



HEALTH WORKFORCE PROJECTIONS MODELLING 2010

PERIOPERATIVE NURSING WORKFORCE

Prepared for Health Workforce New Zealand

By Health Workforce Information Programme (HWIP)

A sector collaborative activity

Perioperative Nursing at a Glance

	Number of perioperative nurses	Growth in Supply (per-annum)	Growth in demand (per-annum)
2009	2,618	1.3%	1.7%
2029	2,969	0.1%	1.3%

The Health Workforce Information Programme (HWIP) has prepared these estimates of the size of the New Zealand perioperative nursing workforce for Health Workforce New Zealand (formerly the Clinical Training Agency). Projections of the future balance of the perioperative nursing workforce supply compared with demand are made 20 years into the future using a forecast model based on the Health Workforce Information Programme forecasting framework.

The Nursing Council of New Zealand's Annual Practising Certificate database provided the main source of data for the forecast.

EXECUTIVE SUMMARY

This report has been written for Health Workforce New Zealand, formerly the Clinical Training Agency (CTA), in collaboration with the National Nursing and Midwifery Workforce Strategy Group. It includes a forecasting model for perioperative nurses in New Zealand.

The demand for perioperative nurses grows steadily by 1 to 2 percent each year, accumulating to a 40 percent increase by 2029. At current entry rates the growth in supply of perioperative nurses falls off rapidly, and the workforce expands by only 14.9 percent by 2029.

The perioperative nursing workforce as a subspecialty of nursing was comprised of 2,618 nurses in 2009, and is estimated to grow to 2969 by 2029. Consistent level of supply to maintain current levels, and changes in demand, are issues for this workforce.

Unlike other professional groups, nurses tend not to make long term career changes into nursing sub-specialties but are likely to transfer between sub-specialties several times over a nursing career. This means that the entry and exits rates from perioperative nursing are consistently a significant proportion of the sub-specialty. Although about half the perioperative nursing workforce remains in the subspecialty longer than two to three years, the other half do not.

Consequently a high level of orientation and professional development education is needed for recruited nurses to ensure a good match between perioperative nursing skills and the needs of operating theatres. For those who remain in the sub-specialty beyond three years, postgraduate clinical education related to perioperative nursing and/or first surgical assistant will be required for many as career advancement. This needs to be coupled with ongoing professional development to ensure currency of clinical skills and knowledge commensurate with a clinical environment of increasingly complex surgical procedures and use of technology.

Perioperative nursing supply numbers were determined from the Nursing Council of New Zealand Annual Practising Certificate database. In particular, patterns of entry to and exits from the perioperative nursing workforce have contributed to the forecast model's development.

Demand indicators included population growth projections, historical, current and anticipated demand for surgical services and the way surgical services are delivered. Changing models of perioperative nursing care delivery and the impact of current and emergent technologies also contributed to the model's development.

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BACKGROUND

Defining perioperative nursing

Perioperative nurses provide care to patients before, during and immediately after surgery; they assess patients' conditions; plan nursing care for surgical intervention; maintain a safe and comfortable environment; assist surgeons and anaesthetists during surgery; and monitor patient recovery from anaesthetic prior to return to, or discharge from ward.

This includes nurses who work in anaesthesia, operating and/or recovery rooms.

Australian and New Zealand Standard Classification of Occupations, (ANZSCO) (2009)

In New Zealand, nurses within the regulated nursing workforce self select 'main' and 'next main' areas of their practice when completing the Annual Practising Certificate (APC) survey requirement for the Nursing Council of New Zealand (NCNZ). For the purposes of this report those nurses who selected the NCNZ practice area code '58' - Perioperative care/theatre' are the nurses who have been counted as perioperative nurses. These may be Registered Nurses or Enrolled Nurses.

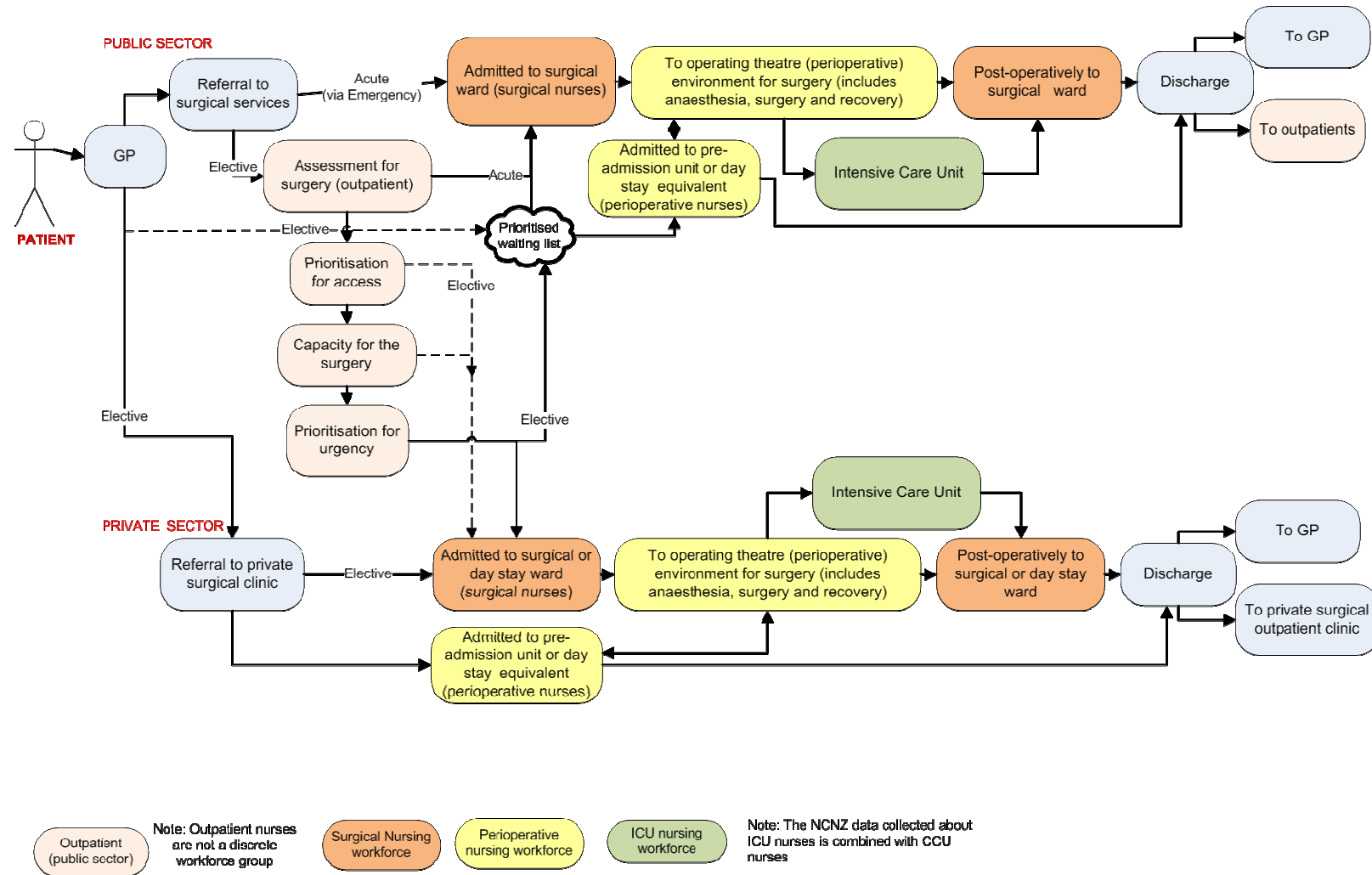
To date the NCNZ does not offer definitions according to each area of practice. It can be assumed that nurses who select perioperative care/theatre in the NCNZ APC survey are nurses who identify working according to the ANZSCO definition. This is because nurses in New Zealand use the term 'perioperative' to describe the area of practice as ANZSCO defines itⁱ.

The patient surgical journey

Supply of and demand for the perioperative nursing service is contingent upon the delivery of surgical services in hospitals in New Zealand. Whereas in medicine a single surgical team follows the patient from referral to discharge, the same surgical patient journey involves several nursing workforce groups. In particular the patient needs the services of outpatient nurses, surgical ward nursing services, perioperative nursing services and possibly intensive/critical care nurses in circumstances where the patient's condition requires more intensive nursing skills than the in general surgical ward (figure one).

ⁱ Australian Bureau of Statistics (2009) 1220.0 – ANZSCO – Australian and New Zealand Standard Classification of Occupations, First Edition, Revision 1. Unit Group 2544: Registered Nurses. Available at: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/0/B42C2EFDF727CCA4CA2575DF002DA61F?opendocument>

Figure 1: Perioperative nursing - patient journey



This report presents a forecasting model for the perioperative nursing workforce as the part of the regulated nursing workforce concerned with the operating theatre component of the patient journey¹.

Sometimes outpatient clinics are co-located with operating theatre suites environments and perioperative nurses expand their roles to include some outpatient functions. In these situations the nurses will have most likely named 'perioperative' as their area of practice; thus these nurses are included in the perioperative nursing workforce.

There are also situations where outpatient clinics are co-located with surgical procedure environments where the nurses are unlikely to nominate 'perioperative' as their area of practice yet assist with the procedures. Examples include endoscopy and fracture clinics. It is assumed these nurses have chosen 'surgical' as their areas of practice.

Where outpatient clinics are staffed by nurses specific to that department, such as 'surgical outpatients', they are most likely to consider themselves part of the surgical nursing workforce and therefore they have not been included in the perioperative nursing workforce.

Becoming increasingly popular are the use of day stay and preadmission units, which are standalone in that they are not associated with the ward situation and are staffed by perioperative nurses. This is demonstrated within the patient journey as part of the perioperative nursing workforce patient journey.

FORECASTS

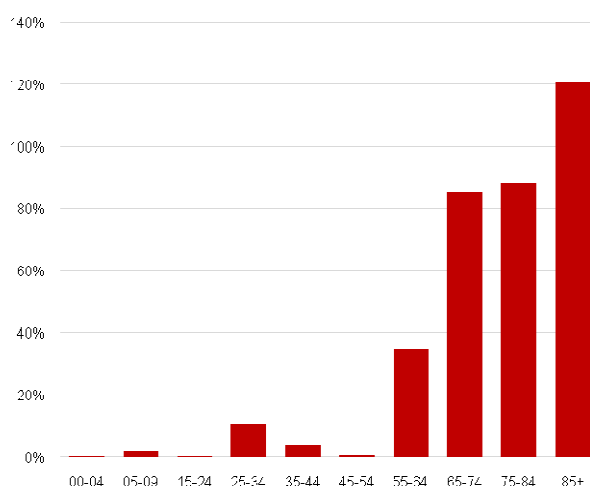
Demand for Perioperative Nurses

The demand for perioperative nursing in the next 20 years is mainly determined by considering the need for surgical intervention within the whole population and the expected population projection for the future.

Population Growth

Most of New Zealand's population growth is in age groups over 55, with the fastest growth rate in the 85+ year age group. This 85+ year population group will more than double in size in the next 20 years. However, the population age group of less than 55 years will remain almost static over the same period (graph 1).

Graph 1: Population growth rates by age group

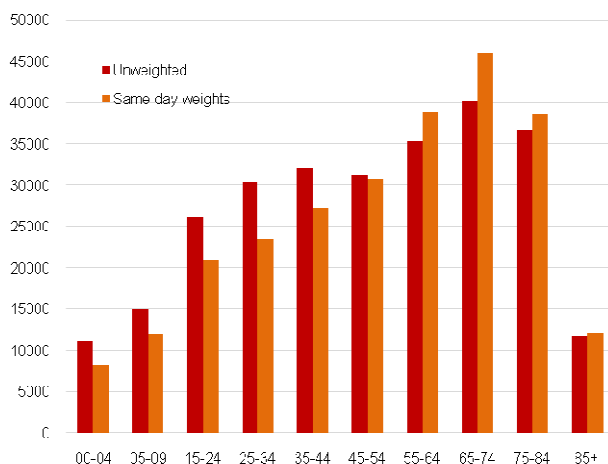


The median age of a public hospital inpatient requiring perioperative nursing is 51 years. A quarter of all patients needing perioperative nursing are over 70 years (graph 2).

Significant factors indicating that the proportion of the three older age bands will increase in the future include:

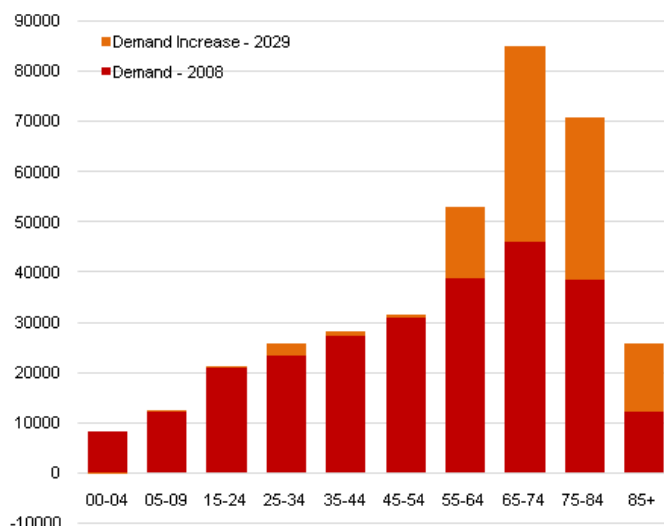
- Returns for replacement surgery. Many replacement, reconstructive and transplant surgeries have limited life. As the population ages, so will the number of patients who have had these surgeries earlier in life, return for repeat surgery in the three older age bands.
- Surgical advances have made surgery more effective and safer for older people. This increases the surgical options for the elderly.

Graph 2: Patients requiring perioperative nursing (2008/09)



The older the person admitted to hospital the more complex the health conditions tend to be and the more expensive the care required from the service. The complexity is often driven by the development of several health conditions as co-morbid to a primary disease or disorder as people age. When allowing for this by weighting by the same-day inlier weights for the surgical event, the median age of patients needing perioperative nursing becomes 61 years. The median age of the overall New Zealand population by comparison is 37 years.

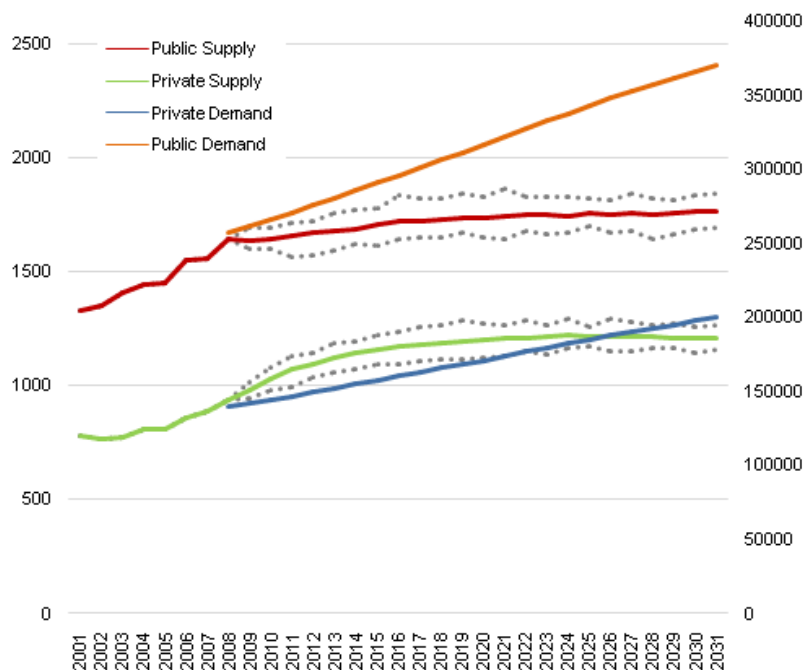
Graph 3: Demand increases by age 2008-2029



The age groups experiencing population growth are also the age groups with the greatest demand for surgery. This combination will mean a considerable increase in demand for surgical services and therefore perioperative nursing services.

Demand for perioperative nurses grows steadily by 1 to 2 percent each year, accumulating to 40 percent increase by 2029. At current entry rates the growth in supply of perioperative nurses falls off rapidly, and the workforce will expand by just 14.9 percent by 2029.

Graph 4: Perioperative nursing supply and demand



At the moment the demand for public sector perioperative nursing is slightly below the public sector supply of nurses. However, the increase in public demand for surgery quickly outstrips the supply of perioperative nurses. The demand for services continues to increase so that by 2029, based on current supply entry rates, the perioperative nurses in the workforce are unlikely to be able to meet service demand.

Demand for cardio-thoracic surgical services

Although the Cardiac Surgery Service Development Working Group Report (2008)ⁱⁱ focuses upon improvement to provide for increasingly more timely cardiac intervention rates (reduced waiting and improved access) it does not provide for expected population-based demand increases.

The demand for cardiac surgery has gradually increased as a result of increasing effectiveness, decreased mortality and increased patient benefit in patients of all age groups. In particular improved surgical outcomes for the over 70s and onto those 80+ have further increased demand for

ⁱⁱ Ministry of Health (2008) Cardiac surgery services in New Zealand. Cardiac Surgery Service Development Working Group Report. Available at: <http://www.moh.govt.nz/moh.nsf/0/6A0AF72DABC7C2C4CC2574DA00148D1E>

cardiothoracic surgery. As well, cardiac surgery has become more complex and has benefitted from technological developments.

Most of New Zealand's population growth is in age groups over 55 and the fastest growth is in the 85+ year age group, which will more than double in size in the next 20 years (refer to graph 1 p.9).

The median age of a public hospital inpatient that needs cardiothoracic surgery is 64 years. This is somewhat higher than the median age of patients undergoing surgery in general, and a lot higher than the median age of the general population. Three quarters of cardiothoracic surgery patients are over 52 years.

Demand constraints

Service delivery and outputs

Service delivery and outputs of surgical hospitals in the public sector are measurable in terms of hospital national minimum data set (NMDS) and Diagnostic Related Groups (DRGs). However, these demand factors are not so readily available from the private sector. Demand based upon the public sector cannot transpose directly to the private sector, yet each of the sectors impacts one upon the other. Private surgical hospitals may be funded by the public sector - DHBs, the Accident Compensation Corporation (ACC) health insurance companies or patients self-funding.

Private surgical hospitals provide elective surgical services, whereas public hospital services provide both acute and elective surgical services. Elective surgery in the public sector is contingent upon acute surgical admissions. If the demand for acute surgical services rises, access to and availability of operating theatres decreases.

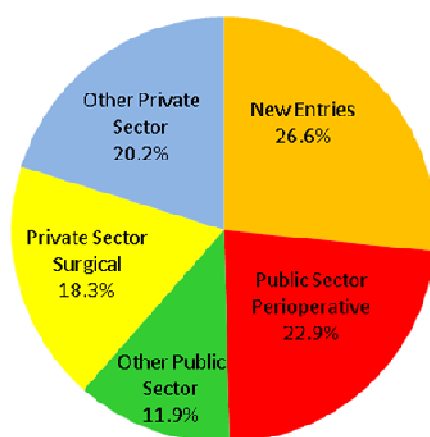
If there is a significant waiting period for elective surgery in the public sector, patients are more likely to access the private surgical services sector, where waiting is limited and patients can arrange surgery at a time to suit. In turn, this depends on surgical health insurance cover for patients. Surgical hospital services health insurance cover has fluctuated since 2003, peaking at 1.4 million people covered in 2008. A 2009 decrease of 0.3 percent in 2009 was predominantly under 60 year age groupsⁱⁱⁱ.

The number of surgical procedures undertaken in the private sector in 2008/2009 was 152,000. In the same period in the public sector, the number of elective surgical discharges rose by 10 percent (11,000) to 129,769. The Private Surgical Hospital Association (2009) claims that the private surgical sector now services 60 percent of the elective surgical service demand.

ⁱⁱⁱ Private Surgical Hospitals Association (2009) *Range and volume of services provided privately*. Available at <http://www.nzpsaha.org.nz/aboutus.php>

The number of elective surgical procedures that can be completed in the private sector depends on the number of perioperative nurses working in private surgical hospitals, when most work in a DHB setting^{iv}. In particular, the skill level of perioperative nurses entering the private sector depends on where they came from. In 2008 23 percent of all the entries to perioperative nursing in the private sector came from perioperative nursing in the public sector (graph 5), leaving a gap in the public sector. Anecdotally some of the reasons for this flow are reported to be lifestyle factors as the private sector surgery tends to be confined to better hours with less, if any, weekend, on-call and/or rostered duties.

Graph 5: Entry to private perioperative nursing, 2008



Increasing the volume of elective surgery in the public sector by 4000 more per annum is a health target for 2009/2010, as is funding 20 new operating theatres.

Service configuration

Over the last decade surgical options, particularly for cardiac surgery, have changed. Whereas in the past some conditions required high risk anaesthesia and time consuming, complex surgery, current options for the same conditions now involve less time, may not require general anaesthetic and are minimally invasive^v. For example, in the past patients having coronary bypass surgery for ischaemic heart disease (IHD) required cardio-thoracic surgery and intricate general anaesthesia. These patients now have the option of having percutaneous coronary intervention (PCI), which does not require cardio-thoracic surgery or a general anaesthetic and can be done outside of the operating

^{iv} Ministry of Health (2009), Current status of the national regulated nursing workforce. Available at [http://www.moh.govt.nz/moh.nsf/pagesmh/6795/\\$File/current-state-nursing.pdf](http://www.moh.govt.nz/moh.nsf/pagesmh/6795/$File/current-state-nursing.pdf)

^v Central Region District Health Boards, (2008), *Regional Clinical Services Plan*. Available at: <http://www.midcentraldhb.govt.nz/NR/rdonlyres/A01751DC-1653-4935-9914-5F919E88040E/0/RCSPFinalDraft.pdf>

theatre. As PCI is being done earlier in the disease process many do not progress to needing a coronary bypass procedure, which frees up operating theatres for other procedures.

Perioperative nursing services are likely to be reconfigured with the shift toward progressively less invasive surgical procedures being undertaken in outpatient clinics and day stay wards. For instance, longer, more complex surgery does not necessarily mean more nurses will be required. A minimum nursing staffing requirement per surgical procedure in an operating suite is three nurses^{vi}. Nurses are commonly required in greater numbers at the beginning and end of surgery, rather than throughout. This means that a long duration procedure may not necessarily require a higher staffing ratio².

The number of instrument nurses required per procedure increases according to the degree of invasion, complexity and numbers of surgeons involved. More than one instrument nurse may be required when more than one surgeon is required.

Conversely less invasive, simpler, faster, surgical procedures that may or may not require general anaesthetic require more nurses. As throughputs increase, lists become larger and nurses' roles are likely to increase, especially to do with anaesthetic induction and recovery, positioning of patient and turn around of instrumentation.

Currently surgical service delivery in the public sector is not meeting demand. In particular, the demand for cardiac surgery has exceeded the human and funding resources available in New Zealand. Total cardiac intervention rates in New South Wales are 85 percent above New Zealand. Waiting times for publically funded cardiac surgery have not reduced to clinically acceptable levels as they have in other countries. According to the Cardiac Surgery Service Development Working Group Report (2008), operating room access and supply of skilled perioperative nurses are two of the most significant issues facing the cardiac surgical services crisis.

A way forward may involve reconfiguring operating theatre roles to enable skilled perioperative nurses to be involved in more complex procedures with support staff as backfill for roles that do not require nursing skills. The emergence of Anaesthetic Technicians in New Zealand and operating department practitioners in the United Kingdom may free up skilled perioperative nurses for progressively more complex procedures.

An anaesthetic technician diploma-based qualification began in 2006. Current forecasting of this workforce indicates a supply of 650 qualified Anaesthetic Technicians in the workforce by 2025. As this qualification pathway has a reduced track for nurses, implications for how this may affect the way

^{vi} New Zealand Nurses Organisation (2005). Perioperative nursing standards and education manual. Available at: http://www.nzno.org.nz/groups/colleges/perioperative_nurses_college/pnc_standards

perioperative services in general are structured is unclear. In particular this may impact upon the current model of care.

Technology developments

Another factor relevant to perioperative nursing is the impact of technology on surgical procedures, particularly developments in robotics^{vii}, which enable less invasive procedures over time³. In turn this will increase the rate of procedures being performed outside of operating theatres and more in outpatient and primary health facilities. The expectation of future surgical intervention is that surgery will become less invasive but more complex. An increasing emphasis on surgery as day-stay or outpatient procedures may free up operating theatre availability and access for increasingly time consuming and complex surgery in-hospital.

Model of care

The shift toward low invasive short stay surgery may be offset by the demand for progressively more complex and time consuming surgical procedures, including higher risk patients that in times past would not have had surgical intervention. This situation will require greater access to high technology operating theatre suites and increasingly complex perioperative nursing skills.

The time may come when patients requiring an operating theatre are those most at risk for anaesthetic-related complications and/or those having high technology complex surgical procedures. This means fewer perioperative nurses would need a greater level of education, especially around monitoring and measuring technology. These nurses would need to be highly skilled to enable them to respond quickly and appropriately to rapidly changing patient circumstances due to the nature of higher risk patients and procedures.

In 2008 the NCNZ discussed a range of issues relating to nurses working in roles which extend the Registered Nurse scope of practice. In particular this included a first surgical assistant role for perioperative nurses. Subsequently the NCNZ found that perioperative nurses who were already functioning as first surgical assistant were doing so outside the Registered Nurse scope of practice. Therefore the NCNZ has redefined a first surgical assistant within the Registered Nurse scope of practice and requires nurses to become authorised to practise in this role^{4 viii}.

Implications of the new role include greater expectation that perioperative nurses will become authorised and step up to assist a surgeon as surgeons become used to nurses as assistants. In particular, the legitimatisation of this role for nurses will enable sole surgeons to be assisted by the

vii Central Region District Health Boards, (2008), *Regional Clinical Services Plan*. Available at: <http://www.midcentraldhb.govt.nz/NR/rdonlyres/A01751DC-1653-4935-9914-5F919E88040E/0/RCSPFinalDraft.pdf>

viii Nursing Council of New Zealand (2009), *Authorisation for first surgical assistant guidelines*. Available at: www.nursingcouncil.org.nz/Guidelines%20for%20FSA.pdf

first surgical assistant nurse where surgical registrars and house surgeons are absent from theatre. An example of this is in the private sector.

Likewise, when medical staff who would usually act as assistants are needed elsewhere in a hospital, the first surgical assistant nurse is likely to substitute in the operating theatre. With rising acuity in hospitals it is likely that house surgeons will be needed in the admission phase for acute cases prior to operating theatre and perioperative nurses as first surgical assistants will become more commonplace. The impact for future supply will be that more perioperative nurses will be required to maintain minimum staffing requirements extra to the first surgical assistant, who is unable to concurrently function as an instrument nurse.

The emergence of new occupational groups such as Anaesthetic Technicians, Physician Assistants and operating assistants⁵ may well impact upon the model of care for perioperative nursing in the future. These include:

- Registered Nurses working as perioperative nurses can now expand their scope of practice to first surgical assistant
- Nurse Practitioners have some minimally invasive procedures within their scopes of practice. These are likely to increase, although there is only one Nurse Practitioner who identifies as working within the perioperative nursing workforce in NCNZ 2009 data collection
- Enrolled Nurse training has been reintroduced with perioperative care included in the acute care module of the curriculum. These nurses are likely to provide a greater proportion of the workforce in a support role for Registered Nurse in the future.
- Anaesthetic technicians may provide personnel for a support role in operating theatres
- Physician Assistants are being introduced to New Zealand in a pilot programme at one DHB
- Operating theatre assistants for support roles in operating theatres are emerging internationally

Together these factors suggest perioperative nurses may be able to refine their skills set to better meet the future demand of increasingly complex surgery. This may include using non-invasive and minimally invasive, technologies to perform procedures that have previously been performed by medical staff within the multi-disciplinary team.

Supply of Perioperative Nurses

There were 2585 nurses who identified as working in the perioperative setting in 2008 by selecting the perioperative category in their NCNZ Annual Practising Certificate survey. The supply of perioperative nurses in the next 20 years is based on current and historical numbers of nurses who work/have worked in perioperative nursing. Career changes, job patterns, inflow of nurses (entering) and outflows (exiting) the specific workforce group over time also contribute to the supply forecast. Inflows

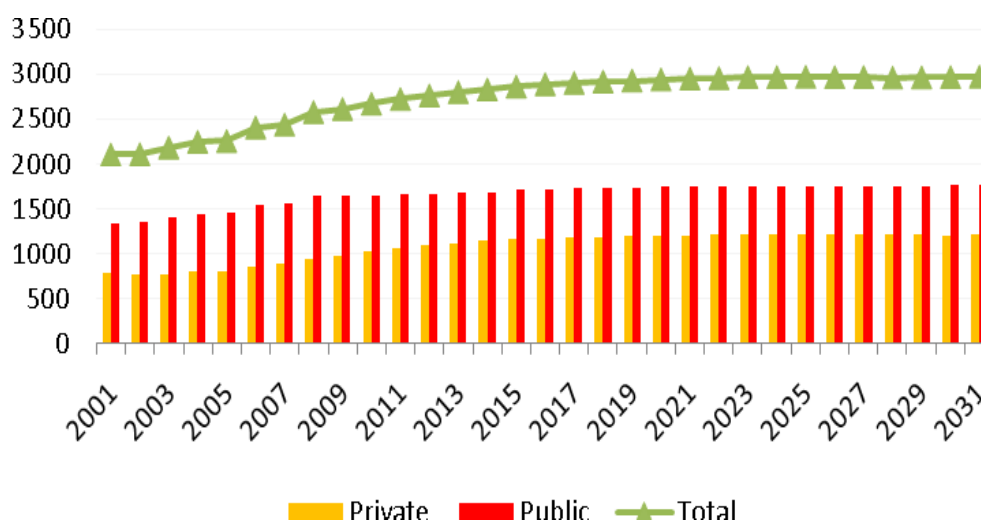
are based upon education (availability and achievement), immigration and nurses return numbers to the service.

Table 1: Perioperative nursing workforce supply 2001-2008

	2001	2002	2003	2004	2005	2006	2007	2008
Number of perioperative nurses (total)	2,114	2,118	2,190	2,254	2,263	2,413	2,445	2,585

The number of public sector perioperative nurses increased by 19 percent between 2001 and 2008, and by 16 percent in the private sector. However, it is expected that in the future nurses will enter perioperative nursing in the private sector at a marginally greater rate than the public sector until 2019. Thereafter entry to the private and public sectors is even, with the private sector supply remaining at approximately two thirds of the number of public sector perioperative nurses. This depends on the private sector continuing to offer the same elective surgical options as now. However, the private sector is likely to increase the range of elective surgical options available, especially in light of the current capacity to enter into contracts with DHBs to perform publically-funded surgeries.

Graph 6: Perioperative nursing workforce - supply 2001 - 2031



Entries and Exits

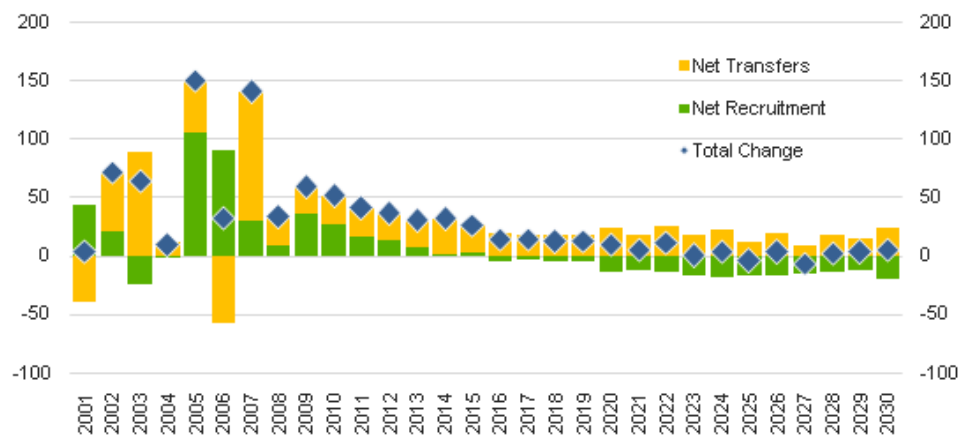
The perioperative supply model starts with a constant baseline inflow of new nurses⁶ based on historical averages (in this case, 300 new nurses per annum). Nurses returning to perioperative nursing are also an important inflow. An estimated 145 nurses returning to perioperative nursing in

2009 will grow to 169 per year by 2029. Although the rate of new entries (graduates and immigrants) to perioperative nursing is lower than the wider nursing workforce, the rate of returning nurses is higher.

The number of nurses entering the perioperative nursing workforce from other areas in nursing is a significant component of the supply of perioperative nurses. This is demonstrated in graph seven as the net inflow.

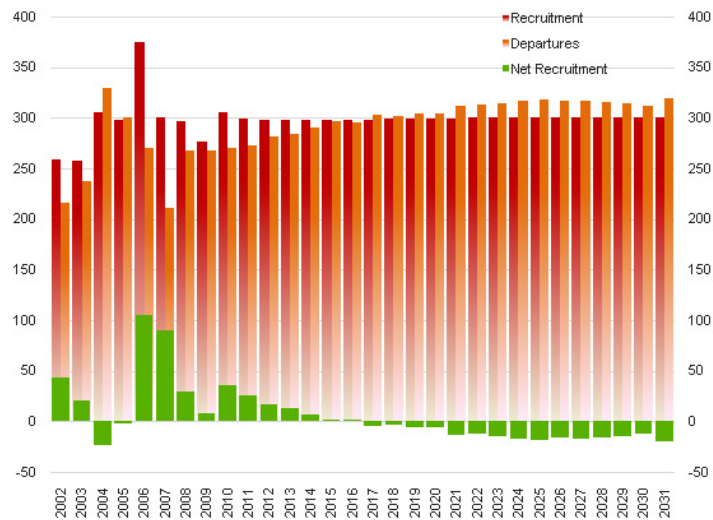
This means that in 2005 most of the entries to perioperative nursing came from other nursing areas of practice, not as new nurses. In 2007, however, the position was reversed, with most people entering perioperative nursing as new nurses rather than transferring from other areas of nursing. After 2009 the net recruitment of new nurses into this workforce will diminish, until 2020 when changes from inflow will thereafter remain fairly constant.

Graph 7: Perioperative nursing inflows



Conversely nurses leave perioperative nursing to work in other areas of nursing. As demonstrated in graph six, entries of new and returning nurses initially outbalance nurses leaving the workforce. However, growth in the number of perioperative nurses falls over the forecast period, and the perioperative nursing workforce begins to decline from 2020.

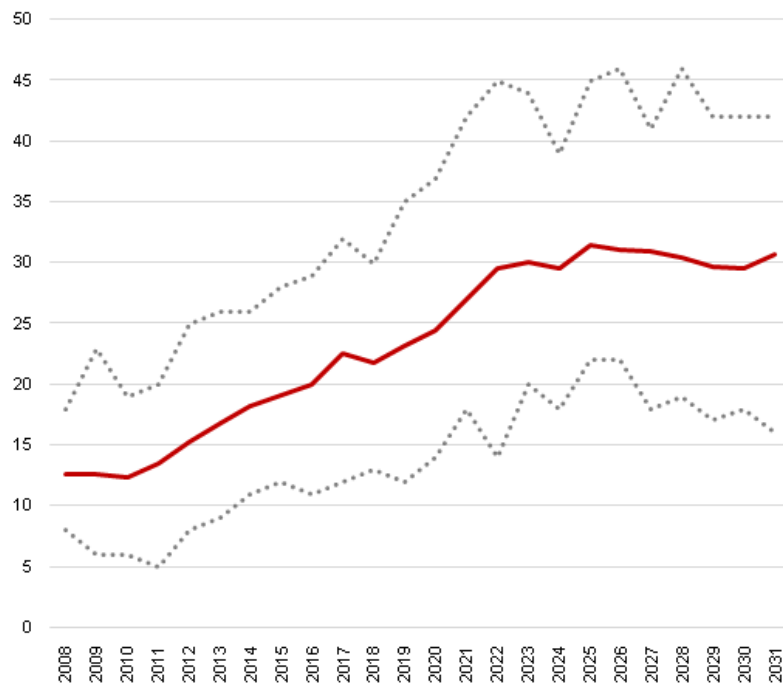
Graph 8: Net recruitment trends for perioperative nurses, 2002 - 2029



Entries to nursing are counterbalanced by exits. Exit rates from perioperative nursing climb from 10.2 percent in 2009 to 10.6 percent in 2029 as the workforce ages.

In graph nine 'high-age' exits are exits from the workforce model of nurses aged over 65, where the likelihood of a nurse exiting the workforce increases to over 27 percent each year. Moreover these nurses leave the workforce permanently, whereas younger nurses are more likely to return.

Graph 9: High age exits

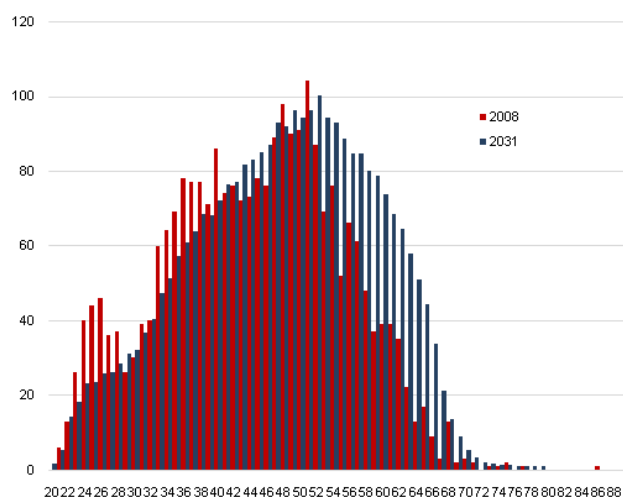


Although the perioperative nursing workforce does not age quite as much as the overall nursing workforce, the number of nurses exiting at over 65 years more than doubles by the end of the forecast period (graph 9), regardless of when the nurses choose to retire. If a nurse leaves the workforce at 66 the calculation remains the same as if they exited at 74.

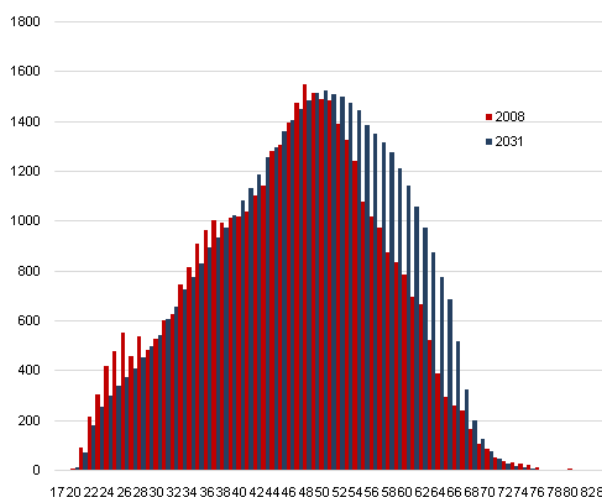
Career changes

The age of a nurse has a strong effect on their chances of leaving a position. While age increases exit rates, due to retirement, it reduces the chance of a nurse leaving their position for another. That is, the older a perioperative nurse, the less likely they are to change to another area of practice. The average age of perioperative nurses is increasing, but the workforce remains relatively younger than the overall nursing workforce. Nurses will continue to leave perioperative nursing for other areas. In graphs 10 and 11 the perioperative age distribution is compared with the nursing workforce in general.

Graph 10: Perioperative nurse age distribution (2008-2031)



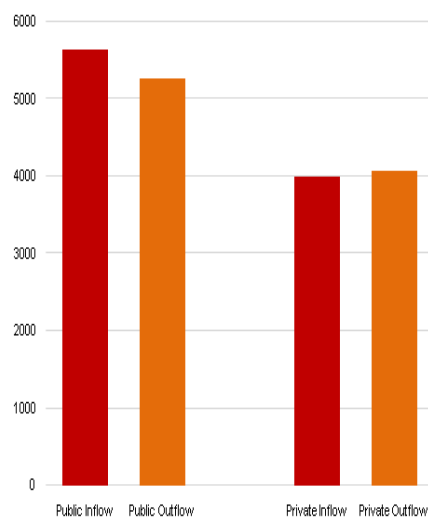
Graph 11: All Nurses Age distribution, (2008-2029)



Outflows from perioperative nursing continue to increase over the forecast period, growing in line with the size of the workforce (graphs 10 and 11).

Conversely, inflows from other areas to perioperative nursing do not keep pace with outflows. While the overall nursing workforce continues to grow over the forecast period, a quickly aging workforce with a greater likelihood of leaving, counterbalances this. This results in a relatively static pool of perioperative nurses for theatres to draw from.

Graph 12: Inflow and outflow of perioperative nurses from other work areas



In graph 12 the inflow and outflow from other areas of nursing is shown. Over the forecast period the net inflow of nurses to perioperative nursing from other nursing areas is positive, but only slightly. The public sector gains nurses from other workforce areas, while the private sector shows a net loss to other areas of the workforce.

Education

The undergraduate pre-registration programme for nurses in New Zealand provides graduate nurses with a comprehensive set of beginning practice skills. Beginning Registered Nurses, who have been trained in the New Zealand tertiary education sector, have had some clinical exposure to the perioperative environment. Likewise perioperative specific knowledge and skills is not necessarily a requirement for a position as a perioperative nurse.

Enrolled Nurses and Nurse Assistants currently comprise seven percent of the nursing workforce^{ix}. The numbers of Enrolled Nurses and Nurse Assistants who work in perioperative nursing are no greater than in the nursing workforce. However, Enrolled Nurses are being reintroduced. The NCNZ has released education programme standards for the new Enrolled Nurse scope of practice. The structure of the programme provides for an 18 month diploma in Enrolled Nursing at level five on the New Zealand Qualification Authority – National Qualification Framework^x. Within that there is an acute care module, which identifies perioperative care.

^{ix} Ministry of Health (2009), Current status of the national regulated nursing workforce. Available at [http://www.moh.govt.nz/moh.nsf/pagesmh/6795/\\$File/current-state-nursing.pdf](http://www.moh.govt.nz/moh.nsf/pagesmh/6795/$File/current-state-nursing.pdf)

^x Nursing Council of New Zealand (2010) Education programme standards for the Enrolled Nurse scope of practice. Available at: <http://www.nursingcouncil.org.nz/download/164/draft-education-programme-standards-en-jan10.pdf>

In-house, on the job, training may or may not be supported by formal education for perioperative nurses. A formal qualification (as a postgraduate course) in either perioperative nursing or first surgical assistant nursing is a pre-requisite to secure authorisation from the NCNZ for a Registered Nurse to practise as a first surgical assistant in operating theatres. This is a first 'enhanced' Registered Nurse scope of practice and is likely to be followed by others, such as colposcopy.

Historically, nurses have had to self-fund, secure external scholarships or have employer support in order to study. It is not possible to measure how many perioperative nurses have undertaken postgraduate study in a post-operative related course funded by these means. From 2006 postgraduate perioperative nursing courses have been supported by Health Workforce New Zealand, formerly Clinical Training Agency (CTA). There were 78 Registered Nurses who completed a perioperative nursing related Health Workforce New Zealand funded postgraduate course 2007/ 2008.

The future supply of perioperative nurses skilled for an increasingly complex operating theatre environment, in particular surgical assistant perioperative nurses, will be contingent upon access to and availability of ongoing postgraduate related courses.

Most new graduate nurses within the Nurse Entry to Practice (NETP) programme undertake postgraduate education as part of the programme. These nurses are most likely to take generic papers rather than specialty specific courses. However, often these papers allow nurses to develop their specialty skills.

A common pathway for specific skill level acquisition in a nursing sub-specialty is on entry to the sub-specialty usual orientation programmes which develop the new entry to a stage of usefulness (advanced beginner). Clinical experience and ongoing education within a professional development and recognition programme (PDRP)⁷ may provide skill level acquisition to the recognised level of 'competence'⁸. However, most perioperative nursing skill acquisition and development is currently provided as on the job orientation in the first year of entry to the sub-specialty.

Formal postgraduate sub-specialty specific education is central to the provision of optimal patient care delivered by a workforce with skills that match the complexity of demand. Each sub-specialty expects that some of the workforce will have completed post-graduate clinically-based study at level eight. Opinion from the sub-specialty Expert Advisory Group (EAGs) indicates across the sector that approximately two years experience plus a completed specific postgraduate course is desirable for development to the stage of advanced practitioner or the level of a 'proficient' nurse. However, there is a gap between what is perceived as desirable and the reality in a climate of scarce resources to support study.

The National Framework for Nursing Professional Development and Recognition Programmes and Designated Role Titles Report (2005) recommends that a pre-requisite to becoming an expert nurse is the need to be engaged in postgraduate study. As this applies to the general workforce the

assumption can be made that the levelling framework within some nursing sub-specialty areas, such as perioperative, requires a greater level of skill acquisition supported by on the job, in-house and postgraduate education than within the general workforce.

A PDRP project, supported by health Workforce New Zealand, is scheduled to follow the nursing subspecialty forecast modelling project. Prospects for advanced skills acquisition for certain subspecialty areas such as preoperative nursing supported by employers, that are beyond the scope of undergraduate or first year registered nurse practice, need to be addressed within that project.

Numbers for postgraduate training requirements would depend on a desirable skill mix for perioperative nursing and how many of the subspecialty is required to function at the level of proficient or expert⁹.

The New Zealand Nurses Organisation (NZNO) Perioperative Nurses College has an accreditation programme for perioperative nurses. Accreditation is a way of receiving professional recognition of knowledge and skills for Registered Nurses within a sub-specialty of nursing. In order to be accredited as a perioperative nurse, a Registered Nurse must have a minimum of 2500 hours over the previous five years as a perioperative nurse and must be employed and practising as a perioperative nurse. Although a nurse 'should' have a balance of formal and informal continuing education, there is no requirement for postgraduate course or programme completion as a pre-requisite for accreditation^{xi}.

To meet the 2500 hour minimum experience requirement would take a full-time perioperative nurse about 15mths¹⁰ to accrue the necessary hours and a half-time nurse 30 months (2.5 years). Given that most nurses take two years to complete a postgraduate certificate the minimum time to achieve an advanced practice role would be three years in the job¹¹. However, considering a half-life of two-three years for perioperative nurses, after three years in the job, fewer than half would remain.

Perioperative nursing education needs 2009-2029

One of the objectives of workforce forecast modelling is to identify future training needs for each of the workforce sub-specialties that are undergoing predictive forecasting. How many nurses will require post-graduate education to sustain nursing service provision in each nursing subspecialty in the future?

In most health workforces this can be predicted as when people make a career change between sub-specialties, it is likely to be for a lengthy period of their remaining career time. That is, the flow between sub-specialities is slow. For instance, when a doctor decides to enter a sub-specialty, such

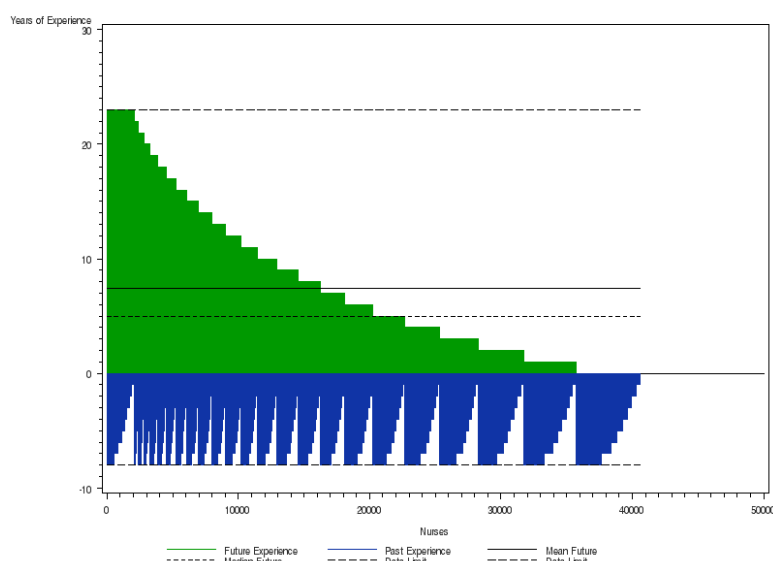
^{xi} Perioperative Nurses Section, New Zealand Nurses Organisation, (2009), Promoting perioperative nursing through knowledge, understanding and fellowship. Available at: http://www.nzno.org.nz/groups/colleges/perioperative_nurses_college

a General Practice, they do the required training and are likely to remain in General Practice for a long time. Thereafter they are unlikely to exit that sub-specialty or enter another for a long period of time. Consequently one can predict how many trainees need to be trained for General Practice based on historical averages and predicted supply to meet predicted demand for General Practice services. The same can be applied to other health practice areas such as physiotherapy, and pharmacy.

In nursing, the picture is different. The median career length in the nursing workforce is 12 years, unlike other professional groups who may have a life span in the same profession. This means that half of all nurses in the current cohort¹² of nurses will spend more than 12 years in the nursing workforce. Regardless of specialty nurses change their job within nursing several times over the course of their careers. Half of all nurses now in nursing will stay for the next five to six years. This is referred to as the half-life of nursing¹³.

Few nurses who are now nursing will remain in the workforce for 20 years (the tip of the green area in graph one), and fewer still of the nurses who are in a particular field of nursing will still be in the same field.

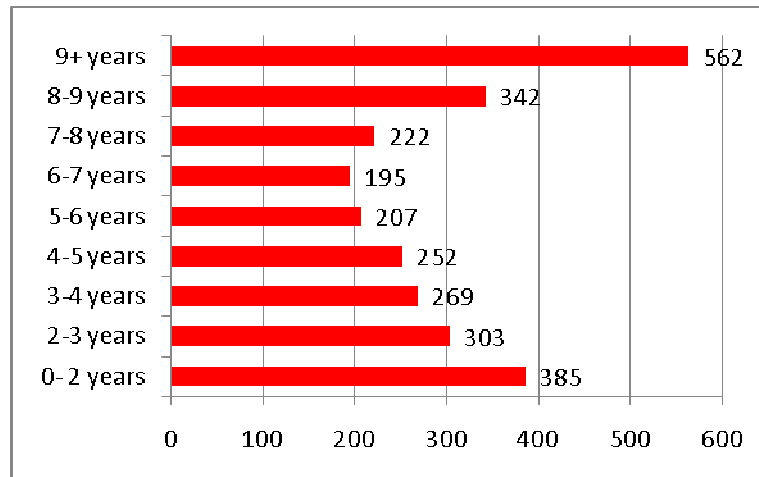
Graph 13: Career length of nurses



Of the perioperative nursing workforce 2009 cohort (2737 nurses) 21% have been there more than nine years. Conversely 25 percent have been in the workforce for less than three years (graph 13). The nurses who have been in the workforce for the least amount of time need to be engaging with postgraduate study now to ensure adequate skill mix for the future. However those with the least experience also need to complete in-house and experience based skills acquisition programmes. If all 688 perioperative nurses who have been in this specific workforce for less than 3 years obtained a postgraduate certificate in the next two years, only 344 would still be in the perioperative nursing workforce at the end of that time. Added to this would be the training needs of new entries to the

workforce each year until 2029, which rises exponentially in comparison with supply numbers. Also included in the equation is consideration of the rate of nurses leaving the specific workforce and the rising rate of demand for perioperative nursing services.

Graph 14: Years of experience in perioperative nursing by percentage

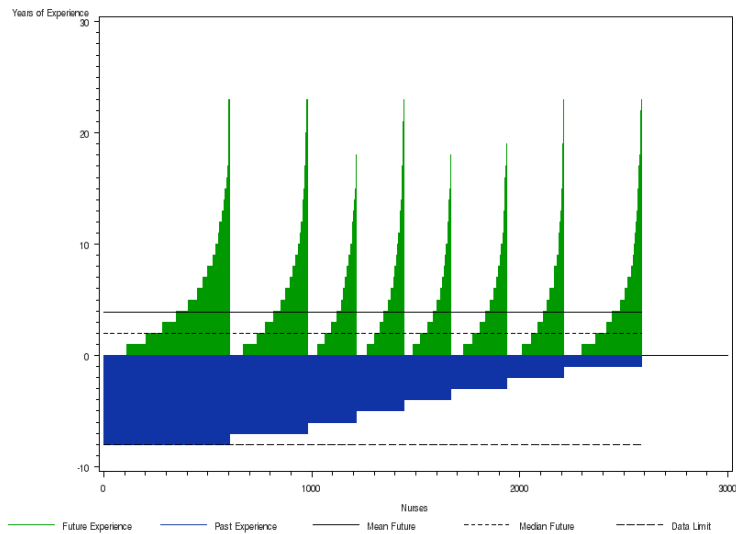


Extrapolating from NCNZ APC data gives an estimate of an overall mean career length of more than 13 years, possibly as much as 16 years¹⁴. With only a limited set of historical data this estimate is dependent on assumptions about the rate at which nurses have historically left the workforce.

Within nursing subspecialties inflows and outflows are more rapid with nurses changing between subspecialties more frequently. Thus the half-life within any subspecialty is shorter than within the general nursing workforce. For example, in perioperative nursing the half life is two-three¹⁵ years. This means that in two or three years time half the nurses in the current cohort of perioperative nurses will have left. As training specific to perioperative nursing begins on entry to the sub-specialty, half of those who have had some specific training will have left. This does not take into consideration the nurses who leave but return to this particular workforce. If these nurses were included, the rate at which they leave is even higher.

Conversely this also means that half of the current cohort of nurses will stay more than two to three years. It is impossible to predict which of the current cohort of nurses will stay longer than two years and which will make up the 50 percent who will leave perioperative nursing. Some nurses are more likely to leave than others (for instance, nurses over 60, or nurses in their late twenties), but these differences only apply on average. In 20 years time the number of the current cohort of perioperative nurses who will still be in the perioperative nursing workforce is negligible (graph 15).

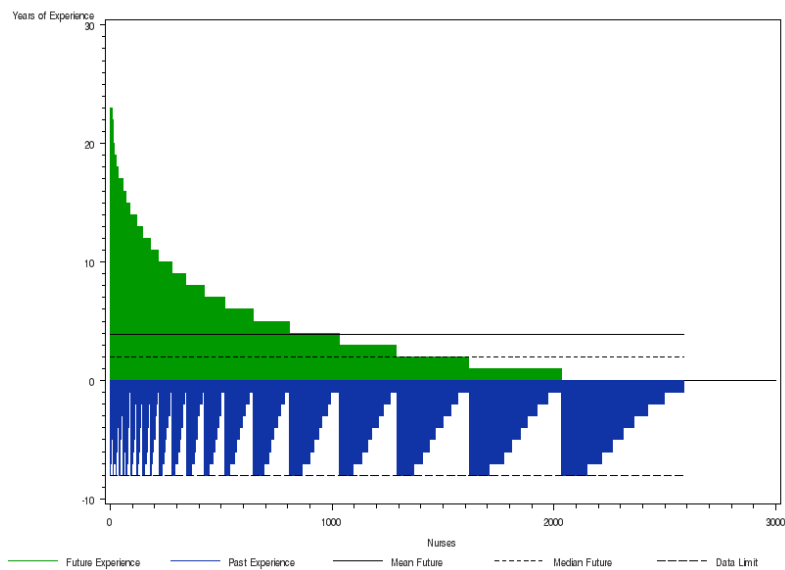
Graph 15: Half life of the perioperative nursing workforce



In the chart above the past experience (in blue) of perioperative nurses is emphasised. The vertical axis plots the years of past experience (shown as negative numbers), and the horizontal axis charts the number of nurses with this much experience. As the number of years of past experience increases, the number (and proportion) of nurses with this much experience declines. The predicted future experience of each of these groups of nurses is shown for reference. Past experience is not thought to be a very good predictor of future experience or length of service.

In graph 17 below, the (predicted) future experience of perioperative nurse, shown in green, is emphasised. The number and proportion of nurses (horizontal axis) declines as years of experience (vertical axis) increases. Past experience of each group of nurses is shown in blue.

Graph 16: Implications of the half life of perioperative nursing workforce for the future



This has implications for determining numbers of nurses to be trained at specific levels within any sub-specialty. For example, the number of nurses to be trained is going to be a lot higher than any increase in demand. In perioperative nursing, for every extra nurse required in two-three years time, approximately two need to be trained now.

When recruited to the perioperative nursing workforce for the first time, nurses need to undergo extensive orientation and professional development in the first two years of practice. Coupled with the clinical experience that comes from functioning within an operating theatre environment, in-house training enables a degree of usefulness as a competent perioperative nurse. However, as technology and surgical procedures become more complex in an Operating Theatre environment, nurses will require ongoing professional development, which may or may not include perioperative and/or first surgical assistant post-graduate education.

There are considerable barriers to the provision and uptake of education for perioperative nurses, including:

- Level of inflow to perioperative nursing by nurses new to the area. Although these nurses are provided with extensive orientation, there is a level of supervision required in practice on entry. This requires existing perioperative nurses in a supervision role. The more entries to the sub-specialty, the greater the need for supervision. The more existing perioperative nurses supervise new nurses, the less likely they are to fit study into their busy lives.
- As nurses who enter the perioperative nursing workforce will have limited if any theatre nursing participation prior to entry the emphasis for the first two years is upon in-house and experience based skills acquisition. Post-graduate study as an added extra is difficult during this time.
- Expense. Nurses are less likely to study when self-funded than when they are funded. Although funding may come from scholarships, employers and Health Workforce New Zealand, some nurses, especially those in the private sector, may have self funding as the only option. When self funded, questions arise about the potential for increased remuneration and to what extent this will offset the costs of study.
- Backfill. The supply of nurses is insufficient to provide backfill for nurses to have leave for postgraduate study
- High proportion of part-time nurses (half of the nursing working). Are part-time nurses as likely to undertake postgraduate study as full-time nurses?
- Travel distance to postgraduate courses in main urban areas with compulsory on-campus attendance is an issue.
- Existing heavy workloads that often include large on-call times over and above usual work hours for acute services may preclude the choice to study.

- Capacity for tertiary educational facilities to provide courses. Most tertiary educators require a minimum number of nurses to establish a financially viable cohort for specific education that is sustainable.
- Because perioperative nurses work shift work, on-call and rostered duties class times do not always concur with availability for attendance

One of the major issues facing nursing is the overall supply of new nurses to the workforce. In 2009 nurses entering from overseas outweighed the number of new graduates emerging from nursing schools in New Zealand^{xii}. Operating in an environment of capped numbers for undergraduate study and rising demand for nursing services suggests that the gap between supply and demand will continue to widen as the population, including the health workforce, ages.

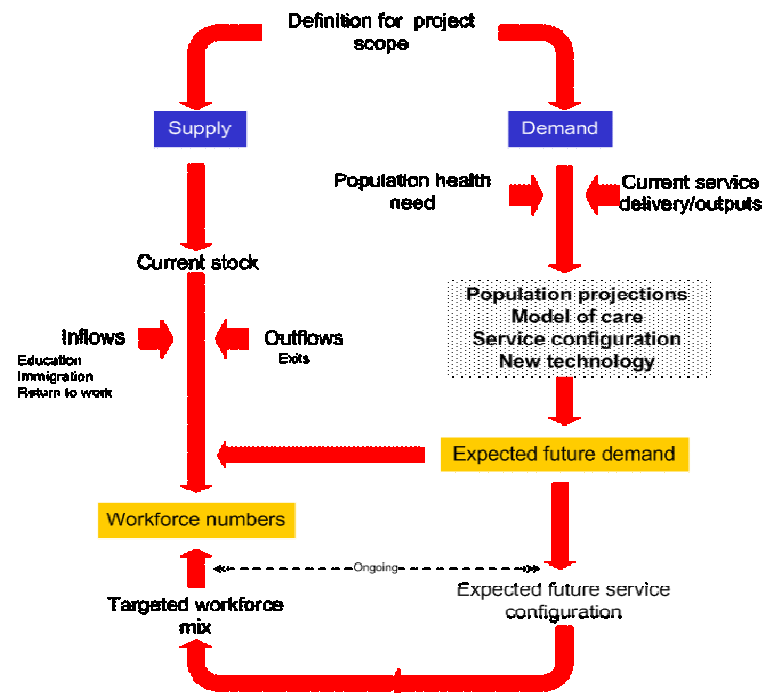
Although nurses emerging from New Zealand based undergraduate programmes have some exposure to perioperative nursing, some of this is limited to clinical follow-through from a general surgical placement. Anecdotally when students have a more participatory role in operating theatre during their undergraduate education, they are more likely to enter perioperative nursing as a registered nurse. Members of the EAG also felt that greater emphasis upon perioperative exposure and experience to the operating theatre environment within the undergraduate programmes, along with active career planning would encourage students to choose sub-specialty nursing as a career pathway earlier. This may result in nurses choosing jobs within perioperative nursing earlier.

^{xii} Ministry of Health (2009), Current status of the national regulated nursing workforce. Available at [http://www.moh.govt.nz/moh.nsf/pagesmh/6795/\\$File/current-state-nursing.pdf](http://www.moh.govt.nz/moh.nsf/pagesmh/6795/$File/current-state-nursing.pdf)

Methodology

The perioperative nursing forecast has been developed from the HWIP Forecasting framework (figure 2). The HWIP Forecasting framework is a type of supply - demand framework and is based on a number of assumptions from the compilation of scenarios based upon likely circumstances. The model predicts 20 years into the future consistent with the Ministry of Health population prediction data.

Figure 2: Health Workforce Information Programme and Planning Framework



Using the HWIP-Forecasting Framework, the first step in forecasting model development is to define and decide on the scope the workforce group for analysis. Thereafter in basic terms the model has two main components – supply and demand.

Supply

Supply of nurses is the headcount plus net inflow (inflow less outflow) calculated iteratively. More than one inflow scenario is calculated based on past inflows and alternately on graduation and immigration.

Inflows are allocated to workforce areas (employer and occupation) in proportion to past data, while outflow is a proportion of the existing workforce, based on known numbers of exits in previous years, and taking into account age, gender, ethnicity and occupation. The proportion of nurses that will return to the workforce is estimated from past data, and this estimate is added to the inflow.

Exit rates for perioperative nurses are lower and less variable than the overall nursing workforce. The wider nursing workforce is more heterogeneous than the perioperative workforce, and is influenced by some workforce areas and age groups that have significantly higher exit rates.

The four entry and exit models are based on binary logistic (regression) models (for a further discussion about logistic regression models refer to the supplementary document about technical methodology). The interflow models are a mix of logistic regression and simple averages. As with other workforce areas the inflow of perioperative nurses will be exogenous. The supply is taken from a separate forecast of the total number of new nurses and the model is used to apportion nurses to various work areas (refer to the supplementary document for the technical report of this analysis). The exit model takes into account exits, re-entries and transitions between work areas is an endogenous model – dependent on the current nursing workforce.

For any constant inflow of nurses a long-run equilibrium number of nurses can be predicted and compared to a demand model. Long-term growth rates for inflow models that feature constantly increasing inflows (for example models that are based on a proportion of the population) can also be predicted.

Demand indicators for analysis include:

- Population growth projections further determined by age, gender, and ethnicity
- Historical, current and future changes to the way surgical services are configured
- Anticipated changes to the way perioperative nursing is offered as models for perioperative nursing care delivery
- The impact of current and emerging technologies

Analysis of these supply and demand factors, including trend analyses, leads to estimates of predicted workforce numbers and patterns.

Future demand considerations applied to current demand and production models lead to predicted future workforce needs. When compared to a workforce supply baseline, estimates of future shortfalls or over-supply can be obtained, and training and recruitment plans can be made accordingly. Factors related to patients requiring perioperative nursing services in the public sector are extracted from national minimum data set (NMDS) data, using a set of Diagnostic Related Grouping (DRG) codes that have been determined to involve perioperative nurses.

Demand measures concerning patients who require perioperative nursing services from private surgical hospitals are extracted from Private Surgical Hospital Association statistics concerning annual total surgical procedures completed. Each population group within this NMDS population has a growth rate applied which is taken from sub-national population forecasts, allowing forecast of demand for perioperative nursing services.

Demand Scenarios

The perioperative nursing Expert Advisory Group (EAG) [refer appendix i] was asked to provide demand scenarios for this projection. Scenarios that were suggested were examined for possible demand weighting. These scenarios, rationales and findings included:

1. Outsourcing elective surgical events

Assumptions

- The restructuring of the health sector includes the stated intent to increase DHB funded contracts
- Private hospitals already do about 6 per cent - around 7000 patients a year - of the elective operations and investigations that are funded by district health boards and say they could do significantly more.
- In Auckland, nearly 11 per cent of DHBs' elective surgery and investigations such as colonoscopies were done by the private sector in the past financial year.
- DHBs will be allowed to enter long-term contracts with private hospitals for elective surgery, rather than using them to meet elective surgery targets at the end of the year.
- There is a flow of nurses from the public sector to the private sector

Managing demand for perioperative nursing

Demand for elective surgery is growing rapidly in New Zealand as the populating ages and life spans increase. It accounts for the use of two thirds of public sector surgical resources^{xvi}, including the employment of many perioperative nurses.

Based on demographic growth alone, and without considering the impact of improving intervention rates or other changes in practice, public sector elective surgery is forecast to grow by 38 percent by 2030^{xvii}.

Maintaining public sector surgical services, including nursing services, at their current level could be done by concentrating on meeting the increasing demand for acute surgery (which will grow by 36 percent in the same period). As demand for acute surgery grows, overall demand on resources could be managed by outsourcing an increasingly large proportion of elective procedures. Under this scenario the size of the public sector perioperative and critical care nursing workforce would remain static, while the private sector would grow.

To hold the volume of surgery constant, elective surgery in the public sector would have to decrease by nearly eighteen percent (from two thirds of all procedures now, to 56 percent of procedures by 2030, while private sector surgical services would nearly double in the same period to meet the increased demand. As a result, the private sector perioperative nursing workforce would also double, to over 2000 nurses^{xviii}, and would eclipse the size of public sector perioperative nursing workforce.

Figure 3: Estimated Public Sector Acute and Elective Mix - 2010

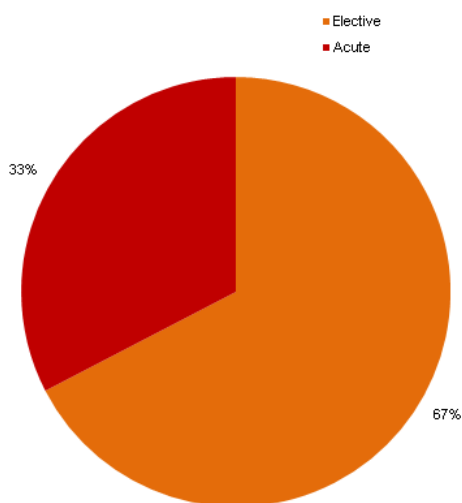
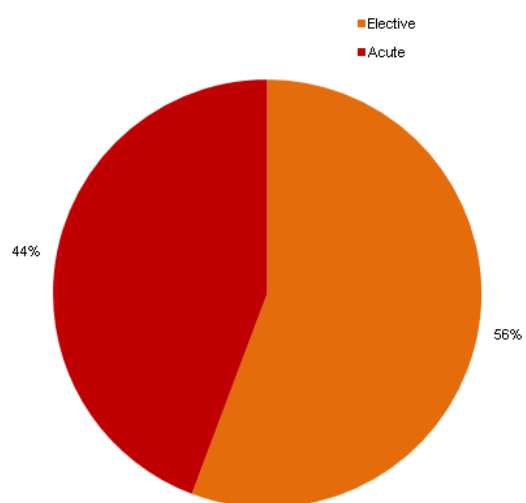


Figure 4: Hypothetical Public Sector Acute and Elective Mix - 2030



Growing the private sector by 98 percent in twenty years requires an annual (compounding) growth of 3.8 percent per-annum, which is in line with current growth projections. This is a net inflow of just over 50 nurses a year. But maintaining this net growth rate for twenty years will not be as simple as recruiting 50 nurses a year.

By 2030, 3.8 percent growth will be over 70 nurses per year. And since this is a net inflow the gross recruitment must be even higher; as the workforce grows the “churn” in the workforce will also grow. Outflows will more than double (since the workforce is aging), and by 2030 some 250 private sector perioperative nurses could be leaving nursing each year.

A major source of private sector perioperative nurse recruitment is the public sector (34 percent appointments), but this would become a smaller source as the relative sizes of the two workforces change. What is now a net inflow from the public to the private sector may become a net outflow, but this will depend on many factors other than just the relative sizes of the two workforces.

Another large recruitment pool for private sector perioperative nurses is private sector surgical (ward) nurses (18.3 percent of appointments). An increase in private sector surgery will necessitate an increase in the private sector surgical nursing workforce and other related areas such as intensive care, increasing the potential recruitment pool for perioperative nurses. An environment similar to the current public sector environment may develop, where new nurses often start their careers in surgical wards, before moving to other areas of practice such as intensive care and perioperative nursing.

In either case it seems inevitable that as the private sector grows in relation to other areas of the nursing workforce, it would become more reliant on recruitment of new nurses, and more involved in the training and education of nurses.

2. Emerging surgical trends

Any factor that affects the future demand for surgical services will affect future supply need for perioperative nurses and therefore training needs. Some emerging trends that were identified as having potential for significant increase in demand include:

- Most prosthetic implants have a limited life. For example the average lifetime of a hip prosthetic implant is 25 years. Because of the success of joint replacement surgery, the procedures are being performed in younger and younger patients. Joint replacements are known to wear out more quickly in younger, more active patients. Whereas in the past a joint prosthetic implant usually outlasted the lifetime of the recipient, now many return for repeat prosthetic surgery, sometimes more than once. The combination of initial joint replacement earlier, increasing repeat surgical procedure rates accordingly and increasing population longevity is likely to impact upon surgical services.
- Obesity and co-morbidity, (such as diabetes) rates are rising in New Zealand. This has resulted in an initial rise in demand for bariatric surgery. Coupled with the discovery that bariatric surgery offers prevention and alleviation from type-two diabetes, publically funded bariatric surgery is likely to increase.
- Total cardiac intervention rates, including surgery in New South Wales are 85 percent above New Zealand. Any attempt to match New South Wales cardiac surgical intervention rates would have a significant impact upon the perioperative nursing workforce

Although these factors are likely to impact upon demand for perioperative services, this needs to be considered in the context of progressively less invasive surgical options. For instance, bariatric surgery is now a keyhole option as is some heart valve surgery. Weighting was not applied as the trade-off will be less invasive but more numbers of surgical procedures.

3. Reconfiguration of the nursing workforce

Assumptions

- Registered Nurses will continue to receive authorisation to expand their scope of practice to include some more complex procedures than is within the current scope of practice
- While some Enrolled Nurses will consolidate existing anaesthetic technician knowledge and skills within the current scope of practice, non-nurses who have become Anaesthetic

Technicians will enter the health workforce. This means that while nurses may continue to have a perioperative nursing role in anaesthesia, in some instances Anaesthetic Technicians will be able to fill the support component of that role. In turn this will mean that nurses will need to define and describe what is the perioperative nursing role in anaesthesia, what is the role of the anaesthetic technician who is not a perioperative nurse, and what differentiates between the roles of practice of the Registered Nurse, Enrolled Nurse and anaesthetic technician within the operating theatre workforce.

- Emerging non-nursing occupational groups for operating theatre will perform support roles for both medicine and nursing.

These factors combined will enable perioperative nursing function to become more streamlined and efficient to better meet service demand. However, the perioperative nursing workforce needs to mitigate the risk of role dilution and will need to determine and define nurse specific skills. A perioperative data set would facilitate definition, description and analysis of nursing activities.

Conclusion

In summary, a perioperative nursing workforce model has been presented in this report, based upon the HWIP-Forecasting framework. This indicates that the demand for perioperative nursing is growing at about 0.4% faster than the supply of perioperative nurses. The demand for perioperative nurses grows steadily at around 1 to 2 percent each year, accumulating to a 40 percent increase by 2029. This estimate is based upon maintaining current intervention rates and so does not account for any existing shortfalls in demand such as an existing unmet demand in cardiac surgery or an uncalculated increase demand for some services such as bariatric surgery or repeat prosthetic implants.

In a climate of capped undergraduate training not directly based upon population health need, a nursing workforce where more than 50 percent work part-time, increasing surgical services demand and an aging workforce, supply of nurses is an issue. A reconstructed health workforce may go some way to addressing this. For example emerging occupational groups such as expanded scopes of practice for Registered Nurses, the re-introduction of Enrolled Nurses, Anaesthetic Technicians, and Physician Assistants may alter roles and functions for nurses working in the operating theatre environment. This extent to which this may alter is immeasurable at the moment. Measurability will come when health clinicians can further define roles and functions to minimise overlap between clinical groups.

An altered perioperative nursing model of care may increase efficiency and effectiveness of care delivery, but will require greater level of postgraduate clinical education so that the greater proportion of the perioperative nursing workforce is adequately prepared to function at more advanced levels commensurate with the higher skill demands of increasing complex and technological surgical procedures.

Higher attrition from the perioperative workforce occurs in the first three years. This is the time of in-house programmes and experience based skills acquisition to enable safe and efficient care within operating theatre. Employer-based programmes with an emphasis upon skills acquisition within these first years prior to postgraduate programmes for career progression will better equip nurses for perioperative nursing elsewhere and increase the likelihood of a return to the sub-specialty later. For example practice overseas and return later to the same sub-specialty.

Coupled with a half life of two to three years for nurses remaining in perioperative nursing, a recruitment and retention model needs to be implemented whereby nurses who undertake study are encouraged to remain in the sub-specialty. At the same time greater emphasis upon specialty nursing, including perioperative nursing, as long term career pathways within undergraduate education would stimulate student thinking about options for Registered Nurse futures.

Appendices

Appendix I – The team

Background of Health Workforce Information Programme (HWIP) - Forecasting

This forecasting report is the first in a suite of nursing sub-specialities projections. The overall project is a national initiative comprising a series of forecasting and workforce modelling exercises on the nursing workforce in New Zealand. The project has developed in response to the widespread need to understand nursing workforce demand, supply and training requirements. This project will help us understand our national nursing workforce picture now and into the future.

The objectives of the programme are:

- To provide a global view of the current status of the nursing workforce.
- To produce nursing workforce projections based on differing scenarios to inform workforce planning and training decisions.
- To improve the quality of nursing workforce information within the Ministry and the health and disability sector.
- To provide a platform to improve the capability of the Ministry and the health and disability sector to undertake nursing workforce planning and funding allocation.

The projections will underpin future planning, as accurate workforce information is fundamental to the effective management and planning of health and disability services. It is also essential to adequately plan for undergraduate, postgraduate and postentry clinical training.

The programme is part of the Future Workforce Nursing strategy initiatives and has been commissioned by Health Workforce New Zealand (HWNZ): Investment and Purchasing Group (formerly Clinical Training Agency). Initial work involved setting up a Stakeholder Reference Group that oversaw the development of the Current Status of the Regulated Nursing Workforce document. Each sub-specialty that is to be forecasted has an Expert Advisory Group (EAG), with a member who liaises between the stakeholders' reference group and the particular EAG.

Future Workforce Nursing Strategy Group

Jim Green	Lead CEO, Nursing and Midwifery WSG, Chief Executive Officer (CEO) Tairāwhiti District Health Board (DHB)
Chiquita Hansen	Director of Nursing, Primary Healthcare, MidCentral DHB
Glenda Alexander	Council of Trade Unions representative
Heather Casey	Director of Nursing, Mental Health, Otago DHB
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Stakeholder Reference Group

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Mark Jones	Chief Nurse, Ministry of Health
Shona Wilson	Advisor, HWIP
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Wendy Guthrie	Operating Room Manager Level 8/Nurse Leader Operating Rooms, Anaesthesia and Central Sterile Supply Department, Auckland DHB
Liz Manning	Project Manager - Workforce, DHBNZ

Appendix II - Data Sources

Nursing Council Registration, Annual Practising Certificate and survey database

A workforce questionnaire accompanies the Annual Practising Certificate (APC) application form sent by the Nursing Council of New Zealand (NCNZ) each year to nurses who are on the register of nurses and who need to update their APC to remain active. The APC workforce survey elicits individual data on a self reporting basis. This provides statistical information about the regulated nursing workforce. As the bulk of the nursing workforce information is within this NCNZ database, this was the major source for analysis. Mercury Project Limited, Wellington, has been recently commissioned by the NCNZ to redesign and implement a contemporary database management system for the nursing registration, annual survey, and APC processes. A copy of the NCNZ database of aggregated and anonymous data was supplied by Mercury Project Limited with permission from the NCNZ for analysis in this project. A contractual arrangement between HWIP and the NCNZ ensured security and anonymity of any data supplied to HWIP.

The NCNZ data collection is based on nurses' individual opinions with regard to their own working situation at the time of APC application using forced choice questions. The quality of the data relies upon the accuracy with which nurses report their situations and the nature of the survey form. In particular with regard to measurement of perioperative nurses:

- the survey form does not supply term definitions to support categorisation of practice areas (e.g. the categories that are used to describe nurses' practice offer selections of terms for different areas of nursing practice, but do not define the meaning and scope of each term)
- the categories for areas of practice matches the Australian New Zealand Standard for Classification of Occupations (ANZSCO), categories. The definition for this nursing sub-specialty workforce group came from ANZSCO

The NCNZ data is the primary data source for the supply estimates for nurses, the NCNZ data records data for over 40,000 individual nurses from 2001 through to the present. This dataset enables the calculation of the influence on entry and exit rates for variables such as age, gender, and ethnicity

Appendix III - Data cleansing, integrity and business rules

Where there is more than one questionnaire record for a nurse for a year, only the record with the latest questionnaire data was kept. This removed 27 duplicate questionnaire records (over all years).

Where there was more than one set of records for a nurse's employment, the set of records with the latest (highest) unique identifier was kept. Seventy two records were removed in this way. Note: There are multiple records for each nurse, as a nurse may have more than one workplace.

To be included in the definition the nurse must work more than zero hours in their primary employment and this work must not be coded as midwifery (survey codes 31-36) or non-nursing

employment, such as work in another health profession (survey codes 71-74). Removing nurses working zero hours or not working in nursing removes another 4633 nurses leaving 41,648 working in nursing (out of 46,281). Note: Nurses working in education, research and nurse management roles are included.

Of the 41,648 nurses working in nursing, 1032 are working overseas¹³. They are excluded from most of this analysis, leaving 40,616 nurses working in nursing in New Zealand.

To simplify analysis a small number of nurses with a missing gender have been recoded as female.

Estimates are made using the nurses' primary employment situation.

The analyses are supported by a supplementary technical report of the general nursing workforce. This will be available online at the conclusion of the forecast modelling project or by request from HWIP.

¹³ Health Workforce New Zealand (2009) Current status of the regulated nursing workforce. Available at:

[http://www.moh.govt.nz/moh.nsf/pagesmh/6795/\\$File/current-state-nursing.pdf](http://www.moh.govt.nz/moh.nsf/pagesmh/6795/$File/current-state-nursing.pdf)

NOTES

¹ An operating theatre suite includes operating theatres, anaesthetic and recovery rooms. The term perioperative includes the components of an operating theatre suite as the environment in which perioperative nursing takes place.

² The Safe Staffing for the Operating Suite standard outlines the recommendation that for each procedure carried out within an operating suite environment there should be a minimum of three nurses, two of which must be Registered Nurses, regardless of the procedure. This means that staffing for a minor procedure with local anaesthetic requires the same minimum number of nurses as a more complex procedure that requires general anaesthesia. A staffing formula is offered that outlines factors that affect staffing numbers within an operating suite including:

- Session numbers
- Surgical complexity
- Available theatres
- Workflow patterns
- Skill mix (nurses)
- Numbers orienting
- Enrolled Nurses working under Registered Nurse supervision
- Availability of support staff
- Layout of the suite
- Amount of emergency (acute) surgery

³ Technological development in surgery is evolving quite rapidly, resulting in more complex procedures, which may result in higher risk, more invasive surgical procedures in the future. Conversely some surgical procedures are becoming less invasive as new techniques are developed, such as robotic surgery in urology and gynaecology.

⁴ The NCNZ defined the first surgical assistant role as:

“The first surgical assistant is a perioperative nurse with additional education and skills, functioning in an extended role. The first surgical assistant during a surgical procedure carries out functions intended to assist the surgeon in performing a safe surgical procedure with optimal results for the patient. These may include:

- Incision of skin or tissue
- Tissue dissection
- Applying diathermy to body tissues
- Applying clamps or clips to vessels
- Suturing skin or any other tissue layers
- Preparation of transplant organs or tissues
- Vein harvesting

The first surgical assistant practices perioperative nursing and has acquired the knowledge skills and judgement necessary to assist the surgeon, through organised instruction and supervised practice. The first surgical assistant functions interdependently with the surgeon during the intra-operative phase of practice. The first surgical assistant does not concurrently function as an instrument nurse” (NZNO, 2008)

⁵ Operating assistants and operating department practitioners have not been introduced to New Zealand. They are occupational groups that have been identified elsewhere such as in the United Kingdom and Australia.

⁶ New’ nurses are nurses entering into critical care nursing for the first time – new graduates and nurses from other fields of nursing.

⁸ The national framework for nursing professional development and recognition programmes and designated role titles have proposed four levels of practice for Registered Nurses and Enrolled Nurses/Nurse Assistants. As the need for post-graduate training need is relevant to Registered Nurses only, the recommended levels for Registered Nurses include:

- Graduate Registered Nurse – the newly registered nurse in their first year of practise.
- Competent Registered Nurse – demonstrates increasing efficient and effectiveness in practice after the first year post registration.
- Proficient Registered Nurse - has an in-depth understanding of the complex factors to contribute to client health outcomes
- Expert Registered Nurse – who is engaging in post graduate studies and practises at a level of practice considered to be expert by their peers.

This levelling process is a recommendation and is not implemented consistently across DHBs and other nursing service providers.

⁹ Levels of nursing practice in New Zealand are based upon the work of Patricia Benner, which began in the 1980's. Patricia Benner used the Dreyfus model of skill acquisition to define levels of nursing practice from the graduate, who Benner termed novice through to the expert nurse practitioner. Central to Benner's work is the notion that skill acquisition post-registration can be based upon experience and on the job training. From this perspective post education training is not necessarily aligned with skill acquisition prior to the Expert Nurse level (level IV) for the general workforce.

¹⁰ This is calculated from the figure of 2086 hours per annum as meaning a full-time position. This includes leave entitlements. Whether NZNO considers experience hours in the same way is unclear.

¹¹ This assumes that the nurse completes the usual orientation programme and PDRP programmes concurrently with practice as on the job training at the point of entry to the sub-specialty.

¹² The term 'current cohort' here is used to refer to all the nurses in the workforce this year. This cohort will always shrink (other nurses will enter the workforce, but they form part of future current cohorts). This differs from the concept of a generational cohort, which would all the nurses recruited in a particular year, or an age cohort (all the nurses of a particular age).

¹³ The behavior of the workforce is similar enough for the terminology to be useful, but unlike other areas where the term half-life is used, the exits of nurses from the workforce are not random, nor do they occur at a constant rate, and the decline in the workforce does not exactly fit an exponential decay curve. Note also that the historical distribution is not the same as the future distribution. The median experience of the existing workforce tends to be slightly longer than the median future career length of the same workforce.

¹⁴ The mean is higher than the median, with a relatively small number of very experienced nurses, and a large number of very short-term nurses skewing the distribution.

¹⁵ NCNZ data is only available in discrete years, and our estimates can only be accurate to within 1 year

^{xvi} We base our estimates of the 'volume' of surgery we use 2009 inpatient events from the national minimum dataset. A subset set patient events that are admitted under DRG codes that typically involve non-minor surgery are counted as "surgical" events. Rather than using a simple count of events (which would not take any account of the complexity of surgery), or using the full case weight (which includes possibly lengthy recovery in critical care and/or in a ward) we use the same day inlier weight (regardless of whether this weight is ever applied to an event). This weight, which is technically only applicable to events lasting one day, is a compromise between ignoring complexity completely and using the full inlier event weight. Use of the same day weight rather than a count of patient events lowers the ratio of elective to acute: acute events are on average more complex and costly in the first day. The full case weight gives an even lower loading to elective events, implying (on average) a longer and more expensive recovery period, including extended time in ICU for acute events.

Better measures of the true volume and weight of surgery would take account of multiple procedures that might occur during a patient event. Ideally the weighting should be based on information on theatre time, staff time (particularly, in this case nursing time) and other costs. Such information is not readily available, and assembling it is beyond the scope of this work. Our estimate of the volume and growth in volume of surgery should be seen as indicative, rather than exact measures of cost, resource use, etc.

^{xvii} Our demographic projections calculate growth in “estimation cells” that are defined by age group, gender and prioritized ethnicity, based on Statistics New Zealand population projections. Surgical events, grouped into the same cells based on patient details, are “projected” by these demographic growth estimates. Implicitly they use a constant “intervention rate” for surgery; they do not take into account other trends, with causes other than population growth, such as technology and public policy.

^{xviii} All estimates of nursing numbers are based on data supplied by the Nursing Council of New Zealand.