



Workload in a provincial New Zealand vascular surgery service

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Abstract

Aim There is increasing evidence that centralising complex surgical procedures improves mortality rates. The focus on mortality as the primary outcome measure overlooks every other aspect of a local surgical service that could be lost by centralisation. The aim of this audit was to assess the total vascular service provided in a provincial vascular surgical unit

Method This was a 12-month prospective audit of the vascular surgical service in Taranaki. All outpatient and inpatient vascular consultations and procedures carried out by a surgeon or interventional radiologist were identified.

Results There were 181 inpatient admissions of which 121 (67%) were elective and 60 (33%) acute. There were 41 (29%) non-operative admissions, while 140 (71%) required an operation as an inpatient. There were 967 total bed days for vascular patients with an average stay of 5 days (4-6 95% CI). There were 588 vascular outpatient consultations for 396 patients. There were 201 (34%) new patient visits and 387 (66%) follow up appointments.

Conclusion Although the number of operations performed per population per year in Taranaki over the audit period was consistent with other reports, the number of major vascular cases did not meet suggested annual thresholds for minimising mortality. Despite this there was no evidence of increased mortality in any group. There was a large amount of non operative work which is not considered when focus is exclusively on mortality.

Centralisation of complex surgical procedures has the potential to improve patient outcomes, particularly mortality rate.¹ Surgeon experience, support staff, infrastructure and recognition of complications may all be important factors in this regard.^{2,3}

Vascular surgery is a specialty where centralisation could be beneficial due to its complex procedures and multi-disciplinary requirements especially with regard to interventional radiology.⁴ A shift has already begun with countries such as Sweden showing improvements in mortality with centralisation of vascular care.⁵ In England, where the health system is similar to New Zealand, centralisation of vascular care is gradually taking place.⁶

By only viewing care from the important, but narrow perspective of mortality rates, providers ignore or override patient wishes to have treatment locally.⁷ Centralisation may actually lead to reduced access to specialist services and disadvantage the very population it is meant to benefit.⁸ A local surgical specialty service provides many benefits additional to the availability of complex operations.

There are no New Zealand studies looking at centralisation of vascular surgical services and it is not clear whether previously published overseas models would be valid in New Zealand. New Zealand possesses its own unique geography and access to health services, in particular a widely spread rural population.¹⁰

Centralising some services may put excessive strain on major regional hospitals already struggling to cope with existing workloads. Centralised hubs may have to absorb not only surgical procedures but also consultations, imaging and other interventions. A realistic assessment of current workloads is required to quantify the resources that would be required before any meaningful investigation of centralisation could occur. Retrospective analysis of electronic records leads to underreporting of events and misses data that cannot be recorded on a computer.^{11,12} Collecting prospective, pre-specified data provides a more accurate assessment of the actual service.¹³

The aim of this prospective audit was to assess the total vascular service provided in a provincial vascular surgical unit.

Method

Taranaki is a province on the west coast of the North Island of New Zealand. It is 3 hours by road to the next largest hospital and approximately 40–50 minutes flight by fixed wing aircraft to Hamilton or Auckland.

Taranaki base hospital is a 250-bed secondary hospital that serves a population of approximately 106000 people. It has an intensive care unit supervised by a specialist anaesthetic intensivist and renal support services. We conducted a prospective clinical audit of the vascular service provided by Taranaki District Health Board (TDHB) between Dec 2008 and November 2009.

All of the vascular services are based in the regional capital, New Plymouth. There are four general surgeons and one vascular surgeon serving the population. One of the general surgeons has an interest in vascular surgery while the vascular surgeon also provides general surgery care.

Proformas for the collection of data were decided before the commencement of the study after discussion with the surgeons involved in the study and other members of the department. All outpatient and inpatient vascular patients along with all vascular operations and procedures carried out by a surgeon or interventional radiologist were identified to provide an assessment of the vascular service.

An inpatient form was completed by the house surgeon or registrar for all patients admitted under the vascular surgeon or those with a primary vascular complaint admitted under a general surgeon. Data included patient demographics, diagnosis, procedure, time in hospital, ICU requirements, complications and follow up on discharge.

Similarly all patients presenting to either the vascular surgery clinic or with a vascular complaint to the general surgery outpatient clinic were identified and data was recorded by the attending doctor. This form contained patient demographics, referral source, outcome from clinic and the diagnosis category. The data from all forms was recorded in a Microsoft Access database and then analysed with Microsoft Excel.

To ensure that every patient was identified the forms were cross checked with the hospital electronic discharge records of all the general surgeons over the time period of the study. The theatre logbook was also cross checked to ensure that no procedures were omitted.

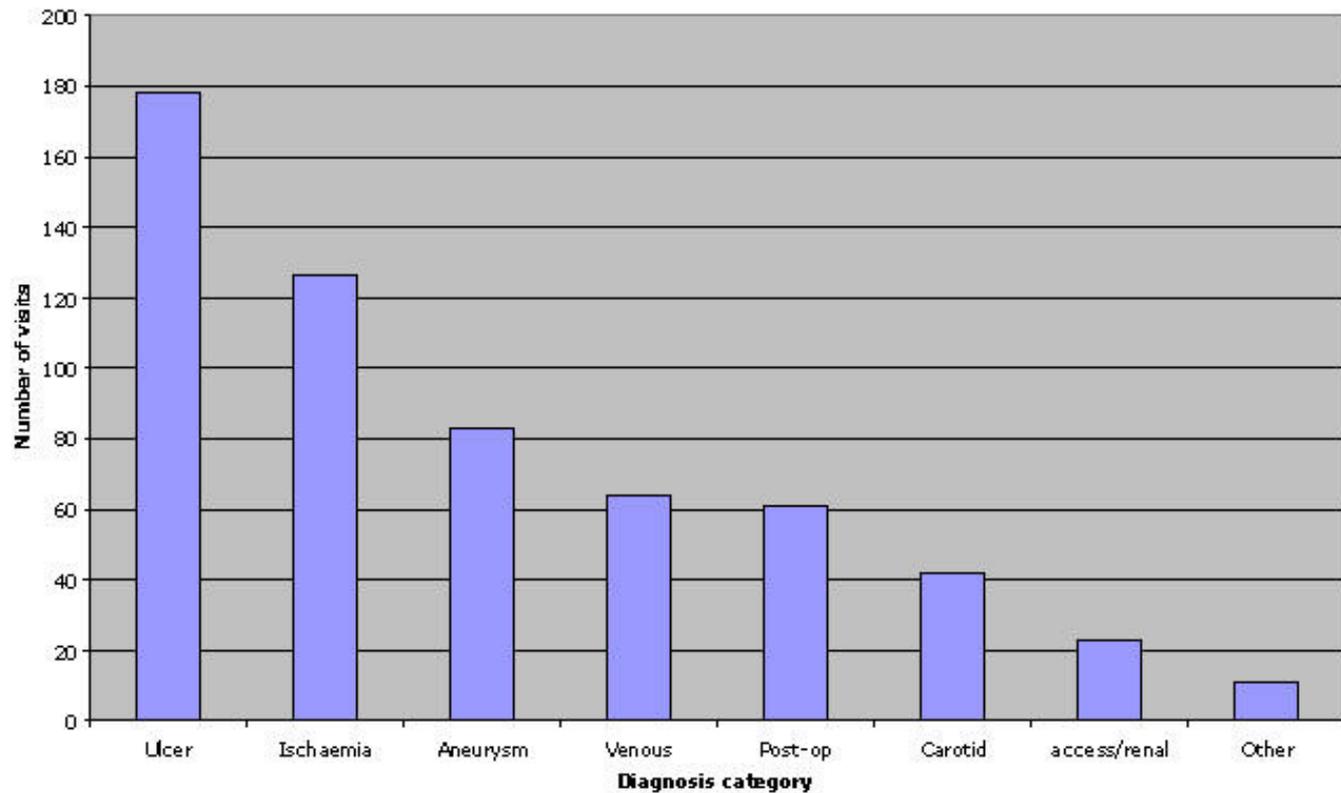
The audit did not include data from ulcer clinics run by specialist nurses or the non-interventional vascular imaging undertaken by radiology.

Results

Over the 12 months there were 588 vascular outpatient appointments with 396 individual patients seen. There were 201 (34%) new patient visits and 387 (66%) follow up appointments. Using broad diagnosis categories as shown in Figure 1 the

most common reasons for seeing patients were leg ulcers (178), and patients with ischaemic or claudication symptoms (124).

Figure 1. Outpatient visits grouped by diagnosis category (n=588)



Some patients required more than one outpatient appointment over the year. 333 (84%) of the patients were seen only once during this time period but over forty patients were seen three or more times in the outpatient clinic. Generally these patients either had chronic ulcers or wound complications that required close monitoring.

As shown from the procedure data, only 8 aneurysm repairs were carried out in New Plymouth during the audit period but over 80 outpatient referrals for this complaint were seen. Figure 2 shows the outcomes for outpatients seen because of an aneurysm. Over 50% of these patients were having ongoing vascular imaging and another 14 were actively being followed up. With no endovascular aneurysm repair (EVAR) carried out in Taranaki a number of patients were referred for consideration of this treatment in Waikato. In total six patients during this time period underwent EVAR in Waikato.

Figure 2. Outcomes for outpatient visits for aneurysm complaint (total =83)

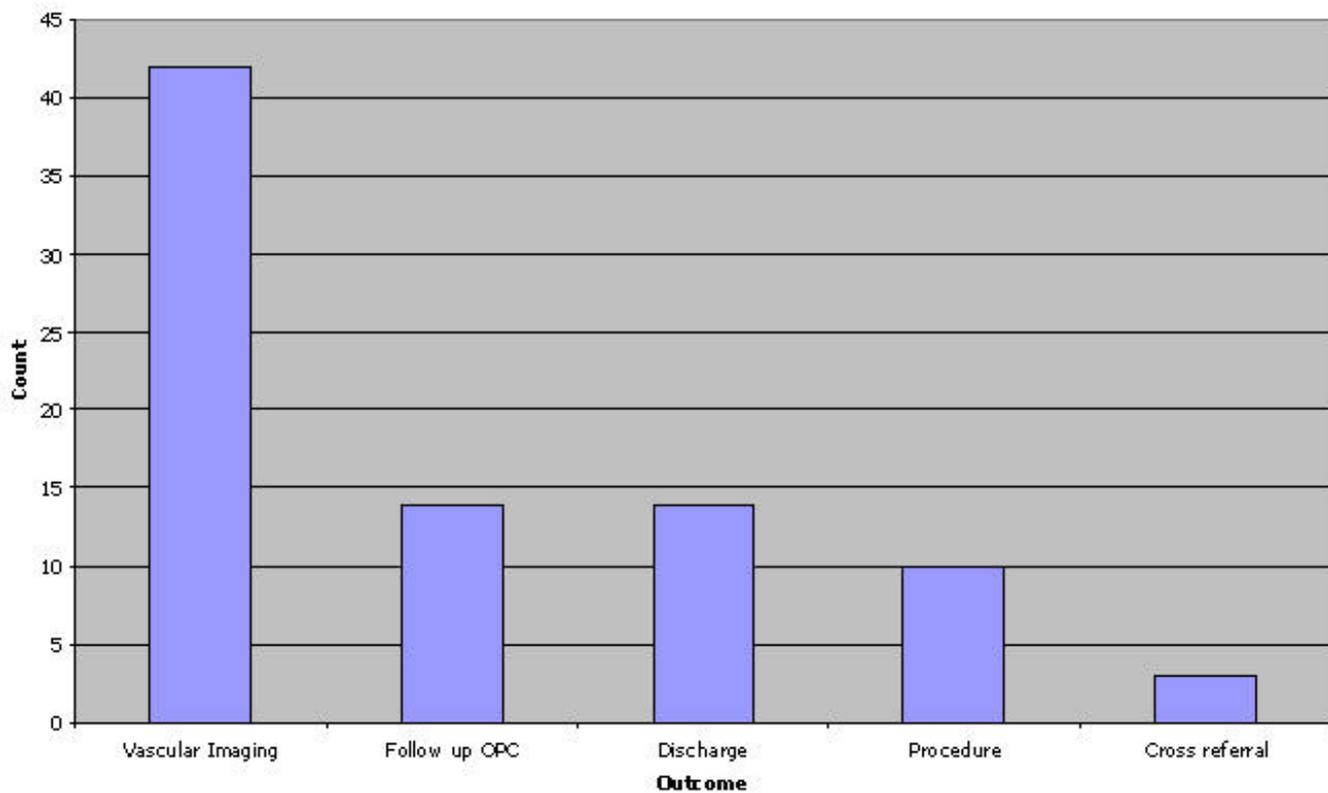
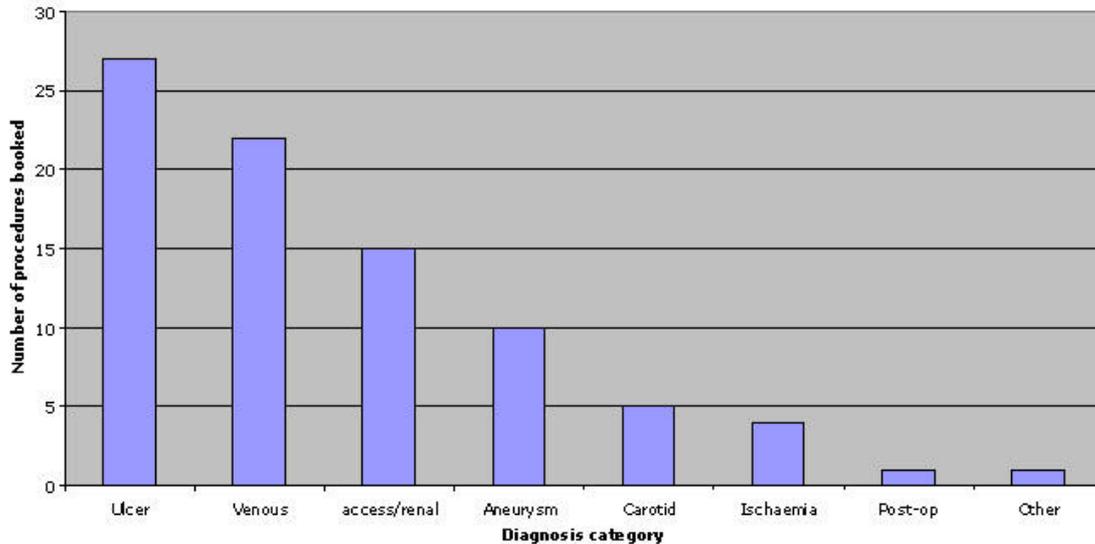


Figure 3 shows that 85 patients were booked from the outpatient clinic for a procedure and the breakdown by diagnosis category. In the ulcer category the procedures booked included angiograms, bypass surgery and amputations.

The procedures booked from outpatient clinic do not match exactly with all the procedures performed in Figure 4. This is due to the acute procedures performed and also those inpatients that were referred directly that admission for carotid endarterectomy.

Figure 3. Diagnosis category for all patients booked for a procedure from outpatient clinic (N=85)

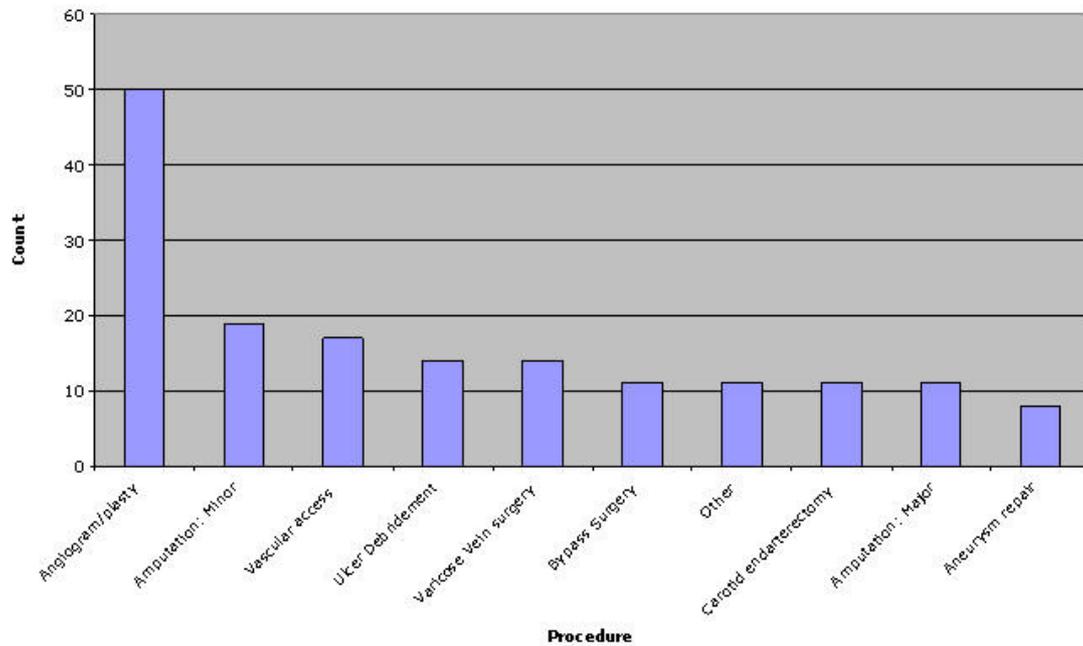


Over the 12-month period there were 181 inpatient admissions of which 121 (67%) were elective and 60 (33%) acute. There were 41 (29%) non-operative admissions, while 140 (71%) required an operation as an inpatient.

The average age of the patients admitted was 68 years (66-70 95% CI) with 40% of the patients male, 60% female; 53% of all patients admitted were over the age of 70. Most of those who did not require an operation were either unfit for an operation, did not require an operation, or had a condition such as a chronic ulcer which required inpatient management

Figure 4 shows the breakdown of the procedures performed over the audit period. The graph shows the high number of interventional angiography procedures that were performed and approximately 10 cases each of abdominal aortic aneurysm (AAA) repair, carotid endarterectomy (CEA) and bypass surgery. The “other” category here included acute embolectomies, cases of repair of vascular trauma and one case of stenting of a subclavian artery stenosis.

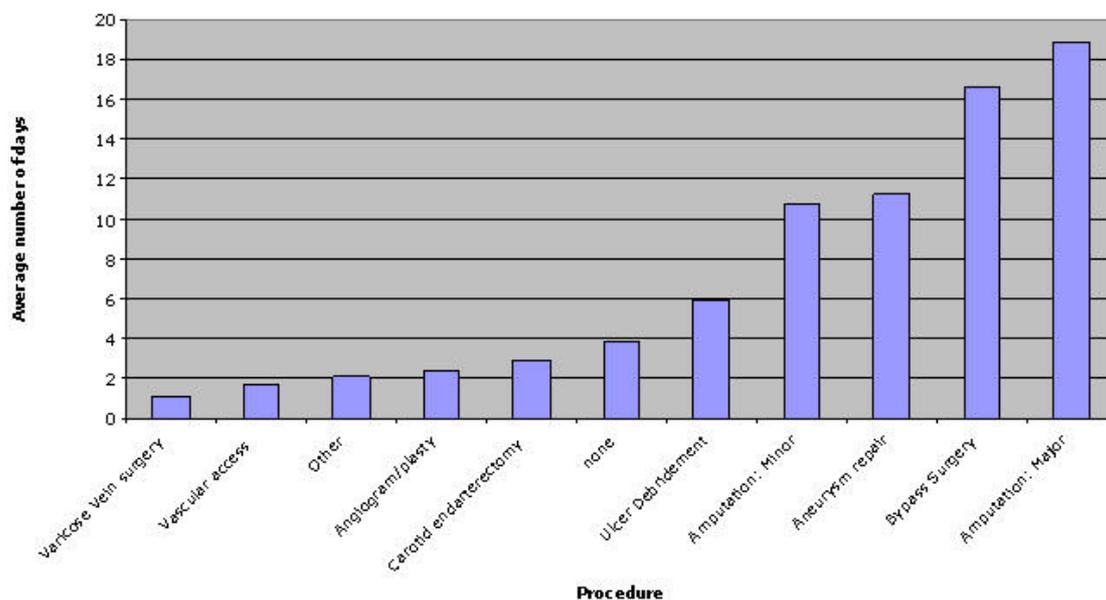
Figure 4. Total count of procedures performed (total=166)



Of the 181 inpatient admissions, 41 (23%) required admission to the high dependency unit (HDU) or intensive care unit (ICU). The only patients requiring ICU level care were aneurysm repair patients and one patient who had a major vascular injury post angiography.

There were 967 bed days for vascular patients over the audit period with an average stay of 5 days (4–6 95%CI). Figure 5 shows the average stay by procedure. It highlights that major operations had a more prolonged stay in hospital. Major amputations had the longest average stay and this was often due to the initial failure of conservative management or less invasive procedures. The length of stay did not include time spent on the rehabilitation ward.

Figure 5. Average stay in hospital by procedure



Complications were recorded for all inpatients and included re-operation rates, requirement for increased level of care and unplanned readmission. Nineteen patients required more than one operation during a single admission with eighteen of these being unplanned re-operation (13% of all operative admissions). Nine of those patients had initial angioplasty which failed requiring either bypass surgery or an amputation. Another five patients had a minor amputation that after ongoing management required further amputation.

Of the other four patients who had unplanned re-operation:

- One patient required re-operation to evacuate a wound haematoma post carotid endarterectomy.
- One patient required a major amputation after acute bypass surgery with a patent graft still present at 30 days after initial operation.
- Two patients required operations for wound complications after unplanned readmission.

In total there were eight unplanned readmissions after surgical intervention during the audit period.

These were all wound or stump related complications. One patient after elective AAA repair required ongoing ICU care and intubation for 4 days due to blood loss and hypotension but subsequently made a full recovery. There were three deaths two of which were post-operative patients following urgent above knee amputations who died from circulatory failure. One of these patients was a Jehovah's witness.

Discussion

In Taranaki over a 1-year period approximately 200 vascular operations were performed. Although the number of operations performed relative to the Taranaki population was consistent with other reports,¹⁴ the number of major vascular cases did not meet some suggested annual thresholds for minimising mortality. Despite this there was no evidence of increased mortality in any group. There was a large volume of non operative vascular work.

There are few audits looking at the total vascular service provided by a hospital. Ashraf et al investigated the change in vascular workload at the Royal Berkshire Hospital serving a population of 500,000 from 1989 to 2003.¹⁵ The outcomes investigated included the number of admissions, number of procedures and number of new outpatient referrals during a 3-month period over five different years.

Comparing the numbers from the Taranaki audit with this study shows that the services do seem to be similar in terms of admission numbers and operation rate per population. One key difference is the high number of varicose vein admissions, operations and referrals that were seen in the Royal Berkshire hospital population. This current audit is the first of its kind published in the New Zealand literature. It highlights the need for careful planning for the future of health services in New Zealand and to ensure that the rural population does not suffer from lack of access to specialised surgery.¹⁶

A previous report from Taranaki over a 10 year period reported risk adjusted mortality rates that were comparable or better than predicted by an established model.¹⁷ The unplanned re-operation rate of 13% is similar to previously published audits.¹⁸ Pooled data has suggested that 43 aortic aneurysm repairs and 72 carotid endarterectomy procedures need to be performed annually to minimise patient mortality.^{20,21}

Clearly Taranaki does not reach these levels nor do many other centres in New Zealand. This data comes from Europe and the USA and has not been validated in New Zealand where mortality from aortic aneurysm is lower than in many of those countries where this data has come from.²²

Even in England over 60% of hospitals with vascular surgery services perform less than 20 AAA repairs per year.²³ With this in mind Karthikesalingam et al have argued that there may not be a simple volume threshold level at which a centre should or should not perform these vascular operations due to the number of factors that contribute to mortality.²⁴

Finlayson et al showed that most patients have a strong preference to be treated in their local hospital even if this meant an increase in procedure mortality rate.²⁵ The elderly population were found to accept the highest mortality rate if it meant they could remain locally. With over 50% of the patients seen in Taranaki being over the age of 70 it would be likely that many of these patients would have strong preferences to stay locally.

Using index procedures as the only guide to future resource requirements hides a huge amount of non-operative work that is required to support a surgical service. 29 percent of the admissions to Taranaki base hospital did not require an operation. The average

bed stay for patients was over 5 days with extended hospital stays for those having major operations. This highlights the heavy load of ongoing specialised care required on the ward for vascular patients.

Almost 600 outpatient clinic appointments were made during the audit period. Of this group 40 patients were seen over three times in the clinic. A large number of patients required on-going vascular imaging which was coordinated through the outpatient clinic.

HDU/ICU access was required for many of the patients undergoing major vascular operations and this would not change if the service was transferred to a larger centre. This access to HDU/ICU beds has been recognised as a potential barrier to centralisation of care.²⁶ A large centre may have the operating time and vascular surgery staff available but may not be able to perform a procedure due to the limited access to ICU.

This audit aimed to assess the resources required by a peripheral vascular unit. One weakness of this audit is that it is a single vascular surgeon's practice in Taranaki which may differ from other peripheral centres in New Zealand. The same vascular patient in a large centre may be managed differently in a peripheral centre. This may be due to the increased resources and technologies available in a larger centre. The resources identified by this audit to provide a vascular service to a peripheral population may be different if administered from a larger centre.

This was a prospective audit of all vascular events and will be a close representation of the actual workload. Even though great efforts were made to ensure complete event capture it is likely there has been a slight underreporting mainly in the area of consultations both inpatient and outpatient. In addition the study did not include any information on pre-operative vascular access imaging, ultrasound, CT angiography and MR angiography. Private patients were not included.

Centralising some services may put excessive strain on major regional hospitals already struggling to cope with existing workloads. Centralised hubs would have to manage all aspects of a vascular service, some of which can not easily be measured.

Accessibility might suffer in many areas by the absence of a local specialist. Outpatient consultations, inpatient cross referrals, the ability to discuss patients with colleagues on an ad hoc basis, availability to consult on emergency cases and support for local specialty initiatives such as leg ulcer clinics or aneurysm screening are all areas that might be lost.

This current study has shown the extensive vascular service provided in Taranaki. It has also highlighted areas of service that often go unreported but that would need to be considered to allow meaningful planning if centralisation was ever considered. Future planners would need to consider all of these areas to ensure equity of patient access.

Competing interests: None.

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