion

The current delivery of RPS services in New Zealand is out-dated, inefficient and does not meet current needs of the populations residing in the provincial areas.

The proposed new model, which will be demonstrated at HBDHB as a provincial ‘node’, integrated with and supported by the regional ‘hub’ based at HVDHB, will illustrate how funds can be better utilised, delivering more efficient services with better outcomes for patients as well as enhancing the productivity and range of services provided in the ‘node’.

The proposed model benefits the patients, their families and the community. It more efficiently utilises the workforce and a benefits the two DHBs directly involved.

Benefits for patients include:

- Multi-disciplinary, patient centred care pathways developed, taking a holistic view.
- Continuity of care and access to local support services.
- Reduced avoidable travel and time away from home for the patients and their families.
- Reduced wasteful in-patient time.
- Improved access to RPS services by specialists of all clinical disciplines through collaboration, leading to better outcomes for the patients.
- Enhances the scope of other clinical disciplines locally.
- Opportunities to attend first specialist appointments and follow-ups locally.
- The ability to maintain support networks locally.
- Building confidence in the whole health system.
- Provision of day surgery and inpatient care locally.
- More effective rehabilitation provided locally through multidisciplinary teams locally.

Benefits for the workforce include:

- Opportunities for local teams to develop collaborative relationships, share expertise, review cases, build trust and mutual support and collaboration.
- GPs as part of local collaborative team.
- Short and long-term follow up provided locally ensuring continuity of care.
- Local support services linked in as required.
- Surgeons are able to develop more effective relationship with the patients.
- High level of support for locally based Plastic Surgeons within the regional team working in ‘hub’.
- Local Plastic Surgeons can be involved in and lead other work in HBDHB, such as skin lesion pathways work.
- Triage system currently used at HBDHB will be supported, guided and improved by involvement of the Plastic Surgeon.
• Extended the capability of other on-site surgical specialties, enhancing recruitment and retention of quality staff.

Benefits for HBDHB (and other ‘nodes’) include:

• Increased productivity of the surgical team.
• Reduced expenditure on travel and accommodation for patients and their families.
• Reduced travel time and no loss of clinics for Plastic Surgeon and General Surgeon.
• Potentially 74% of all plastic surgical procedures could be safely delivered in Hawke’s Bay.
• Local multidisciplinary teams, providing support and educational opportunities for a range of health professionals.
• Extending service delivery of other clinical disciplines as Plastic Surgery is a collaborating specialty. Other specialties which could be enhanced include general surgery and breast surgery, ENT surgery, orthopaedics, primary care, skin cancer surgery, trauma management.
• Plastic Surgery is a low-cost specialty.
• Fits with the intent and direction of Regional Services Plan.

Benefits for HVDHB (and other ‘hubs’):

• Increased efficiency of service delivery for the entire region.
• Improved outcomes for patients.
• Increased access and equity of access to services for the entire central region’s population.
• Opportunities for education and mentoring.
• Better utilisation of resources.
• Reduced impact on beds and theatre space.
• Increased opportunities for delivery of highly complex interventions.
• Fits with intent and direction of Regional Services Plan.

It was noted that recruiting and retaining Plastic Surgeons at HBDHB would be an attractive proposition, working alongside colleagues at the ‘hub’ and with a range of other specialists at the ‘node’. Providing collegial support, multidisciplinary teams and on-going professional development, were all seen as positive.

Other workforce roles that could be enhanced include nursing and allied health staff, working in dedicated Plastic Surgery roles in the secondary setting and GPs, supported by local RPS, could continue to up-skill, in the area of diagnostics, treatment and referring skin cancers.

It is noted that a dedicated Plastic Surgery coordinator role could be developed, to enhance integration and seamless links between the ‘nodes’ and the ‘hub’ and to assist with linking support teams, rehabilitation, nursing and allied health
professionals. The current work on improving the information technology required to support the model is also supported.

At HBDHB, a pilot of clinical pathways project has been initiated, with skin lesions as one of the initial areas of focus. Some members of the Group are involved in this directly. As part of the proposed new model, the Plastic Surgeon(s) would be involved in and lead similar work. The Group endorses this work.

One of the areas that the Group was asked to consider, was how to best deal with the increasing numbers of patients presenting with skin cancer and where there may be areas of overlap with another of the workforce service forecast groups looking at Dermatology provision. It is acknowledged that there needs to be a national response to this, which provides guidance and standards at a national level. It was noted that the Ministry of Health is about to finalise tumour standards for melanoma, but it is felt that a focus on NMSC is needed because it is the most numerous, and is increasing rapidly in volume.

While it is acknowledged that further work is required to put the proposed new model in place, it is proposed that the current Group remain as the implementation group for this initiative. Building on the financial modelling already undertaken, the requirement to explore options for accessing the required theatre space and recruitment processes for plastic surgeon(s) to a 1.0 FTE role. It is envisaged that the proposed new model would begin with the appointment in July 2015.

Health Workforce New Zealand has an Innovations Team that has provided funding for project management or evaluation of similar demonstration sites previously and an application will be made for this support.

**Conclusion**

The aim of the forecast was to develop a vision of the relevant health service and workforce for 2020 and beyond, and possible model or models of care that are patient-centred, team based and build in primary care where appropriate.

Through the proposed new model of regional service provision, the Plastic Surgery Workforce Service Forecast Group has adequately fulfilled the task given to them, and has developed a proposed new model and demonstration site that will provide a blue print for other parts of the country.

Ensuring that current levels of Plastic Surgeons continue to be trained and that, through adopting the proposed new model across the country, a service is developed that is equitable in terms of access and efficient in terms of financial and social imperatives is seen as a priority.

The proposed new model meets the current requirements of the Ministry of Health, Regional Services Planning and the two DHBs involved in the demonstration site. In
addition, it improves the outcomes for patients, enhances the workforce and is far more equitable and efficient than current service provision.

The model also fulfils the vision that the Group has developed for Plastic Surgery in 2027 - equitable, patient-centred, integrated care, as close to home as possible, through regional networks, which cooperate nationally.

**Recommendations**

**At A National Level:**

1. **HWNZ supports the new model proposed by the Plastic Surgery Workforce Service Forecast**
   a. Maintaining existing regional RPS units as regional ‘hubs’ – which deliver low volume, high complexity services and provide support to the ‘nodes’, as well as providing lower complexity RPS for their local or sub-regional populations.
   b. Establishing provincial ‘nodes’ – which deliver higher volume, low complexity RPS services.
   c. Supporting the development of integrated, multi-disciplinary teams to support those working in the ‘nodes’.
   d. Supporting equitable distribution of Plastic Surgeons across New Zealand to enable delivery of the new model.
   e. Support clinical leadership and networks to ensure best-practice through education and audits.
   f. Supporting and building on educational opportunities and up-skilling of other clinical disciplines, General Practitioners, nursing and allied health staff.
   g. Support the development of strong pathways to ensure consistency at the national level.
   h. Providing Plastic Surgery patient coordinators to manage the flow and increased volume and to link services and this needs persons with clinical experience and ability to communicate with all involved in care.

2. **HWNZ supports and retains the current levels of training places for plastic surgeons, with regular reviews of the predicted needs.**

3. **Due to the increasing incidence of NMSC in New Zealand, that HWNZ urgently convenes a group to report on sustainable and equitable access to quality care for NMSC. The group should include Plastic Surgeons, General Surgeons, Dermatologists and General Practitioners, Radiation Oncologists and support personnel such as nurses and IT specialists.**

   This group will consider and report on:
   - Standard of care
   - The concept of a multidisciplinary team
   - An integrated model of service delivery
- Clinical and patient pathways
- Access criteria
- Scopes of practice and credentialing of participating clinicians – *who does what and where?*
- Databases and audit
- The use of technology

**At Central Regional Level:**

Given the current inadequate access to RPS services in Hawke’s Bay, the size of the population and the distances, time and costs incurred in travelling to access RPS services at the regional ‘hub’, HBDHB has been identified as a priority for service development under the proposed new model.

1. **HWNZ supports the establishment of a demonstration site at HBDHB based on providing a single service for the region**

   a. By supporting the current Group to continue as the implementation group for the project.
   b. By providing evaluation or project management support (funding application to Innovations Team to be completed).
   c. By supporting the on-going work of the Clinical Skin Lesion Pathways Group at HBDHB and involvement of the Plastic Surgeon in this work, once appointed.
   d. By supporting centralising administration and utilising CRISP share patient information.
   e. Ensuring costs are as effective and efficient as possible and preventing discussions over funding from getting in the way of clinical decisions.
   f. Developing clear pathways for GPs and supporting the development of primary care.
   g. Ensuring that IT systems work to enable and support the model, though access to patient information, creation of databases, allowing for referrals etc.
   h. Ensuring that the infrastructure is in place to support the new model of RPS service delivery, including theatre, outpatient and inpatient spaces, equipment, and up-skilling of nursing and allied health staff.
Background Paper

Mr Brandon Adams and Prof Swee Tan prepared the information contained in this section.

11.1 Plastic Surgery in New Zealand

New Zealand currently has 4.3 million citizens\(^1\) and 57 plastic and reconstructive surgeons (PRS)\(^2\). By 2027 the New Zealand 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. By 2026 it is estimated that 1 million New Zealanders will be aged 65 and over. Demand for RPS services increases with age and is predicted to increase by 49% by 2026\(^3\). Surgical workforce planning is challenging due to rapid changes in population size, demographics, medical 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 due to inadequate number of service providers, funding provision or low use due to geographic inaccessibility. They also do not account for future increased per-capita disease burden due to rising disease complexity with increased age and severity of co-morbidities.

Six of New Zealand’s 20 District Health Boards (DHBs) directly provide some RPS services. The services provided range from a single part-time appointment to a comprehensive centre with 16 surgeons. Supra-regional co-operation for Burns, Vascular Anomalies, Laser and Craniofacial Surgery is well established. Five regional centres provide 24-hour acute services. In 2011, 2.5 million of New Zealand’s 4.3 million citizens do not have a RPS service in their home DHB and are dependent on either outreach services or travelling inter-district to access these services (after utilising local services for outpatient assessment). By 2026 this number will rise to nearly 2.9million unless the current service delivery model is changed.

The current RPS service delivery model, based on post-World War II requirements, is outdated and no longer serves the New Zealand population adequately resulting in increasingly inequality of access to quality RPS services. It has been recognised that this outdated service delivery model has to change to better serve the New Zealand populations. Integrating RPS services within provincial hospitals will improve access to RPS expertise by local clinicians thus supporting and enhancing local clinical services, including trauma services in which RPS is an essential part. Reorganising PRS service delivery has the great potential to achieve more efficient service delivery that is better, faster and more convenient to the entire populations.

Transition from a centralised hub to the proposed “hub” and “nodes” service delivery model with better distribution of the RPS workforce and service centres (through which a single regional service to provide equitable, efficient, quality and sustainable PRS services to a combined population), requires support and facilitation of new service provision and preservation of regional links, tertiary expertise and academic cooperation.
11.2 PRS Workforce - How Does New Zealand Compare with Other Countries?

New Zealand currently has a plastic surgeon to patient ratio of 1:83,000. This compares well with France, Sweden and Australia (1:80,000), but is well below the United States (1:50,000) and Switzerland (1:58,000).

11.3 Predicted Future Need

If the current ratio of 1 plastic surgeon to 83,000 persons was simply maintained, a total of 60 plastics surgeons will be required by 2026. If the increasing complexity of our patient population and increased age related demand for RPS is also taken into account, an increase by 49% will be required by 2026\(^3\). Raymont and Simpson\(^3\) use age specific surgical intervention rates to arrive at their estimated 49% increase in RPS service provision, as RPS delivers treatment across a wide spectrum of ages it is markedly affected by population aging – in particular with the increasing incidence of cancers including complex cutaneous malignancy. This prediction can be used to estimate the number of plastic surgeons needed by 2026. This gives a range of 79-84 surgeons depending on whether 2011 or 2012 is chosen as the baseline (in 2011 there were 53 registered plastic surgeons; in 2012 there were 57 surgeons). These predictions give an approximate surgeon to patient ratio of between 1:63000 and 1:59000 (the population in 2026 divided by the number of surgeons). The size of the populations and the number of RPS surgeons needed for the population of each regions currently and in 2026 is shown in Table 1.
<table>
<thead>
<tr>
<th>Regions in 2011</th>
<th>Regional pop in 2011</th>
<th>Number of PRS 2012</th>
<th>Pop of 20 DHBs in 2027</th>
<th>12 Possible Services in 2027</th>
<th>Region pop in 2027</th>
<th>PRS need 2027</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northland</td>
<td>157,350</td>
<td>1</td>
<td>180,146</td>
<td>Northland</td>
<td>180,146</td>
<td>3</td>
</tr>
<tr>
<td>Middlmore region</td>
<td>1,478,000</td>
<td>26</td>
<td>614,911</td>
<td>Waitemata</td>
<td>614,911</td>
<td>10.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>515,536</td>
<td>Auckland</td>
<td>515,536</td>
<td>8.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>561,674</td>
<td>Counties Manukau</td>
<td>561,674</td>
<td>9.4</td>
</tr>
<tr>
<td>Waikato region</td>
<td>837,490</td>
<td>7</td>
<td>422,504</td>
<td>Waikato/Lakes</td>
<td>539,967</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>240,526</td>
<td>Bay of Plenty</td>
<td>240,526</td>
<td>4</td>
</tr>
<tr>
<td>Wellington region</td>
<td>993,770</td>
<td>12</td>
<td>117,464</td>
<td></td>
<td>125,089</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>53,237</td>
<td>Hawkes Bay/Tairawhiti</td>
<td>230,280</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>177,043</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>66,861</td>
<td>Mid-Central Whanganui Taranaki</td>
<td>374,385</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>182,435</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>46,115</td>
<td>Hutt Valley Wellington Wairarapa</td>
<td>553,294</td>
<td>9.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>164,633</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>342,546</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>158,107</td>
<td>NMDHB &amp; West Coast</td>
<td>195,579</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>37,472</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>581,824</td>
<td>Canterbury &amp; South Canterbury</td>
<td>645,891</td>
<td>10.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>64,067</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>208,138</td>
<td>Southern region</td>
<td>347,812</td>
<td>5.8</td>
</tr>
<tr>
<td>Southern region</td>
<td>303,800</td>
<td>2</td>
<td>139,674</td>
<td></td>
<td>139,674</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>4,367,300¹</td>
<td>57</td>
<td>5,000,000¹</td>
<td></td>
<td>5,000,000</td>
<td>83.3</td>
</tr>
</tbody>
</table>

This analysis does not account for current unmet needs due to existing lower levels of RPS service provision in provincial centres (i.e., where a RPS service centre does not exist currently).
11.4 Scope of RPS

RPS is a tertiary surgical service. However, it is incorrectly assumed that RPS is more appropriately delivered in small number of centres. There have been major changes in the advances and development of RPS since World War II. Modern RPS provides services of the general nature (“general plastic surgery”) and 17 sub-specialties. The subspecialty areas of RPS provided in New Zealand public hospitals include breast reconstruction, burns surgery, cleft lip & palate surgery, craniofacial surgery, ear reconstruction, facial palsy surgery, hand surgery, head and neck resection surgery, head and neck reconstruction surgery, hypospadias surgery, laser surgery, lower limb reconstruction, maxillofacial surgery, oculoplastic surgery, skin cancer (including melanoma and non-melanoma skin cancer) surgery, skull base surgery, and vascular anomalies. The scope of RPS is broad and many areas of RPS services require modest capital investment and can be more efficiently delivered in provincial centres rather than the tertiary hubs that should continue to provide low volume, high complexity services and those that require specialised equipment and with appropriately trained plastic surgeon.

The areas of RPS which require low capital investment to provide service include general plastic surgery (including complex wounds repair, flap and graft reconstruction), melanoma surgery, non-melanoma skin cancer surgery, breast reconstruction, ear splinting, lower limb reconstruction, oculoplastic surgery, maxillofacial trauma, acute and secondary hand surgery, and minor burns.

As a collaborating specialty, an on-site RPS service also supports and enhances other clinical disciplines in provincial hospitals. For example, a patient presenting with a complex compound fracture can be more efficiently treated locally by an orthopaedic surgeon in collaboration with a plastic surgeon with closure of the wound in a timely manner. Currently such patients would have the fracture stabilised (usually by internal fixation) and then transferred to the tertiary centre at Hutt Hospital. Considerable delay usually occurs for logistic reasons incurring significant cost for prolonged and unnecessary hospitalisation and markedly increased risk of chronic osteomyelitis. The ability to provide treatment efficiently locally also has the significant benefit of continuity of care as long-term rehabilitation and follow up will need to be provided locally. Similarly, the capacity to provide other services such as breast reconstruction, hand surgery, minor burns, melanoma and non-melanoma skin cancers, facial injuries, and general plastic surgery (e.g., complex abdominal hernias, complex wounds) would support and enhance the scope of surgeons and other clinicians locally and improve the access to quality RPS service that can be efficiently delivered locally with minimal disruption to the patients and their families.

The development of RPS services based at provincial hospitals will increase access to PRS for the local populations. However, certain subspecialty RPS services that are currently functioning well will need to remain centralised to the hub. These include craniofacial surgery, skull base surgery, cleft lip & palate surgery, ear reconstruction, major burns, hypospadias, laser surgery and vascular anomalies.
11.5 Provision of RPS Services in the Central Region of New Zealand

The Wellington Regional Plastic, Maxillofacial & Burns Unit (the Unit) based at Hutt Valley DHB (HVDHB) provides RPS services to 993,000 people in 7 DHBs. In addition, the Unit provides a national service for vascular anomalies and supra-regional services for craniofacial surgery and laser surgery. 85% of the population in the Central region reside outside of HVDHB catchment. The distances and times required to access RPS services provided at Hutt Hospital by residents domiciled within different DHBs of the Central region are shown in Table 2.

Table 2 Distances and times required to access RPS services at Hutt Hospital

<table>
<thead>
<tr>
<th>Region</th>
<th>Population in 2011</th>
<th>% of Population</th>
<th>Return Trip to Hutt Hospital (km)</th>
<th>Travel Time (Mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawkes Bay</td>
<td>154,640</td>
<td>15.6</td>
<td>598</td>
<td>468</td>
</tr>
<tr>
<td>Whanganui</td>
<td>58,400</td>
<td>5.9</td>
<td>372</td>
<td>312</td>
</tr>
<tr>
<td>Midcentral</td>
<td>159,350</td>
<td>16</td>
<td>276</td>
<td>242</td>
</tr>
<tr>
<td>Wairarapa</td>
<td>40,280</td>
<td>4.1</td>
<td>171</td>
<td>154</td>
</tr>
<tr>
<td>Hutt Valley</td>
<td>143,800</td>
<td>14.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Capital &amp; Coast</td>
<td>299,200</td>
<td>30.1</td>
<td>41</td>
<td>46</td>
</tr>
<tr>
<td>Nelson</td>
<td>138,100</td>
<td>13.9</td>
<td>446</td>
<td>468</td>
</tr>
<tr>
<td>Marlborough</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Over the last 55 years the Unit has provided an increasing number of outreach clinics at Palmerston North, Hastings, Nelson, Blenheim and Whanganui and a small number of operating sessions at Palmerston North, Hastings and Nelson.

11.5.1 Volumes of General and Subspecialty RPS Services Provided in the Central Region

A list of 714 ICD-10 AM codes for RPS procedures were identified and matching procedures between 2005 and 2010 performed at Hutt Hospital were identified. This yielded a database of 37,386 operations in 16 categories of RPS (Table 3).

Table 3 Plastic Surgery Sub-categories and ICD Procedures Codes

<table>
<thead>
<tr>
<th>Plastic Surgery Sub-categories</th>
<th>Number of Procedures 2005-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin Lesion Excision – Plastics Sites</td>
<td>12,813</td>
</tr>
<tr>
<td>Local Flap and Graft Reconstruction</td>
<td>5,805</td>
</tr>
<tr>
<td>Breast Reconstruction</td>
<td>1,352</td>
</tr>
<tr>
<td>Hand Surgery</td>
<td>5,461</td>
</tr>
<tr>
<td>Lymph Node Surgery</td>
<td>1,476</td>
</tr>
<tr>
<td>Maxillofacial Fractures</td>
<td>1,664</td>
</tr>
<tr>
<td>Microsurgery</td>
<td>2,630</td>
</tr>
<tr>
<td>Burn Surgery</td>
<td>1,440</td>
</tr>
<tr>
<td>Head &amp; Neck Resection</td>
<td>939</td>
</tr>
<tr>
<td>Head &amp; Neck Reconstruction</td>
<td>2,202</td>
</tr>
<tr>
<td>Cleft lip &amp; Palate Surgery</td>
<td>274</td>
</tr>
<tr>
<td>Craniofacial</td>
<td>404</td>
</tr>
</tbody>
</table>
Those sub-categories listed in black and some of the subcategories listed in blue (e.g., minor burns, and low complexity head and neck resection and reconstruction) can be safely and effectively provided at a strategically located on-site RPS centre based in a provincial hospital.

11.5.2 RPS Procedures Performed for Residents According to the DHB of Domicile

RPS procedures performed were allocated to the patients’ DHB of domicile using the NZ Post postal codes (Table 4).

Table 4 RPS procedures for Residents According to the DHB of Domicile

<table>
<thead>
<tr>
<th>DHB of Domicile</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>DHB TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVDHB</td>
<td>2,341</td>
<td>2,161</td>
<td>2,002</td>
<td>2,391</td>
<td>2,157</td>
<td>2,168</td>
<td>13,220</td>
</tr>
<tr>
<td>CCDHB</td>
<td>2,387</td>
<td>2,004</td>
<td>2,090</td>
<td>2,136</td>
<td>1,852</td>
<td>1,859</td>
<td>12,328</td>
</tr>
<tr>
<td>Wairarapa</td>
<td>287</td>
<td>241</td>
<td>253</td>
<td>311</td>
<td>270</td>
<td>319</td>
<td>1,701</td>
</tr>
<tr>
<td>NMDHB</td>
<td>201</td>
<td>175</td>
<td>201</td>
<td>209</td>
<td>285</td>
<td>303</td>
<td>1,374</td>
</tr>
<tr>
<td>Midcentral</td>
<td>723</td>
<td>649</td>
<td>570</td>
<td>553</td>
<td>666</td>
<td>717</td>
<td>3,878</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>444</td>
<td>434</td>
<td>562</td>
<td>462</td>
<td>542</td>
<td>596</td>
<td>3,040</td>
</tr>
<tr>
<td>Whanganui</td>
<td>138</td>
<td>154</td>
<td>157</td>
<td>128</td>
<td>174</td>
<td>153</td>
<td>904</td>
</tr>
<tr>
<td>YEARLY Total</td>
<td>6,633</td>
<td>6,002</td>
<td>5,972</td>
<td>6,376</td>
<td>6,092</td>
<td>6,311</td>
<td>37,386</td>
</tr>
</tbody>
</table>

11.5.3 Procedure Volumes and Intervention Rate for RPS Services for Each DHB

The procedure volumes were population normalised using Statistics New Zealand regional population estimates. These rates were also normalised to the intervention rate of CCDHB, HVDHB’s closest neighbour DHB, where access should be least affected by distance and travel barriers (Table 5).

Table 5 Procedure Volumes and Intervention Rates for RPS Services for Each DHB

<table>
<thead>
<tr>
<th>DHB</th>
<th>Total Operations 2005 - 2010</th>
<th>Region’s Population</th>
<th>Procedures per Population</th>
<th>Intervention Rate Normalised to CCDHB</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVDHB</td>
<td>13,220</td>
<td>143,800</td>
<td>0.0919</td>
<td>2.23</td>
</tr>
<tr>
<td>CCDHB</td>
<td>12,328</td>
<td>299,200</td>
<td>0.0412</td>
<td>1</td>
</tr>
<tr>
<td>Wairarapa</td>
<td>1,701</td>
<td>40,280</td>
<td>0.0422</td>
<td>1.02</td>
</tr>
<tr>
<td>Midcentral</td>
<td>3,878</td>
<td>159,350</td>
<td>0.0243</td>
<td>0.59</td>
</tr>
<tr>
<td>Hawkes Bay</td>
<td>3,040</td>
<td>154,640</td>
<td>0.0196</td>
<td>0.48</td>
</tr>
<tr>
<td>Whanganui</td>
<td>904</td>
<td>58,400</td>
<td>0.0154</td>
<td>0.38</td>
</tr>
<tr>
<td>NMDHB</td>
<td>1,374</td>
<td>138,100</td>
<td>0.0099</td>
<td>0.24</td>
</tr>
<tr>
<td>Total</td>
<td>37,386</td>
<td>993,770</td>
<td>0.0376</td>
<td></td>
</tr>
</tbody>
</table>

The intervention rate for each DHB was compared with that of CCDHB and it was found that the HVDHB population had a significantly higher intervention rate (an
expected finding as the Unit based at Hutt Hospital provides secondary as well as tertiary services to its local population). Giving the close geographical proximity and the absence of an alternative tertiary service provider, Wairarapa DHB (WDHB) also had equal intervention rates to that of CCDHB. Whereas the more remote DHBs had significantly lower intervention rates compared to that CCDHB and WDHB (Figure 1). There is an inverse relationship between distance and intervention rates (Figure 2) which shows that access to RPS services (intervention rate) reduces with increased distance from the Unit based at HVHDHB.

**Figure 1 Access to RPS Services vs Distance from Hutt Hospital**

![Graph showing access to RPS services vs distance from Hutt Hospital](image1)

**Figure 2 Overall Access to RPS Services Relative to CCDHB**

![Bar chart showing access to RPS services relative to CCDHB](image2)

**Key:**
Blue – population normalised intervention rate is equal to that of CCDHB
Green – population normalised intervention rate is significantly greater than that of CCDHB
Red – population normalised intervention rate is significantly lower to that of CCDHB
11.5.4 Possible Reasons for Inequality of Access to RPS Services

Possible reasons for the inequality in access to RPS services by the populations residing within and outside the HVDHB catchment and the variation in access to different subspecialty RPS services include:

1. Differences in regional disease prevalence
These are likely to be small and related to age/demographic mix in region.

2. Possible alternative providers in peripheral centres
Services with no possible alternative provider (cleft lip & palate surgery, craniofacial surgery, breast reconstruction) are equally served suggesting equitable provision of these services.

There are some alternative providers, which may explain some of the variations. The ENT service at CCDHB provides some head and neck resections. Some patients residing within the Nelson Marlborough DHB catchment may access services provided by the Christchurch Regional Plastic Surgery Unit. The effect of alternative providers is likely to be greater for secondary RPS services and less with tertiary RPS services. The magnitude of this effect is difficult to quantify on the basis of current data but may be as high as 30-50% for select services such as ENT at CCDHB, which provides some head and neck cancer resection service (Figure 5). However, potential negative affects on outcomes such as higher incomplete excision rates (Appendix 2) and the costs of further treatment must to be considered. Procedure data from all 7 DHBs (or from the National Minimum Dataset) would be required to determine the effect of alternative provider. Intuitively, it may be assumed that other secondary services such as ENT surgery, general surgery and dermatology may adequately provide some of the secondary RPS services locally. This is unlikely to be the case as absence of an on-site RPS (e.g., microsurgery) may lead to alternative treatment that may have less ideal long-term outcome (see below).

3. Unmet need
It is likely that there are significant unmet needs in provincial areas such as hand surgery and microsurgical reconstructions which may provide improved outcomes but may be under-utilised due to the lack of access because of the absence of on-site RPS service.

4. RPS is not currently part of local trauma services in the distant DHBs
RPS is internationally recognised as a vital and integral part of trauma service. Within RPS, it provides trauma services including hand surgery, burn surgery, microsurgery, wound repair with flaps and grafts and facial trauma. These areas of RPS account for 12,512 of 36,062 RPS operations performed at Hutt Hospital in the 2005-2010 period. That is, at least 34.6% of RPS procedures in the Central region were for acute trauma. The lack of ready access to an on-site RPS service often results in alternative (that may be less than ideal) treatments being provided or delayed referral from remote DHBs which occurs regularly.
Communities that live in remote areas appreciate that complex or low-volume surgical procedures will not be available locally and travel will be required to access them. However, a large proportion of the RPS procedures which are required in growing provincial centres are of a high volume nature that does not require significant capital investment. The services which could be appropriately delivered in a provincial hospital include majority of the acute RPS services (e.g., hand, microsurgery, facial trauma, complex wound) which constitutes 34% of all RPS services, and a large proportion of melanoma and non-melanoma skin cancer excision and repair, lymph node surgery, breast reconstruction, hand surgery, and a smaller proportion of the less complex head and neck cancer resection and reconstruction. Cleft lip & palate surgery, craniofacial, ear reconstruction, hypospadias, laser surgery and vascular anomalies and the more complex trauma and head and neck surgery and skull base surgery would still need to be provided by a regional hub. On this basis, up to 74% of current RPS services could potentially be provided at an on-site RPS centre, strategically located at certain provincial hospitals.

Estimates of the cost borne by the community to access services remotely are an important comparison to any cost-savings from efficiencies gained from higher volume units delivering service at a distance. Estimates of community borne costs are difficult to estimate, as the relationships between time, distance and community opportunity costs are not linear. It is possible to estimate minimum financial costs of accessing services remotely as follows:

The minimum financial cost of accessing RPS services at a distance includes the cost of return road transport from home DHB to service provided by the Unit based at HVDHB. Distances may be converted to monetary values using the generally accepted IRD travel cost rates for use of motor vehicles of 74c per km travelled (Table 6).

### Table 6 Minimum Estimates of Travel Costs to Hutt Hospital 2005 – 2010

<table>
<thead>
<tr>
<th>Domicile</th>
<th>Distance Travelled (km)</th>
<th>Return trip Distance (km)</th>
<th>No. of Operations 2005-2010</th>
<th>Total Distance Travelled (km)</th>
<th>Total IRD Travel Cost 74c/km ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Hutt</td>
<td>0</td>
<td>0</td>
<td>13220</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wellington</td>
<td>20.3</td>
<td>40.6</td>
<td>12328</td>
<td>500516.8</td>
<td>370,382.43</td>
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<tr>
<td>Masterton</td>
<td>85.3</td>
<td>170.6</td>
<td>1701</td>
<td>290190.6</td>
<td>214,741.04</td>
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<tr>
<td>Nelson</td>
<td>223</td>
<td>446</td>
<td>1374</td>
<td>612804</td>
<td>453,474.96</td>
</tr>
<tr>
<td>Palmerston</td>
<td>138</td>
<td>276</td>
<td>3878</td>
<td>1070328</td>
<td>792,042.72</td>
</tr>
<tr>
<td>North Hastings</td>
<td>299</td>
<td>598</td>
<td>3040</td>
<td>1817920</td>
<td>1,345,260.80</td>
</tr>
<tr>
<td>Whanganui</td>
<td>186</td>
<td>372</td>
<td>904</td>
<td>336288</td>
<td>248,853.12</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2,473,839.4</strong></td>
<td><strong>3,424,755.1</strong></td>
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<td></td>
</tr>
</tbody>
</table>

The minimum productive time lost by the community to access RPS services remotely may be estimated by the determining the time required for travel from their home DHB to Hutt Hospital. As patients travelling for RPS are not usually able
to transport themselves home following operations and anaesthesia it this estimate may be doubled to account for a support person who travels with the patient and provides transport for them (Table 7).

Table 7 Minimum Estimates of Travel Time to Hutt Hospital 2005-2010

<table>
<thead>
<tr>
<th>Domicile</th>
<th>AA Return Trip Duration (Mins)</th>
<th>No. of Operations 2005-2010</th>
<th>Total Travel Duration (Min)</th>
<th>Total Travel Duration (40- hr Weeks)</th>
<th>Total Travel Duration in Working Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Hutt</td>
<td>0</td>
<td>13,220</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Wellington</td>
<td>46</td>
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<td>567,088</td>
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<td>261,954</td>
<td>109.1</td>
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<tr>
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<td>1,374</td>
<td>643,032</td>
<td>267.9</td>
<td>6.1</td>
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<td>Palmerston North</td>
<td>242</td>
<td>3,878</td>
<td>938,476</td>
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<tr>
<td>Hastings</td>
<td>468</td>
<td>3,040</td>
<td>1,422,720</td>
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<td>13.5</td>
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<tr>
<td>Whanganui</td>
<td>312</td>
<td>904</td>
<td>282,048</td>
<td>117.5</td>
<td>2.7</td>
</tr>
</tbody>
</table>

A minimum of 39 standard working years of patient time have been consumed in the 2005-2010 period solely for travelling to access RPS at Hutt Hospital. This number increases to 78 working years if the minimum time for a support person to transport each patient, is included. If this is productive working time lost and if we consider the average New Zealand Salary to be $49,875, this would translate to $3,890,250 in lost earnings during the 2005-2010 period.

These calculations do not include the cost to the community for necessary clinic attendance. For every elective RPS operation there is likely to be one pre-operative consultation and at least one post-operative consultation. For acute RPS there is likely to be more than one follow up clinic appointment [for early wound check, and later to ensure satisfactory long-term outcome]. Hence the true cost to the community for accessing the RPS services at Hutt Hospital is likely to be more than 3 times the estimated cost of accessing the surgery alone.

In addition, to transport and lost productive time, DHBs or individual patients may bear accommodation costs, road or air ambulance transport costs, and inter-hospital transfer isolation costs. Although these estimates do not provide precise figures, it is clear that even from basic calculations that the costs are substantial.

The cost of accessing RPS services remotely will increase in future, not only due to increasing population size, but also due to the increasing number of elderly New Zealanders living in provincial centres who may require increased support of other community members to transport them to access these distant services.

12.1 Role of RPS in a Peripheral “Node”

RPS is a broad specialty that is not restricted to any region of the body or age group. There are many areas where RPS has cross-over service delivery with other surgical and non-surgical specialties and general practice. One example of this is skin cancer surgery. RPS plays an important role in treating skin cancers and should be a member of the locally based multidisciplinary team treating skin cancers. Our recent study of non-melanoma skin cancer (NMSC) treated surgically over a 10-year period
within the Central region shows that plastic surgeon treated over a third of all NMSC cases. RPS also treated the most complex and largest lesions, and with the highest rate of complete excision compared with all clinical disciplines (Appendix 2).

Rather than seeing RPS as a service that can be split into multiple components some of which can be provided by alternative surgical specialties, it is more appropriate to regard RPS as a specialty which provides a wide range of surgical procedures which are underscored by plastic surgical principles and techniques to achieve the best functional and cosmetic outcome through optimal reconstruction. RPS is not just a service provider of specific operations, but is an effective partner and collaborator to other surgical and non-surgical disciplines to provide high quality of care in a wide range of settings. When a plastic surgeon is available patients with all manner of conditions may receive reconstruction from a high volume provider of reconstruction (plastic surgeon), which allows the partner surgeons to maintain their main focus on other aspects of care rather than reconstruction. Being the only remaining ‘general’ surgical discipline, plastic surgery is a surgical discipline that is well suited in provincial hospitals in strategically located peripheral centres networked with a central hub.

12.2 What RPS Services Can Be Provided in A Provincial RPS Centre?

RPS provides surgery of a general nature and in 17 sub-specialty areas (Appendix 1, Table 3). The range of service a particular RPS service based in a provincial hospital should deliver depends on the local population size and the relative distance from a central hub. The recent review of South Island Neurosurgical services used the terminology of peripheral “nodes” (providing secondary and essential emergency surgery) and central “hubs” which provide for their local population and also provide a low volume or capital intense services for a number of peripheral nodes.

Using this concept, it is feasible that by 2027 there will be 12 population centres of more than 180,000 that would warrant a peripheral service node. These include the 6 current DHBs that provide plastic surgery and also Waitemata, Auckland, Bay of Plenty, Hawkes Bay, MidCentral, and Nelson-Marlborough.

Beyond their populations’ need for an on-site RPS service, these DHBs have significantly different characteristics of population, current surgical and medical services and proximity to a current provider of complex RPS services.

Out of the sub-categories listed in Table 3, those listed in black and some of the subcategories listed in blue (e.g., minor burns, and low complexity head and neck resection and reconstruction) can be safely and effectively provided at a strategically located on-site RPS centre in a provincial hospital.

A RPS service at these 6 centres would likely contribute to acute and elective hand surgery, facial trauma, treatment of melanoma and non-melanoma skin cancer, low complexity head and neck cancer resection and reconstruction, minor burn surgery, lower limb reconstruction, and breast reconstruction surgery and general reconstruction such as pressure sore surgery, in which integration to local services is vital for success. Trauma is a significant component of DHB activities. An on-site RPS service would improve access to RPS as an integral part of a trauma service that is vital especially in the management of complex wounds and provide
support of other surgical and medical services. The areas of RPS service that could be delivered in the peripheral nodes are not capital intense. There is little equipment required for much core RPS work, but investment in nursing, allied health and other support staff development is essential as a service evolves.

The delivery of low volume and highly complex procedures (Table 3) such as cleft lip & palate surgery, craniofacial surgery, skull based surgery and vascular anomalies and capital intense RPS services such as laser surgery would need to continue to be delivered from “hubs”. The nodes could provide clinics for first specialist assessment and follow up to compliment some parts of these services.

12.3 RPS as A Facilitator of Surgical Services in Provincial Hospitals

In addition to providing RPS services locally, it is possible for a provincial hospital hosting an on-site RPS service to extend the capacity of other surgical services to provide a wider range of services to their local populations. This also has the other benefits such as recruitment and retention of staff of other clinical disciplines.

General Surgery – Breast cancer, melanoma, non-melanoma skin cancer are examples of areas where a local RPS service can enhance and support general surgery to extend the range of work that could be safely and effectively treated in provincial hospitals without the need for transfer to a tertiary hub.

Orthopaedic Surgery – Hand injuries, lower limb trauma, amputations, large volume bone and/or soft tissue loss from trauma or tumour are areas where local RPS service would extend the range of patients that could be safely treated in a peripheral centre without need for transfer to a tertiary hub.

ENT Surgery – Less complex head and neck cancer surgery is an area where an on-site RPS service could extend the range of patients that could be safely treated in a provincial hospital without need for transfer to a tertiary hub.

Skin Cancer Surgery – These services are provided by a large range of clinical specialties. Melanoma and non-melanoma skin cancer are areas where local RPS service would enhance the services as a member of the multidisciplinary team without need for transfer the patient to a tertiary hub.

Facial Trauma Surgery – Facial trauma is provided by a range of specialties including ENT, oral & maxillofacial, ophthalmology and general surgery. An on-site RPS service would extend the range of patients that could be safely and effectively treated in a provincial hospital without need for transfer to a tertiary hub.

RPS services in provincial hospitals have the potential to decrease the need for transfer of patients for both plastic surgery and surgery for other services. RPS should be seen as a low capital cost facilitator of extended secondary services.

It is possible that, quoting the South Island Neurosurgical Services Review, a number of service providing nodes may coordinate with a central hub, which facilitates complex care, but the nodes may deliver much of the service in provincial centres.
13 National Priority Areas in Need of Local RPS Service Development

By 2027, 2,900,000 people will rely on outreach or visiting RPS services (Appendix 1). Currently, 6 DHBs provide some RPS service in New Zealand. The other 14 DHBs have a wide range of population sizes, are variable distances from their closest referral centre and have varying degrees of current outreach services. Of the 6 additional DHBs which, by 2027, would have sufficient populations to warrant an on-site RPS service (Appendix 1) it is possible to create a relative priority list by giving priority to developing services where there are large populations or longer distances from the current provider of RPS services. On this basis the priority order would be as follows:

1. Hawkes Bay

Current population: 154,640
Current RPS service: One plastic surgeon resident half time in Hawkes Bay, 6 sessions per month (clinics and operating). All other services require travel to Lower Hutt with a 586km return trip taking 7 hours and 45 minutes.
Estimated 2027 population: 177,043
Estimated 2027 plastic surgeon need: 3
Estimated proportion of the population reliant on outreach services = 6.1%, calculated as [177,043/2,900,000]x100%

2. Waitemata

Current population: 537,100
Current plastic surgery service: 2 plastic surgeons visit for one half day a fortnight each to provide breast reconstructive services. One plastic surgeon attends melanoma meetings fortnightly. No plastic surgery clinics are provided. All other patients are operated on at Counties-Manukau DHB and seen in clinic at the Manukau Super Clinic.
Estimated 2027 population: 614,911
Estimated 2027 plastic surgeon need: 10.2
Estimated proportion of the population reliant on outreach services = 21%, calculated as [614,911/2,900,000]x100%

3. Auckland City

Current population: 450,300
Current plastic surgery service: Visiting service from Middlemore hospital with craniofacial, paediatric, hypospadias, ENT head and neck, gynaecological, cardiothoracic, orthopaedic, general surgery, vascular surgery, hand surgery being provided by a limited number of regular and ad hoc visiting plastic surgeons with frequent transfer and follow up performed at Counties Manukau DHB.
Estimated 2027 population: 515,536
Estimated 2027 plastic surgeon need: 8.6
Estimated proportion of the population reliant on outreach services = 18%, calculated as $\left[\frac{515,536}{2,900,000}\right] \times 100$

4. Bay of Plenty
Current population: 210,090
Current plastic surgery service: One plastic surgeon resident in Tauranga. One day of public hospital plastic surgery (clinics and operating) per week. All other services require travel to Hamilton with a 206km return journey taking 3 hours.
Estimated 2027 population: 240,526
Estimated 2027 plastic surgeon need: 4
Estimated proportion of the population reliant on outreach services = 8.2%, calculated as $\left[\frac{240,526}{2,900,000}\right] \times 100$

5. Nelson-Marlborough
Current population: 138,100
Current plastic surgery service: Visiting service from HVDHD. One day of public hospital plastic surgery (clinics and operating) per month at Nelson and Blenheim. All other services require travel to Hutt Hospital with a 446km road and ferry return journey taking 8 hours or air and land transport.
Estimated 2027 population: 156,107
Estimated 2027 plastic surgeon need: 2.6
Estimated proportion of the population reliant on outreach services = 5.4%, calculated as $\left[\frac{156,107}{2,900,000}\right] \times 100$

Any service development requires planning, coordination, sufficient operating, ward and clinic space as well as surgeon recruitment and axillary staff recruitment and training.

Hawkes Bay DHB serves the largest population with very large distances required to access RPS services; travel of almost 8 hours for day case RPS is common and adds substantially to the true (community and DHB) cost to providing the service. This identifies it as a priority for service development.

References
1. Statistics New Zealand website.
2. Medical Council of New Zealand website.
5. Prioritisation of Medical Disciplines for funding by Health Workforce New Zealand, Health Workforce New Zealand, 08 September 2011.
Appendix 1: NZMJ article

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

The future of the New Zealand plastic surgery workforce
Brandon M Adams, Michael F Klaassen, Swce T Tan

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 and 57 specialist plastic surgeons. By 2027 the NZ population will reach 5 million. 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. 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. These methods do not account for current unmet needs, unequal and poor access 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 and co-morbidities.

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).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>
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<td>8.8</td>
<td>273,000</td>
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<tr>
<td>2009</td>
<td>4,300,000</td>
<td>36.6</td>
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<td>2027</td>
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<tr>
<td>2041</td>
<td>5,400,000</td>
<td></td>
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</tr>
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</table>

Current and historic workforce capacity

NZ has a total medical workforce of 11,478 doctors in 2010.¹³ 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).¹⁴⁻²⁶ 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 (Waitakere).

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.
Table 2. Current and predicted future distribution of NZ PRS workforce

<table>
<thead>
<tr>
<th>Region</th>
<th>DHB Population</th>
<th>Population for Each PSU</th>
<th>Surgeons in Each Region</th>
<th>Surgeon: Population Ratio</th>
<th>DHB Population</th>
<th>Surgeons Needed</th>
<th>12 Potential Service Centres and Number of Surgeons</th>
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</thead>
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<td>Northland</td>
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<td>180,146</td>
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<td>3.0</td>
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<td>Waitemata</td>
<td>537,100</td>
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<td></td>
<td></td>
<td>614,911</td>
<td>10.2</td>
<td>10.2</td>
</tr>
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<td>Auckland</td>
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<td>1,478,000</td>
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<td>515,536</td>
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<td></td>
<td>422,504</td>
<td>7.0</td>
<td>9.0</td>
</tr>
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<td>Bay of Plenty</td>
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URL: http://journal.nzma.org.nz/journal/126-1372/5599/
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 \(((18.7+6.0) \times 0.76 + (22.3+5.0) \times 0.24)\)^20

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.34

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.

Author information: Brandon M Adams, Plastic Surgery Fellow, New Zealand Institute for Plastic and Cosmetic Surgery, Auckland; Michael F Klaassen, Plastic Surgeon, Parnell Surgeon, Auckland; Swee T Tan, Professor in Plastic Surgery, University of Otago; Director, Gillies McIndoe Research Institute; Plastic & Cranio-Maxillofacial Surgeon, Wellington, Regional Plastic, Maxillofacial & Burns Unit, and Director of Surgery, Hutt Hospital, Wellington

Correspondence: Professor Swee T Tan, Wellington Regional Plastic, Maxillofacial & Burns Unit, Hutt Hospital, Private Bag 31-709, Lower Hutt 5010, New Zealand. Fax: +64 (0)4 5872510; email: swee.tan@huttvalleymdhb.org.nz

References:

33. Wraith, B. Health workforce New Zealand. Personal communication, 8 June 2012.
Appendix 2: Membership of the Plastic Surgery Workforce Service Forecast Group

Prof Swee Tan (Chair) - Representing NZAPS
Mr Grant Broadhurst - General and breast Surgeon HBDHB
Dr Hannes Meyer - GP, Hawke’s Bay
Ms Ruth Grewer - Hand therapist, HBDHB
Mr Brandon Adams - Recently graduated plastic surgeon (currently in Brisbane) - representing NZAPS
Mr Gary Duncan - Plastic surgeon based at HBDHB/HVDHB
Ms Carolyn Braddock - Operations Director, HVDHB
Ms Carleine Receveur - Secondary Service Planner, HBDHB
Ms Robyn Madden - Plastic surgery nurse, HBDHB
Mr Warrick Frater - Deputising for the Operations Manager, HBDHB
Mr Peter Kennedy - Planning & Funding, HBDHB
Ms Barbara Graves - Project Manager

Also contributing:
Joel (for Peter Kennedy) - Planning and Funding, HBDHB
Katherine Johnson - Elective and Surgical Services Manager, HBDHB (deputising for Warwick Frater)
## Appendix 3: Financial Modelling for Demonstration Site

PLASTICS WORKING FILES using 2010 data provided by Mr Brandon Adams Plastic Surgeon Hutt Valley DHB

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<th>Brandon view</th>
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<tr>
<td>Total Volume</td>
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<tr>
<td>percentage of surgery capable of being done locally</td>
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<td>Number or procedures done locally</td>
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<td>Diagnostic costs</td>
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| Patient T&A avoided | $300 per patient | $137,068 |

| Total costs of activity bought back in house | $2,481,792 |

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| w | $624,010 |