Vascular Anaesthesia Society of Great Britain and Ireland

Annual Scientific Meeting

Abstracts for the Leeds Meeting

Monday 9th & Tuesday 10th September 2024

The Queens Hotel
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Welcome to the abstract booklet for the VASGBI 2024 Annual Scientific Meeting in Leeds at the Queens Hotel

NAVIGATION

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VASCULAR ANAESTHESIA SOCIETY
Day 1 - Monday 9th September 2024

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11.30am **Post-op renal dysfunction and how to manage it**
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Mr Les Ruffell, Leeds

4.30pm **Development of patient decision aids**
Mr Andrew Garnham, London
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Post-op pulmonary complications and how to avoid them

Dr Andy Lumb
Consultant Anaesthetist, St James's University Hospital, Leeds
Honorary Associate Professor, University of Leeds, Leeds

Post-operative pulmonary complications (PPCs) are a common event, occurring in 2.0-5.6% of patients, and lead to increased length of hospital stay, cost, and mortality.[1] Older studies regarded almost any post-operative respiratory event as a PPC, but there is now an agreed definition that a PPC is any one of post-operative atelectasis, pneumonia, adult respiratory distress syndrome or radiologically proven pulmonary aspiration.[2] Many risk factors contribute to developing a PPC, half of which are modifiable, and several scoring systems exist to assess the risk for an individual patient. The most useful of these is the ARISCAT score[3] which includes seven factors, three of which focus on the patient's current respiratory health at the time of surgery rather than on respiratory co-morbidities. Patients having vascular surgery are at high risk of developing PPCs, particularly those having open AAA repair,4 with even higher rates for emergency repairs.

Avoiding PPCs involves multiple strategies throughout the peri-operative period:

Preoperative

1. Pre-operative smoking cessation, for as long as possible, is probably the single most useful intervention, but to be maximally effective needs to be intensive i.e. delivered by experts, monitored, and supplemented with pharmacotherapy.[6]
2. Ensuring respiratory co-morbidities are optimally treated is helpful, especially for asthma, and postponing surgery whenever possible if the patient reports symptoms of a respiratory tract infection within 30 days of surgery.

Intraoperative

3. Avoid atelectasis, which occurs in most patients having a general anaesthetic. In many, particularly those having major surgery, atelectasis persists into the postoperative period. Avoidance of 100% oxygen, protective ventilation and use of recruitment manoeuvres may minimise atelectasis, particularly in obese patients[5] and during laparoscopic surgery.
4. 'Protective' ventilation should be used in theatre, and typically includes small tidal volume (6-8 ml/kg ideal body weight), moderate PEEP (5-10 cmH2O), pressure-limited ventilation (to minimise driving pressure[7]) and recruitment manoeuvres. The ideal PEEP value for use in theatre is unknown, with recent research suggesting that in 'difficult to ventilate' patients e.g. those with morbid obesity and/or having laparoscopy, PEEP should be individualised based on imaging or achieving a minimal driving pressure.[8] While there is little evidence supporting a role for individual components of protective ventilation in preventing PPCs, the overall 'package' of protective ventilation is associated with about half the incidence of PPCs versus traditional ventilation.[9]
5. Use the correct FIO2 in theatre. Higher median FIO2 during anaesthesia is associated with greater prevalence of PPCs, even when multiple factors, including impairment of oxygenation, are taken into account.[10] Once the airway is secure FIO2 should be set to the lowest value to achieve oxygen saturation of ≥94%.[11] Recent work has also

suggested that hyperoxia in theatre may also contribute to kidney and myocardial injury.[12]

6. Use of muscle relaxants is associated with more PPCs, although this effect is believed to be minimal if correct reversal strategies are used, including quantitative neuromuscular junction monitoring.[13] Being inadequately reversed immediately post-operatively is associated with impaired airway muscle activity and coordination, making aspiration a possibility, and there is a selective effect on inspiratory muscles i.e. forced expired vital capacity may be normal but inspiratory effort remains impaired. Results from studies of PPC incidence between patients reversed with neostigmine versus sugammadex are currently mixed, though a recent study of patients at high risk of PPCs showing a benefit from sugammadex.[14]

Postoperative

7. Optimal post-operative analgesia, irrespective of how this is provided, reduces the risk of a PPC. Individual interventions such as physiotherapy, incentive spirometry etc have little evidence supporting their use to prevent PPCs unless used as part of a postoperative package of respiratory support. A good example of this strategy is iCOUGH components of which include patient education, incentive spirometry, head-of-bed elevation, regular mobilisation, coughing and deep breathing exercises, and oral care.[15]

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Post-op cardiac complications, the role of troponins and other biomarkers

Dr Simon Howell, Associate Professor
Leeds Institute of Medical Research, University of Leeds

The VISION study identified an unequivocal association between postoperative troponin elevation and postoperative mortality.(1) This subsequently formed the basis of the definition of Myocardial Injury after Non-cardiac surgery (MINS).(2) The MINS definition attributed perioperative troponin release to ischaemic injury, whether or not there was other evidence of ischaemia. This is important as the likely mechanism for myocardial injury will underpin choices of therapeutic intervention. The Fourth Universal Definition of Myocardial Infarction is clear that not all myocardial injury has an ischaemic mechanism.(3) Subsequent reviews have laid out the mechanisms by which the pathophysiological response to surgery could cause perioperative troponin release without invoking myocardial ischaemia as a mechanism. Recent consensus clinical trial definitions likewise make a distintion between perioperative myocardial injury and infarction.(5) Whilst there is evidence for an association between perioperative Brain Natriuretic Peptide (BNP) concentrations and adverse perioperative outcome, it is less clear that this translates into a screening tool that can guide management. A rigorous appraisal of the value of perioperative troponin and BNP measurement did not provide clear support for the use of either of these biomarkers.(6) This is not to dismiss the importance of the association between myocardial injury and adverse perioperative outcome. It does suggest that future interventions to reduce the burden of injury need to look beyond myocardial injury alone.

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Carotid stenting; Indication and pitfalls

Dr Trevor Cleveland, Consultant Interventional Vascular Radiologist
University Hospitals Plymouth

Endovascular treatment of carotid bifurcation stenoses started as balloon angioplasty in the last 10 years of the previous century. With the publication of the CAVATAS Trial in 2001[1], this demonstrated, despite considerable scepticism in the community at the time, the feasibility of balloon angioplasty as a method of treatment for patients at high risk for carotid endarterectomy (CEA).

Over time the procedure has evolved to become the modern-day procedure of primary placement of stents (CAS) at the carotid bifurcation, usually utilising some form of cerebral protection system.

Since the CAVATAS trial there has been significant technological and drug therapy changes that have been designed to reduce the risk of complications, particularly neurological, which have included the development of a variety of cerebral protection devices, dedicated stents (more recently double layer stents), and improved drug therapy.

A significant number of trials, randomised and cohort, have been published, generally demonstrating a reduction in the overall complications associated with the stenting procedure with time. The large multi-centre trails have all been consistent in their outcomes, in showing that in patients considered to have “normal risk” for carotid endarterectomy and who are considered suitable for stenting (i.e. those randomised into the trials), that the outcomes for major stroke and death at 30 days are similar. There is consistently a slight excess of minor strokes in the stented cohorts. The evidence, however, also shows that these minor strokes are likely to resolve and the patient’s functional ability (Modified Rankin Score) at 1 year and beyond is the same for CAS and CEA[2].

When a patient is at high risk of recurrent stroke (internal carotid stenosis >70% using NASCET criteria) and is also at high risk of CEA for preventing further events, then the patient may be suitable for stenting, in which case CAS is preferrable. Such patients may be those with restenosis following previous CEA, patients who have had radical neck radiotherapy, those with a high carotid bifurcation (that would require mandibular dislocation to allow for surgical access) and other high-risk surgical features. A patient may express a preference for CAS, indeed having this choice is recommended for the younger patients in the National Stroke Guidelines of 2023[3].

There remains controversy as to if there is a benefit to patients for intervention (CEA or CAS) who have high grade asymptomatic carotid stenoses, over modern best medical therapy. If intervention is undertaken, trials such as ACST2[4] indicate that the stroke risk associated with CEA and CAS in such patients are similar.
These data are derived from cases where the carotid bifurcation, and the approach arteries, has been considered anatomically suitable for CAS, there are adverse features which make carotid stenting hazardous or not technically possible.

More recently, patients with acute stroke and a large cerebral vessel occlusion have been shown to accrue benefit from mechanical thrombectomy. Around 10-20% of such patients also demonstrate significant carotid bifurcation disease. The indications are that early stenting of the bifurcation lesion in such patients confers a beneficial outcome, and saves a subsequent additional operation of CEA[5].

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Modern vascular access for haemodialysis

Mr Max Troxler, Consultant Vascular & Resuscitative Surgeon
Leeds Vascular Institute, Leeds General Infirmary

Before the 1940s both acute and chronic kidney failure were universally fatal conditions. In 1943, the Dutch physician Willem Kolff while working in the Nazi occupied Netherlands invented his rotating drum kidney. This pioneering invention utilised sausage skins, orange juice cans and washing machine parts and was initially used to treat patients with acute kidney injury. It took 2 years and 16 patients before his first patient survived but this invention proved the principal that haemodialysis was possible for human patients. The initial vascular access employed was direct sharp needle cannulation of arteries and veins and the associated iatrogenic vascular wear and tear was one reason that this treatment was limited in duration.

It was not until the invention of the Scribner shunt in Seattle in 1960 that a reliable form of vascular access was available. Clyde Shields was the first patient to receive this device and remarkably survived for a further 11 years. With the invention of a reusable vascular access the concept of a maintenance haemodialysis program was born. At a similar time, Dr Shaldon, an English nephrologist at the Royal Free Hospital invented and built his own dialysis catheters and was instrumental in establishing the first haemodialysis programme outside of Seattle.

However, both shunts and catheters were beset with the complications of thrombosis, infection and bleeding and so the hunt for an alternative strategy continued. In 1966, Brescia, Cimino and Appel published the results of 15 patients that had undergone the surgical creation of an arteriovenous fistula at the wrist. This created a dilated, high flow vein that could be cannulated to allow regular haemodialysis. It is sobering to reflect that an almost identical surgical technique is still employed almost 60 years later.

End stage renal failure and the transition to maintenance haemodialysis is a difficult time for every patient and troublesome vascular access just adds to the distress. The potential options remain the arteriovenous fistula, the central venous catheter and the dialysis graft. Modern patient centred decision making has moved away from the concept that every patient should be subjected to repeated attempts to create an arteriovenous fistula. The current philosophy is to establish what is best for them at this time in their lives and how that might change over time[1].

In recent years there have been several notable inventions and innovations. The development of the early cannulation dialysis graft now allows this access to be needled on day 1 rather than day 14 after insertion. This ability has been utilised to allow emergent haemodialysis and thus avoid the insertion of a central venous catheter completely. Two endovascular techniques to create a fistula deep in the proximal forearm have been developed and are finding their place in the treatment algorithm. They offer a less invasive and perhaps more reliable option but remain expensive.

The HeRO and SuperHeRO grafts offer the ability to persist with access in the upper limbs in the presence of catheter-induced central venous stenoses or occlusions and have reduced the need to look for access options within the lower limbs. For surgically created fistulae, the type

of anaesthetic technique and the associated sympathetic block may positively influence maturation[2]. We await the results of a UK, multicentre trial designed to assess the benefit of a regional anaesthetic technique[3].

The aging population and increasing type II diabetes mellitus are likely to result in a significant increase in the number of patients needing haemodialysis over the next 10 years. Establishing reliable vascular access is likely to become more challenging for the same reasons. Hopefully, ongoing research and development of novel ideas will improve the triumvirate of current options to offer patients as we help them to choose the right access, at the right time and for the right reasons.

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Development of human factors in surgical training

Mrs Rosie Darwood, Consultant
Leeds Teaching Hospitals NHS Trust

Approximately 1 in 10 surgical patients experience an adverse event of which 40% are thought to be preventable. There is increasing recognition that a large proportion of these are related to "human factors". Human factors or Ergonomics is defined as "the scientific discipline concerned with understanding interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimise human well-being and overall performance".

As a result of the importance of human factors in surgical performance and patient safety there has been an explosion of "human factors" training for surgeons. Multiple courses, teaching methods and assessment techniques available but there is a lack of a systematic approach. Much of the training focuses on Non-Technical Skills, a subset of Human Factors consisting of situation awareness, decision-making, communication and teamwork, leadership and performance. In contrast areas such as the work environment and systems have been neglected.

One of the most widely used frameworks is the Royal College of Surgeons NOTSS (Non-Technical Skills for Surgeons) which was developed by surgeons for surgeons, has been validated and is reliable and is now taught internationally.

Emerging new areas of interest include the concept of Cognitive Load, the role of Sabermetrics in Surgery and the use of the Operating Room Black Box. Team training remains underutilised. There are some specific challenges to Human Factors Training in Surgery including the fluidity of surgical teams, access to simulation facilities, the unique demands of robotic surgery and the challenge of "hard to reach" specialities.
Robust delivery of effective Human Factors Training for the next generation of surgeons will depend on a systematic approach with engagement, investment and commitment by both NHS Trusts and Education bodies.

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Development of patient decision aids

Mr Andrew Garnham, Consultant Vascular Surgeon
The Royal Wolverhampton NHS Trust

Over the last two decades the treatments available to our patients have expanded greatly and become more complex. The evidence base for individual treatments have expanded and we have a better understanding of the risks and benefits of the procedures we undertake.

Much of what we do is finely balanced in terms of risks and benefits and we need to explore what the population and trial data mean for individual patients.

We have moved beyond a system of paternalistic medicine and we rightly now look to informed consent with joint patient decision making. The population we treat have varying needs, personal preferences, comorbidities and levels of education. This provides us with a need to analyse individuals risks and to be able to represent and covey complex data to our patients in a format they can process. This enables patients to take a full part in the decision making around their care.

Decision making tools look at individual procedures and the range of appropriate evidence-based treatments. They look to represent the risk and benefits of procedures in a format that is accessible and understandable for patients. Their development includes expert patients who provide perspective on the questions that non-medical staff might consider important. A well-developed decision aid will facilitate patients making informed decisions about the treatments available for their condition. They are designed to prepare patients for consultations around their condition and make the consultation more productive. They enable patients to interpret the current evidence for treatment with their own personal circumstances and preferences in mind to establish the best course of action for them as an individual.

We will look at the tool we have developed for varicose veins and look at how this might be extended to other areas of vascular practice.

VASCULAR ANAESTHESIA SOCIETY
Day 2 - Tuesday 10th September 2024

Session 4: Exercise Training

9.00am **How to train and why it works; elite performance training at Leeds Triathlon Centre**
Mr Rhys Davey, Leeds

9.20am **How to prehabilitate patients - What works and why?**
Dr David Yates, York
click here to view this abstract

9.40am **Exercise therapy for peripheral arterial disease**
Mr Sean Pymer, Hull
click here to view this abstract

Session 5: A view from the Clinic

11.00am **Vascular perioperative medicine clinic in Leeds**
Dr Rebecca Anthony, Leeds
click here to view this abstract

11.20am **Non-operative AAA management - an ADAPTive approach**
Mr Tom Wallace, Leeds
click here to view this abstract

11.40am **Pre-op Assessment Clinic, CPX and risk scoring for vascular patients**
Dr John Carlisle, Torbay
click here to view this abstract

Session 6: Research and Audit – Free paper session

12.10pm **Platelet function in patients undergoing major non-cardiac vascular surgery (PLUGS): A prospective cohort study**
Dr Akshay Shah, Oxford
click here to view this abstract

12.25pm **Inter-test reliability of point of care platelet function tests: comparison of ROTEM Multiplate and TEG-6S platelet mapping in patients with peripheral arterial disease taking clopidogrel**
Dr Mark Parson, Brighton
click here to view this abstract

12.40pm **Disease specific survival in patients who have undergone open repair of Extent I-V thoracoabdominal aortic aneurysms**
Dr Mysoon Alabdah, Edinburgh
click here to view this abstract

12.55pm **A single institute, 3-year, service evaluation of outcomes for carotid endarterectomy using general or regional anaesthesia techniques**
Dr Hew Torrance, London
click here to view this abstract

Session 7: Peri-op Consideration

2.10pm **Effects of alcohol excess on the peri-operative period**
Dr Alwyn Kotze, Leeds
click here to view this abstract

2.30pm **Utility of pre-op cardiac investigations**
Dr Rob Sapsford, Leeds
click here to view this abstract

2.50pm **Perioperative care of the patient with pulmonary hypertension**
Dr Ruth Newton, Sheffield
click here to view this abstract

Session 8: Pro-Con Debate

3.40pm **Open AAA repair - Epidurals in and out?**
Dr Vanessa Fludder, Brighton & Dr Rajiv Malhotra, Liverpool

How to prehabilitate patients - What works and why?

Dr David Yates, Consultant Anaesthetist
Intensivist and Clinical Director at York & Scarborough Teaching Hospitals NHS Foundation Trust

As the evidence base builds around prehab in general I will present my opinion around the state and quality of the literature. I will also explore the place of procedure or speciality specific prehabilitation in the wider context of perioperative behaviour change to improving lifestyles and our role as healthcare professionals in delivering this.

Exercise therapy for peripheral arterial disease

Mr Sean Pymer, Academic Clinical Exercise Physiologist
Hull York Medical School

Summary
Background
Intermittent claudication (IC) is a symptomatic manifestation of peripheral arterial disease, defined as a reproducible ischaemic leg muscle pain that is precipitated by exertion, usually walking, and relieved by rest. Since 2012, the NICE recommended first-line treatment for this condition has been a supervised exercise programme (SEP)[1], based on irrefutable evidence for its clinical and cost-effectiveness.

Exercise therapy
Exercise Therapy for the treatment of IC was initially suggested by Erb in 1898 and the first randomised controlled trial dates back to 1966[2]. This demonstrated that one hour of daily walking over a period of 6 months significantly improved pain free and maximum walking distance, compared to controls.

Since this time, there have been numerous randomised controlled trials considering exercise therapy for the treatment of IC. Within these, exercise therapy consists of basic exercise advice, unsupervised structured home-based exercise and SEPs. More recently, this evidence has been synthesised across several systematic reviews and meta-analyses.

First, an overall synthesis of exercise therapy (either supervised or unsupervised) demonstrates that it significantly improves walking distance compared to controls or best medical therapy. When this is broken down further, the evidence demonstrates that SEPs are more effective than unsupervised home-based exercise programmes and basic walking advice[3]. Specifically, SEPs improve maximum walking distance by a further 120m and 210m, when compared to unsupervised home-based exercise programmes and basic walking advice, respectively. This evidence therefore supports the NICE recommendations.

However, unsupervised home-based exercise programmes can be broken down further. When home-based exercise programmes include an appropriate structured prescription along with remote and self-monitoring, they appear to be equivalent to SEPs for improving walking distance[4]. This supports the recent recommendation made by the European Society for Vascular Surgery that a structured home-based exercise programmes can be used when SEPs are unsuitable or unavailable[5]. This is an important consideration as in the UK, only 25% of vascular centres are known to have access to a SEP, with uptake (24%) and completion rates (75%) also being poor. This suggests that just 5% of patients with IC currently access and complete their first-line treatment. This has been considered in the Vascular Society of Great Britain and Ireland Peripheral Arterial Disease Quality Improvement Framework and has prompted innovative research exploring alternatives to traditional SEPs, such as high-intensity interval training, novel home-based exercise programmes and the identification of the optimal exercise prescription to aid practitioners in the delivery of SEPs[6-8].

However, exercise programmes, regardless of how they are packaged will not be suitable for everyone. This has led to other bodies of research considering alternative non-invasive interventions that can be delivered as a standalone treatment, or as an adjunct to exercise therapy[9,10].

The aim of this lecture is to delve deeper into the evidence base for exercise therapy as a treatment for IC, whilst also considering the contemporaneous development of novel treatments.

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Vascular perioperative medicine clinic in Leeds

Dr Rebecca Anthony, Consultant in Older Person's Medicine with an interest in Perioperative Medicine
Leeds Teaching Hospitals NHS Trust

This talk will discuss the specialist skill of a geriatrician- the assessment and management of frailty using comprehensive geriatric assessment. Alternative tools for assessing frailty such as the Clinical Frail Scale, Edmonton Frail Scale and electronic Frailty Index will also be outlined. The role of the geriatrician in perioperative clinics will be considered, highlighting how geriatricians, surgeons and anaesthetists can work collaboratively in this setting to optimise care and decision making with patients, using real life case examples to illustrate this work.

Non-operative AAA management - an ADAPTive approach

Mr Tom Wallace, Consultant Vascular and Resuscitative Trauma Surgeon
Vascular Surgery Aortic Lead, Leeds Vascular Institute

Talk overview

Abdominal Aortic Aneurysm is a common diagnosis in the elderly; many are enrolled on routine surveillance programmes. At Leeds, approximately 700 patients are actively enrolled on ultrasound-based AAA surveillance, with many more AAAs found incidentally in elderly, comorbid and / or frail patients in whom intervention is unlikely to be appropriate.

We demonstrated that routine surveillance pathways are generally inefficient in older patient cohorts; the Clinical Frailty Score also appears to be a useful independent predictor of future treatment appropriateness.

An Aortic-Advanced Decision and Planning Team (Aortic-ADAPT) pathway has been evolved to help identify and counsel patients in whom ongoing AAA surveillance and/or future treatment may not be appropriate. The Aortic-ADAPT service offers a platform for holistic review and counselling around appropriateness of ongoing surveillance and formulation of advanced decisions, including treatment and ReSPECT conversations where appropriate.
An initial pilot phase demonstrated a reduction of scan burden, direct and indirect costs for both patients and the Vascular service, along with favourable patient and relative feedback. This is now standard of care within our Aortic service.

Pre-op Assessment Clinic, CPX and risk scoring for vascular patients

Dr John Carlisle, Consultant
Torbay and South Devon NHS Foundation Trust

Objectives of medicine
Prolong and improve life
Shorten and improve death

Effects of repair of unruptured AAA
Doesn't improve life
Can prolong life
Can shorten life
Can make no difference

Discussions about scheduled AAA repair are primarily about longevity.
Is my survival longer without AAA repair or with AAA repair? This is THE question to answer.

Most deaths are due to heart disease, cancer, accidents, dementia, stroke, chronic lower respiratory disease, diabetes and COVID.

Patients with unrepaired AAA die from heart disease, cancer, accidents, dementia, stroke, chronic lower respiratory disease, diabetes and COVID. And they die from AAA rupture.

Patients at high risk of dying from these diseases don't have the time to die from AAA rupture. Even when the probability of rupture is high.
Patients at low risk of dying from these diseases have plenty of time to die from AAA rupture. Even when the probability of rupture is small.

How can we help patients decide what to do?
We predict survival without AAA repair.
We predict survival with AAA repair.

Offering scheduled repair mandates that median survival after repair exceeds median survival without repair.

NICE 2020 guideline NG053 on AAA management wrote:

"The specific tools listed are the ones for which evidence was available. This evidence led the committee to conclude that these tools would not improve decision-making and could potentially lead to inappropriate decisions about patient management. They agreed that this could lead to harm, and therefore advised that risk assessment tools should not be used."

"The committee agreed that the outcomes which matter most are mortality and complications that occur within 30 days of surgery."

“The committee considered that use of risk assessment tools with insufficient discriminatory power could have potentially harmful effects on patient care. This is because such tools could result in the decision to operate on a patient who shouldn’t be operated on, or vice versa.”

I am going to tell you to use my calculator when patients are deciding whether to have an intact abdominal aortic aneurysm repaired.

You can also use it to calculate that Joe Biden has had a 1 in 4 chance of dying between his inauguration in 2021 to the end of his four-year term. The calculator can be used to calculate survival for yourself, your family and for patients, whether their primary pathology is surgical or medical, acute or chronic.

Calculation of survival with and without AAA repair is mandatory to have a cogent conversation and a valid decision. The calculator does not dictate whether you offer AAA repair, and it does not dictate whether the patient has AAA repair. It does not dictate whether repair is endovascular or open, but it can help with that decision. The calculator also gives insight into the experiments in the 1990s that spawned the 55 mm threshold.

The experts who authored the 2020 NICE guidance “Abdominal aortic aneurysm: diagnosis and management” know more about the pathology of AAA than I do. They know more about AAA repair than I do. But I know more about general survival than they do and I know which metrics of survival prediction matter and which do not.

Why do we need to know about death from causes other than AAA rupture to make decisions about AAA repair?

An unrepaired AAA is sometimes described as a ‘ticking time bomb’. The bomb is inactivated when the aneurysm is repaired. The wider the aneurysm the greater the probability that it will rupture. The probability that a 55 mm wide aneurysm will rupture in a month is about 1 in 500. The probability that a 65 mm wide aneurysm will rupture in a month is about 3 in 500.

The aneurysm is not the only bomb. The monthly probability of death due to age alone can dwarf the probability of aneurysm rupture. And ill-health is a cluster bomb.

The effect of deactivating a single bomb in a minefield depends upon how many other bombs lurk under the surface, how unstable those other bombs are, and the probability of triggering those bombs during deactivation of the single aneurysm bomb.

Enough with the bomb analogy. The lesson to learn is this. Repair of a 90 mm diameter aneurysm will be futile for a patient likely to die in the next two years. Repair of a 45 mm diameter aneurysm can prolong survival for a patient unlikely to die in the next 15 years.

NICE NG156 does not help your consultations with patients. The guideline says: don’t operate if AP diameter < 55 mm unless annual expansion > 10 mm; operate if AP diameter > 55 mm,

unless patient insufficiently well (but fails to help you determine what that means). The guideline offers no guidance on how to personalise the process.

NG156 wrote “don’t use any of the risk scores”, including my calculator. The authors chose death at one postoperative month as the important metric, from which one can only conclude that no one should have repair of an intact AAA (as they’re more likely to be alive 30 days later if they stay at home). What we need is prediction of survival trajectory over years, not days, with and without surgery.

The authors chose discrimination at one month as the important metric, which is of no value to an individual, as discrimination only states whether Mr Brown is more likely to be dead than Mrs Smith, but it does not tell either patient whether he or she is more likely to survive with or without surgery. Discrimination is a useless metric for models as well as patients, as calibration is more important: do you want to know that carriage 1 precedes carriage 2 when a train reaches a station (discrimination), or do you want to know when the train is going to reach the station (calibration)? They also chose an AUROC of > 0.75 at one month, which is almost impossible to achieve due to the infrequency of death.

We can also challenge 55 mm as a useful threshold: it isn’t.

Effects of alcohol excess on the peri-operative period

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Risky consumption of alcohol is a global problem. More than 3.3 million deaths annually are associated with hazardous drinking, and global alcohol consumption continues to increase. Perioperative hazardous drinking prevalence in Europe is 7-49% for patients undergoing elective surgical procedures, and 14-38% for those undergoing emergency surgical procedures [1].

Alcohol excess has pathophysiological effects, even in the absence of alcohol-related liver disease (ARLD). These include a relationship with cardiovascular disease and perioperative haemodynamic disturbance as well as effects on tissue repair [2, 3]. A subset of hazardous drinkers will develop ARLD which for some will progress to liver cirrhosis. The natural history of cirrhosis can be divided into an initial stage, known as compensated cirrhosis, and an advanced stage which encompasses both decompensated cirrhosis and acute-on-chronic liver failure (ACLF) [4]. Surgery or trauma in patients with liver failure can precipitate acute decompensation through mechanisms including hemodynamic instability, systemic inflammation, immune dysregulation, and metabolic disturbances.

Given how common and potentially severe the perioperative effects of alcohol excess can be, the intervention literature to support cessation or harm reduction is surprisingly sparse: a Cochrane review found very few studies of moderate quality [1]. Intensive cessation support was shown to reduce postoperative complications in the included trials but it is still unknown what the optimal intervention is, or what the utility of structured programmes are. Abstinence starting 3–8 weeks before surgery will significantly reduce the incidence of several serious postoperative complications, so despite the research gaps it remains important that a structured alcohol history is elicited and interventions appropriate to the perioperative context are consistently applied.

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Utility of pre-op cardiac investigations

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In a multinational registry of 40,000 non-day case surgery patients > 45 years the incidence of perioperative cardiac events (myocardial infarction / non-fatal cardiac arrests and cardiac death < 30 days of non-cardiac surgery) occurred in 3% (with 1.6% of events occurring in patients having no identifiable excess cardiac risk) when applying the Revised Cardiac Risk Index (Reference 1). The incidence of any myocardial injury was 13% as evidenced by systematic troponin measurements (recognised marker of increased 30-day mortality). The proportion of patients undergoing non-cardiac surgery, deemed at higher cardiac risk is also expected to continue rising, suggesting a greater requirement for pre-operative cardiac assessments (Reference 2).

Several guidelines (References 3 & 4) have developed algorithms to help anaesthetists / cardiologists and pre-operative assessment teams identify patients deemed at higher peri-operative risk. The aim being to standardise practice and prevent unnecessary pre-operative testing in low-risk groups whilst selecting the most appropriate pre-operative management and investigations in the higher risk groups.

The pre-operative period gives an opportunity to assess the medical status and potential cardiac risks which may be posed by noncardiac surgery. The use of risk calculators (such as the Revised Cardiac Risk Index) influenced by pre-operative tests in higher risk groups may help refine discussions on perceived risk benefits for the MDT process and help inform patient consent. It may also enable recommendations on appropriate management strategies to reduce cardiac risk pre-operatively and possibly influence future cardiovascular risk.

Aims of pre-operative assessment include the identification of patients at risk of perioperative cardiovascular events and those with cardiovascular disease which may carry an adverse prognosis (possibly limiting the value of the proposed surgical intervention). The nature and scope of any assessment being individualised dependent on the acuity and type of surgical intervention proposed.

The current guidelines whilst differing in certain aspects all utilise assessment of patient specific risks together with functional status, which can then be judged against the proposed surgery specific risks. This enables the selection of the most appropriate non-invasive tests and whether more specialist input or invasive assessments are required.

The lecture will review the utility of the electrocardiogram and biomarkers (BNP / troponin). Review the role for the more specialist investigations (echocardiography / perfusion scans and functional stress tests) and the limitations of anatomical studies (angiography). The paucity of evidence to support cardiac interventions to reduce peri-operative cardiac risk will be highlighted, suggesting an individualised approach to patients identified with higher pre-operative cardiac risk are required.

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Perioperative care of the patient with pulmonary hypertension

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Abstract
Pulmonary hypertension is characterized by right ventricular impairment and a reduced ability to compensate for hemodynamic insults. Consequently, surgery can be challenging but is increasingly considered in view of available specific therapies and improved longer term survival. Optimal management requires a multidisciplinary patient-centred approach involving surgeons, anesthetists, pulmonary hypertension clinicians, and intensivists. The optimal pathway involves risk: benefit assessment for the proposed operation, optimization of pulmonary hypertension and any comorbidities, the appropriate anaesthetic approach for the specific procedure and patient, and careful monitoring and management in the postoperative period. Where patients are carefully selected and meticulously managed, good outcomes can be achieved.

Summary
Long term survival is improving for patients with pulmonary hypertension (PH) and subsequently we are seeing more patients with this condition presenting for and proceeding with elective and emergency surgery. Pulmonary hypertension is associated with an increased perioperative risks of morbidity and mortality. Optimal case management involves risk: benefit assessment, optomisation of pulmonary hypertension and co-morbidities, careful anaesthetic planning, monitoring and postoperative care. A multiprofessional approach with careful patient selection and meticulous management improves survival. Patients with group 1 and group 4 types of pulmonary hypertension should be managed in or with the advice of specialist centres experienced in the management of patients with pulmonary hypertension.

Pulmonary Hypertension is defined as mPAP>20mmHg as measured by right heart Catheterisation Precapillary pulmonary hypertension (PAH or Pulmonary “Artery” Hypertension) has the following characteristics: mPAP>20mmHg, Wedge Pressure ≤15mmHg, and PVR >2WU

- Type 1; Pulmonary Artery Hypertension. These patients should be managed by or with the advice of a specialist pulmonary vascular disease centre. Perioperative care focuses on optomising PA pressures with the use of pulmonary artery dilators for moderate to high risk surgery.
- Type 2; PH in association with Left Heart Disease – Isolated pre-capillary PH (ipcPH) (PRV <2WU) or Combined postcapillary PH (cpcPH)(PVR >2WU). Pre and perioperative care should focus on optomising left heart disease. Pulmonary artery vasodilators are not evidence based in ipcPH and used rarely in cpcPH. Cases with ipcPH can be managed locally and/or with cardiology specialist input. Cases with cpcPH, if on pulmonary artery vasodilators should be managed with the advice of a pulmonary vascular disease centre.
- Type 3; PH Associated with lung disease or hypoxia. Pre and perioperative care should focus on optomising underlying lung disease. Pulmonary artery vasodilators are not

evidence based and may be harmful by increasing perfusion to underventilated lung worsening shunt.

- Type 4; Chronic Thromboembolic PH. Patients who have been treated with pulmonary endarterectomy and have normalised PA pressures can be managed locally. If there is residual or untreated disease with pulmonary hypertension then they should be managed by or with the advice of a specialist pulmonary vascular disease centre.
- Type 5; PH with unclear cause or multifactorial cause. Therapy and perioperative management is directed at the underlying cause of the PH. These cases can be managed locally.

Useful websites

- www.pulmonaryhypertensioncentres.co.uk

Useful documents

- Pulmonary Hypertension ERC/ERS guidelines 2016. European Heart Journal 2016; 37: 67-11
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ORAL PRESENTATIONS

Platelet function in patients undergoing major non-cardiac vascular surgery (PLUGS): A prospective cohort study
Dr Akshay Shah, John Radcliffe Hospital
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Inter-test Reliability of Point of Care Platelet Function Tests: Comparison of Rotem Multiplate and TEG-6S Platelet Mapping in Patients with Peripheral Arterial Disease Taking Clopidogrel
Dr Mark Parson, Royal Sussex County Hospital
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Disease specific survival in patients who have undergone open repair of Extent I-V thoracoabdominal aortic aneurysms
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A single institute, 3-year, service evaluation of outcomes for carotid endarterectomy using general or regional anaesthesia techniques
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Dr Eoin O'Rathallaigh, St Mary's Hospital, Imperial College NHS Trust
Dr Holly-India Esam, St George's University Hospital NHS Foundation Trust
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Platelet function in patients undergoing major non-cardiac vascular surgery (PLUGS): A prospective cohort study

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Background

$P2Y_{12}$ inhibitors, such as clopidogrel, pose challenges to vascular anaesthetists particularly when regional/central neuraxial anaesthesia is being considered. Current guidelines recommend discontinuation of clopidogrel 5–7 days prior to major surgery to reduce the risk of bleeding, but also before attempting central neuraxial anaesthesia to mitigate the rare risk of developing a vertebral canal haematoma. However, guideline recommendations do not take into consideration the individual variability in pharmacodynamic responsiveness to clopidogrel. Approximately 32% of patients on clopidogrel may be non-responders (2). The leading question in a VASGBI research priority setting exercise was – "Can regional anaesthesia safely be performed on patients taking clopidogrel and similar antiplatelet agents?".

Aims

The aim of this study was to characterise platelet function in patients undergoing vascular surgery using near-patient viscoelastic testing (Thromboelastography (TEG®) 6S).

Methods

PLUGS was a single-centre, prospective, non-interventional cohort study conducted at the John Radcliffe Hospital, Oxford, UK. The study was prospectively registered (ISRCTN11959105). Inclusion criteria were: (i) age >18 years; (ii) scheduled to undergo vascular surgery (carotid endarterectomy, abdominal aortic aneurysm (open or endovascular), lower limb arterial revascularisation and lower limb amputation); and (iii) established on antiplatelet therapy for at least 7 days before entering the study. Study-specific blood samples were collected at pre-operative assessment clinic (POAC) visit and on the day of surgery. Baseline demographic, laboratory procedure-related, and clinical outcome data were collected for each participant. The primary outcome of interest was the proportion of patients with antiplatelet drug resistance at (i) initial presentation to POAC and (ii) on the morning of the surgery.

Results

Between 9 June 2022 and 17 April 2023, 80 participants were enrolled of which 64 proceeded to have surgery. The mean (SD) age was 71.7 (12.1) years, and 69 participants were male. Fifty-two participants had >2 pre-exisiting comorbidities. The commonest operation was abdominal aortic aneurysm repair (n=25) followed by carotid endarterectomy (n=20). The proportion of patients with antiplatelet resistance at POAC ranged from 25% to 70% (**Table 1a**). Approximately three-quarters of patients taking clopidogrel displayed antiplatelet resistance. Medication compliance was generally good with only four patients forgetting to take their medications (on 1-2 days) in the preceding two weeks. On the day of surgery, the proportion of patients with antiplatelet resistance ranged from 15.3 to 83.3% (**Table 1b)**. In an exploratory analysis, stopping clopidogrel 5-7 days before surgery demonstrated no statistically significant changes in platelet clot strength and ADP-induced platelet inhibition (**Table 1c)**.

Table 1.

a) Platelet function at pre-operative assessment clinic (n=80)

	Aspirin (n=20)	Clopidogrel (n=20)	DAPT (n=20)	Control (n=20)
$MA_{AA,}$ mm AA-inhibition, % MA_{ADP} ADP-inhibition, % vWF	39.7 (15.2) 48.9 (28.5) 58.9 (11.3) 9.9 (13.1) 1.7 (0.51)	43.8 (17.9) 38.4 (35.7) 54.8 (11.1) 18.1 (16.9) 2.0 (1.2)	28.1 (16.8) 68.0 (31.9) 47.8 (16.5) 31.5 (31.0) 1.89 (0.5)	61.1 (5.1) 9.8 (16.7) 55.8 (11.4) 10.1 (19.1) 1.6 (0.5)
No. of patients with antiplatelet resistance, n (%, 95% CI)	6 (30, 11-54))	14 (70, 45-88)	5 (25, 8-49)	-

b) Platelet function on day of surgery (n=40)

	Aspirin (n=13)	Clopidogrel (n=6)	DAPT (n=10)	Control (n=12)
$MA_{AA,}$ mm AA-inhibition, % MA_{ADP} ADP-inhibition, %	44.6 (13.9) 36.5 (25.3) 61.6 (5.4) 6.4 (7.9)	37.5 (22.1) 64.0 (48.6) 51.3 (11.6) 31.0 (14.4)	27.5 (17.0) 70.6 (35.8) 49.9 (11.1) 27.9 (22.2)	61.8 (3.3) 11.9 (24.7) 47.2 (21.2) 14.8 (23.3)
No. of patients with antiplatelet resistance, n (%, 95%CI)	2 (15, 2-45)	5 (83, 35-99)	3 (3, 6-65)	-

c) Effect of stopping clopidogrel on clot strength (MA_{ADP}) and ADP-induced platelet inhibition (n=8)

	Pre-operative	Day of surgery	Mean difference (95%CI)	P value
MA_{ADP} ADP-inhibition, %	52.7 (10.7) 20.7 (18.6)	56.1 (11.7) 10.6 (15.5)	3.4 (16.3 to -10.2) -10 (18.3 to -25.4)	0.57 0.16

AA, arachidonic acid; ADP, adenosine diphosphate; CI, Confidence interval; DAPT, Dual antiplatelet therapy; MA, maximum amplitude

Protocol definitions of resistance:

For aspirin – group (i), drug resistance was be defined as an arachidonic acid (AA)-induced platelet-fibrin clot strength (MA_{AA}) > 47 mm plus an AA-induced platelet inhibition rate < 50% (18). For $P2Y_{12}$ inhibitors (clopidogrel) – group (ii), drug resistance was be defined as an adenosine diphosphate (ADP)-induced platelet-fibrin clot strength (MA_{ADP}) > 47 mm plus an ADP-induced platelet inhibition rate < 50%.

Conclusion

This study confirms a high prevalence of antiplatelet, particularly clopidogrel, resistance (3). This combined, with the introduction of CYP2C19 genotype testing, offers an opportunity for precision-based medicine in vascular surgery. Using our approach, a large, adequately powered, multicentre study is feasible to confirm our findings and to clarify the role of resistance testing on clinical outcomes.

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Inter-test Reliability of Point of Care Platelet Function Tests: Comparison of Rotem Multiplate and TEG-6S Platelet Mapping in Patients with Peripheral Arterial Disease Taking Clopidogrel

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A high proportion of patients with peripheral arterial disease (PAD) take clopidogrel as a routine antiplatelet. For patients undergoing vascular surgery, neuraxial anaesthetic blockade (NAB) is typically preferred over a general anaesthetic due to concurrent patient illness. Current guidance suggests omission of clopidogrel for 5-7 days for NAB, which may not be feasible for emergency surgery. A proportion of the population have a genetic polymorphism in clopidogrel metabolism, resulting in a reduced antiplatelet effect, contributing to High on Treatment Platelet Reactivity (HTPR). These patients potentially could have NAB earlier than 7 days; however, this requires accurate and reproducible point of care (POC) testing of platelet function, this currently is an under investigated area, with no common consensus on a reliable POC cut-offs. Our study primarily aims to determine the degree of correlation between TEG-6S PlateletMapping (PM) and Rotem Multiplate (RM) POC analyser and the proportion of patient suitable for NAB using surrogate HTPR cut-offs from cardiac anaesthesia, with a secondary aim to determine any difference in platelet inhibition between a cohort of ward and clinic patients.

We conducted a single-centre, prospective cross-sectional study of vascular ward and claudication clinic patients at the Royal Sussex County Hospital (Brighton, UK). Venous blood was obtained and analysed by both RM and PM. Baseline demographic and clinical data was collected prospectively. The study gained ethical approval from London – Fulham Research Ethics Committee. Informed consent was obtained from participants.

Sixty patients were recruited, 68% were male; the median age was 68 years. We found a moderate correlation from the two analysers for paired samples ($R=0.63$, $P<0.001$)). Using published consensus cut-off values for HTPR of area-under-the-curve (AUC) 46U for RM and maximum amplitude (MA) 47mm. 67.7% of RM and 69.5% of PM measured patients were safe to proceed with NAB. No difference was found in in AUC or MA between ward and patients, however fibrin was higher in ward patients compared to clinic (17.0 versus 12.6, $P=0.003$), in addition AUC was found to be higher in females versus males (78 and 61U respectively, $P=0.049$). Statistical analyses was carried out using GraphPad Prism 8 software.

Guidelines regarding the role of platelet testing in peri-operative decision making exist in relation to cardiac surgery, but not yet for use of NAB in vascular surgery[1]. Our finding suggests that there may be a high proportion patient suitable for safe NAB whilst taking clopidogrel, however variability in POC results remain which adds uncertainty in identification of these patients. Further work is required in this field. This maybe the first step in developing a personalised antiplatelet management for patients needing vascular surgery.

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Disease specific survival in patients who have undergone open repair of Extent I-V thoracoabdominal aortic aneurysms

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Thoracoabdominal aortic aneurysms (TAAA) are abnormal dilatations of the aorta which involve the visceral arteries. Open repair, involving interruption of blood supply to abdominal organs and the spinal cord is associated with considerable mortality risk. The overall mortality rate is approximately 5-20%, but for the more extensive repairs (I,II,III,V) it may be higher.

This observational cohort study aimed to perform survival analysis on patients that underwent extent I-V open TAAA repair. Using death certificates we observed disease specific survival, ascertaining whether the cause of death related to the aortic aneurysm or not.

Data were collected from 424 patients who underwent open TAAA repair in the Royal Infirmary of Edinburgh between 1999 and 2022. These data were analysed using the R programming software. The data were split into extent I, II, III, V repair and extent IV repair. Survival was estimated using Kaplan-Meier curves, with data censored at either death or the date of the patient's last follow-up.

Of 424 patients, 148 patients had an extent I, II, III, V repair and 276 patients had an extent IV repair. Overall mortality at 30 days after extent I, II, III, V repair was 24%, compared with 6% for extent IV repair. Between 30 days and 10 years after surgery, mortality due to the aneurysm is 10% for type I,II,III,V TAAA and 7% for type IV. Overall mortality in the same period is 30% for type I,II,III,V TAAA and 56% for type IV. Figure 1 represents the disease specific and overall Kaplan Meier survival curves, with associated p-values of less than 0.0001 for disease specific survival and 0.76 for overall survival.

Death due to the aneurysm is significantly greater in open repair of the more extensive (I,II,III,V) TAAAs. Most of this additional aneurysmal death is seen in the immediate 30 post operative days. Those who survive the 30 days after open TAAA repair are more likely to die from causes other than their aneurysm in the 10 years following surgery. All-cause mortality following open Extent IV repair exceeds that following Extent I,II,III,V surgery after 8 years. This may reflect an older median age at intervention (70 vs 64 years).

Future work will consider those who were assessed for aortic surgery but were not managed operatively, and those who underwent endovascular repair for their TAAA.

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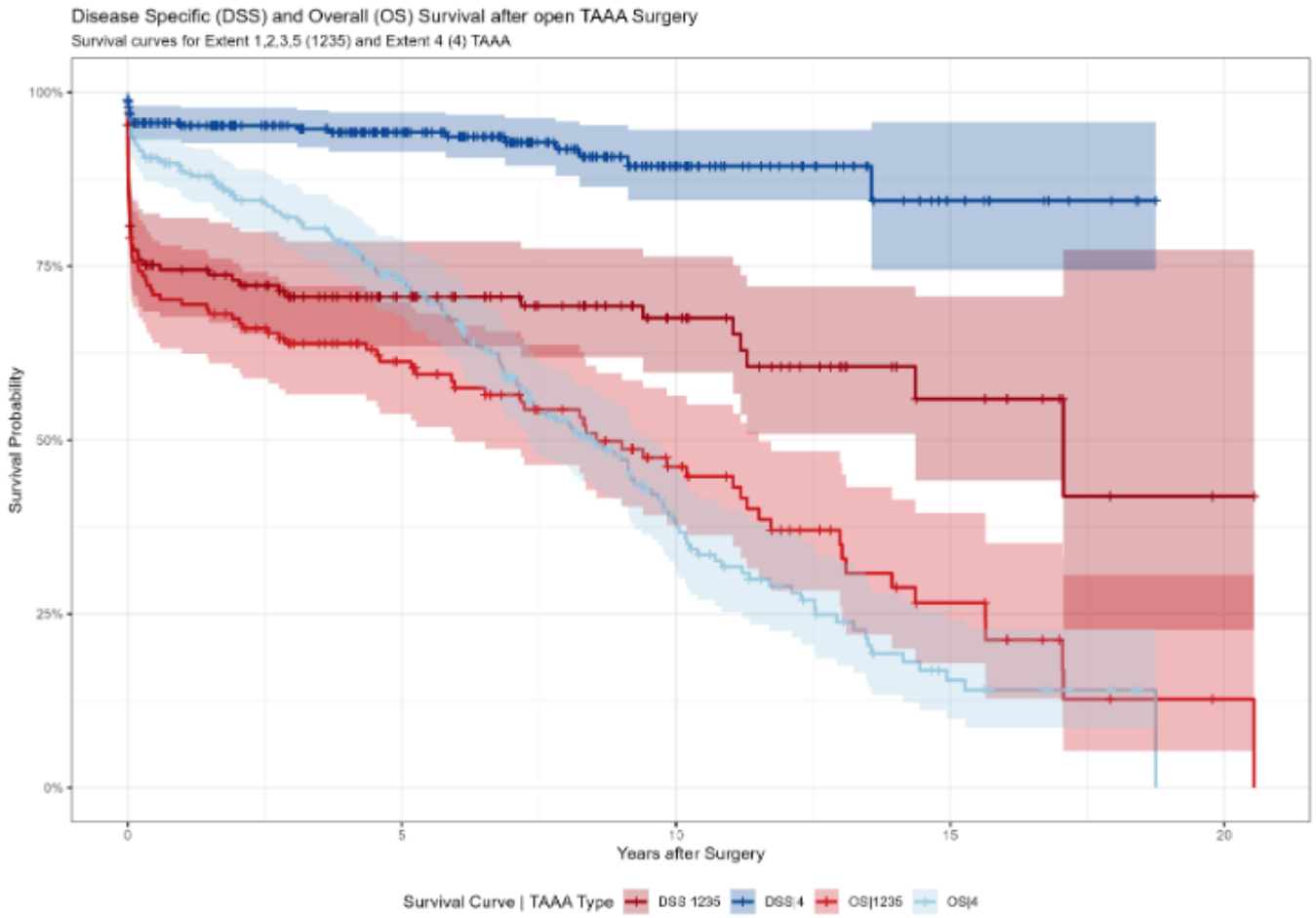
Figure

Figure 1. Kaplan Meier survival curve outlining disease specific (due to the aneurysm) and overall survival in patients who have undergone open extent I, II, III, V and extent IV TAAA repair. Shaded areas represent 95% CI.



A single institute, 3-year, service evaluation of outcomes for carotid endarterectomy using general or regional anaesthesia techniques

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Dr Eoin O'Rathallaigh, Trauma Fellow
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Following the completion of the GALA study in 2008 (1) controversies still exists among vascular units regarding the preferred anaesthetic technique for carotid endarterectomy (CEA).

As part of a service evaluation, patients undergoing CEA at St Mary's Hospital, Imperial College Healthcare NHS Trust, were retrospectively analysed between December 2019 and December 2022. Aims were to compare these data to the National Vascular Registry (2021) (2) and to explore if anaesthetic technique influenced duration in recovery, use of postoperative vasopressors or admission to critical care. Analysis was performed using R v4.0.0.

One hundred and forty-seven patients were identified (Table 1), 72% male (n=106), median age 71 (IQR 64-78), 86% (n=126) suffered an acute stroke or transient ischaemic attack (TIA). Median duration from symptoms to surgery was 12 days (IQR 7-25), mirroring national data (13 days, IQR 8-22) (2).

General anaesthesia (GA) accounted for 51% of cases with the remainder performed under regional anaesthesia (RA), (79%, intermediate and 21%, deep cervical plexus). 29% performed under GA also included a regional component. This was in stark contrast to national data with 64% of cases being performed under GA alone, 11% under GA with a block or local anaesthetic (LA) component and only 8% were performed under block alone.

No differences were identified in the incidence of preoperative hypertension, hypercholesterolaemia, diabetes mellitus, chronic lung disease, obesity or smoking status in RA or GA. However, GA patients trended towards a reduced incidence of preoperative ischaemic heart disease, 27% vs 41% (P=0.08), but an increased incidence of preoperative stroke, 65% vs. 48% (P=0.03). Our institution rarely utilised shunts (19%), compared to national data (64%). Stent usage was reduced in RA, 10% vs 27% (P=0.01). In those patients undergoing GA, 67% had concomitant near infrared spectrophotometry monitoring documented.

Surgery duration was reduced in RA patients (P=0.006), they also received less intraoperative fluid (P=0.0001) and were less likely to require intraoperative vasopressors (P=0.0001). No differences were detected when comparing duration in recovery or postoperative vasopressor

requirements. There were no statistical differences in return to theatre rate (7% vs. 1%, P=0.11), or critical care admission (28% vs. 17%, P=0.16) when comparing RA to GA.
The length of stay and discharge performance status was consistent between RA and GA; at one year there was no statistical differences in incidence of stroke (7% vs. 3%, P=0.27).

In this hypothesis generating service evaluation, despite our unit using differing anaesthetic strategies to published national data, we demonstrated similar outcomes. Anaesthetic choice did not appear to influence use of vasopressors in recovery, duration in recovery or admission to critical care, although this may be affected by study power. These data may reflect the conclusions from the pragmatic GALA trial illustrating that major perioperative outcomes after CEA are broadly similar between RA and GA and are reflective of unit experience and expertise.

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Figure

Table 1: Summary of data set and a comparison between those having undergoing carotid endarterectomy using general or regional anaesthesia techniques.

(see next page)

Table 1: Summary of data set and a comparison between those having undergoing RA vs GA

	All (*n=147*)	Regional* (*n=71 (49%)*)	GA* (*n=74 (51%)*)	*P* value
Male sex	106 (72%)	52 (73%)	52 (70%)	0.71
Age on procedure date	71 (64 – 78)	72 (66 – 80)	69 (62 – 76)	0.22
Stroke or TIA	126 (86%)	58 (82%)	66 (88%)	0.34
Symptoms to surgery (Days)	12 (7 – 25)	10 (7 – 23)	14 (7 – 33)	0.14
Preoperative				
Performance status (admission)	1 (1 – 3)	1 (0 – 1)	0 (0 – 1)	0.28
ASA	3 (3 – 3)	3 (3 – 3)	3 (3 – 3)	0.99
Stroke	85 (57%)	34 (48%)	49 (65%)	0.03
Ischaemic Heart Disease	49 (33%)	29 (41%)	20 (27%)	0.08
Essential Hypertension	103 (70%)	48 (68%)	53 (72%)	0.72
Hypercholesteraemic	103 (70%)	50 (70%)	51 (69%)	0.86
Diabetes Mellitus	43 (29%)	22 (31%)	19 (26%)	0.60
COPD or Asthma	29 (20%)	17 (24%)	12 (16%)	0.30
Obesity	25 (17%)	12 (17%)	13 (17%)	1.00
Ex or current smoker	83 (56%)	41 (58%)	40 (54%)	0.14
Intraoperative				
Shunt placed	27 (19%)	7 (10%)	20 (27%)	0.01
Surgery duration (Mins.)	117 (91 – 143)	106 (78 – 134)	126 (101 – 148)	0.006
Intra-operative vasopressor	125 (87%)	52 (72%)	73 (99%)	<0.0001
Fluids administered (mL)	1000 (500 – 1975)	600 (0 – 1000)	1700 (1000 – 2000)	<0.0001
Postoperative				
Duration in recovery (Mins.)	325 (255 – 575)	320 (240 – 493)	335 (256 – 588)	0.50
Return to theatre	6 (4%)	5 (7%)	1 (1%)	0.11
Recovery vasopressor	47 (32%)	22 (31%)	25 (33%)	0.90
Critical care review	35 (24%)	21 (30%)	14 (19%)	0.17
Critical care admission	33 (22%)	20 (28%)	13 (17%)	0.16
Discharge				
Length of stay (Days)	2 (1 – 4)	2 (1 – 3.25)	2 (1 – 4)	0.82
Performance status (discharge)	1 (0 – 2)	1 (0 – 2)	1 (0 – 2)	0.73
Stroke at one year	7 (5%)	5 (7%)	2 (3%)	0.27

ASA, American Society of Anesthesiology. COPD, Chronic Obstructive Pulmonary Disease. GA, General Anaesthetic. TIA, Transient Ischaemic Attack.

** 2 patients in cohort missing values for method of anaesthesia, therefore unassigned to either GA or regional anaesthesia techniques.*

Data are presented as absolute counts or median values and in parenthesis either the interquartile range or a percentage.

Comparisons are either by a Mann-Whitney U test or a Fisher's exact test as appropriate.

P values displayed are uncorrected for multiple comparisons.

POSTER PRESENTATIONS

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Dr John Vella, Mater Dei Hospital
Dr Glenn Paul Abela, Mater Dei Hospital
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Inflammatory aneurysms - the balancing act of managing disease modifying agents in the peri-operative period
Dr Joshua Singleton, St Mary's Hospital
Dr Gregory Fraser, St Mary's Hospital
Dr Harriet Gardiner, St Mary's Hospital
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Tired of surgical cancellations & complications? Get a vascular physician! Improving patient outcomes & productivity in vascular surgery: Vascular physician use in the care of surgical patients

Dr Aynkaran Dharmarajh, Northwick Park Hospital
Dr Khiloni Dodhia, Northwick Park Hospital
Dr Ankita Menon, Northwick Park Hospital
Dr Neelaanjana Pradeep Chandran, Northwick Park Hospital
Dr Jasmin Ravindra, Northwick Park Hospital
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Post-operative pulmonary complications following endovascular aortic repair: risk factors and long-term impact

Dr Abdul Gazwani, University Hospitals Birmingham NHS Foundation Trust
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Vascular surgery patients: where do they go postoperatively and what do they need?

Dr John Vella, Anaesthesia Trainee
Dr Glenn Paul Abela, Anaesthesia Consultant
Mater Dei Hospital, Malta

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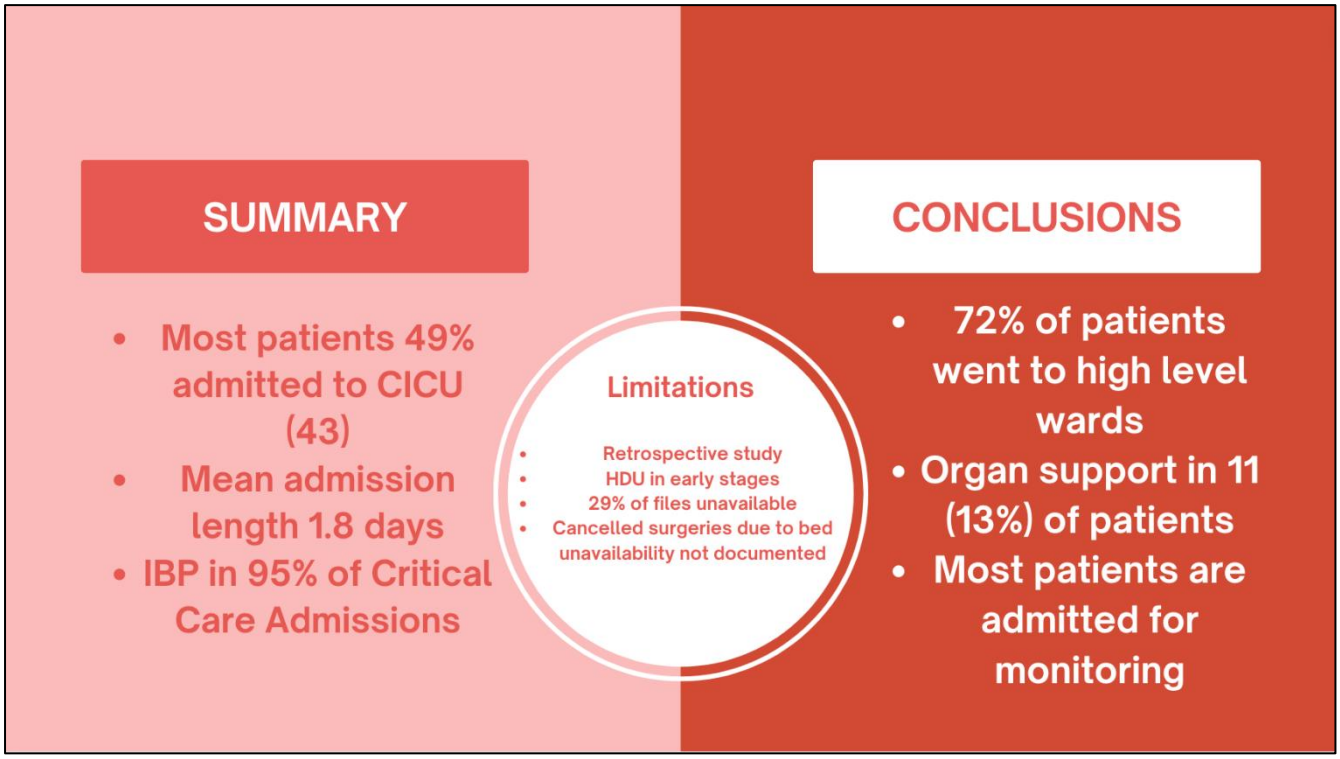
The objective of this audit was to investigate where patients who underwent major vascular surgery at Mater Dei Hospital in Malta are admitted postoperatively and what does their care involve. Mater Dei Hospital is the tertiary level 1000-bed facility that serves the whole country and includes one 20-bed Intensive Care Unit and other level 2 areas of varying bed capacity. The secondary aim of this audit was to assess the viability of setting up an enhanced care unit specifically for postoperative vascular surgery patients.

Presently these patients are transferred either to the Intensive Care Unit (ICU) or one of level 2 areas, namely the Cardiac Intensive Care Unit (CICU), the Coronary Care Unit (CCU) and the Surgical High Dependency Unit (HDU). The ultimate destination for these patients postoperatively depends on bed availabilities on the day of surgery in the aforementioned wards, patient and surgical complexity and urgency of the case. This arrangement sometimes leads to delays in starting the surgical list, returning patients to a level 3 surgical ward or case postponement.

This was a retrospective audit carried over a six-month period from November 2021 to April 2022. Institutional clearance to go ahead with study was obtained and data was collected from the hospital's central registry and the patients' medical files, specifically looking at anaesthetic sheets, medical and nursing documentation and ward admission notes. Data collected included patient demographics, type of surgery, length of stay in the level 2 or 1 unit postoperatively, and the monitoring and intensive interventions required. Data analysis was then carried out using MS Excel.

A total of 122 patients had major vascular surgery over the six-month period specified above. Of these 29.0% could not be analyzed further due to difficulties with locating their medical files and therefore 87 cases (79.0%) were studied. Most of these patients (63, 72.0%) were admitted to level 2 or 1 areas, specifically the CICU (43, 49.0%), the Intensive Care Unit (17, 20.0%) and the Surgical HDU (3, 3.4%). Invasive BP monitoring was set up in 60 (68%) of cases, with central venous access used in 14 (16.0%) of patients. Cardiac output monitoring was not used in any of these patients. Only 6 (6.9%) of these patients required organ support: 5 (5.6%) required cardiovascular support with vasoactive drugs and 4 (4.5%) were admitted to the ICU intubated and ventilated and were extubated there. 2 (2.2%) patients required renal replacement therapy. Mean length of stay in a level 2 or 1 unit for these patients was 1.8 days (range: 1-33 days). A considerable portion of this patient cohort 24 (28%) were returned to level 3 surgical wards.

Vascular patients merit tighter monitoring after surgery but very often do not require much intervention in the immediate postoperative period. While returning such patients to level 3 wards is a reason for concern, their admission to a level 1 ICU may present an unnecessary pressure on a rare resource in our hospitals. Setting up a specific enhanced care unit with better nurse-to-patient ratio and where invasive arterial monitoring is available would strike the right balance in providing a tailored care for these patients.



Postoperative complications following Carotid Endarterectomy in Post Anaesthetic Care Unit, Addenbrooke's Hospital, Cambridge

Dr Nuwan Weerasinghe, Clinical Fellow (Higher)
Dr Basel Obeidat, Clinical Fellow (Higher)
Dr Sabari Karthick Kumar, Clinical Fellow (Higher)
Dr Petrus Fourie, Consultant Anaesthetist
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Addenbrooke's Hospital

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Carotid endarterectomy (CEA) is carried out within 14 days of non-disabling stroke or Transient Ischaemic Attack (TIA) for patients with symptomatic carotid stenosis. CEA carries significant morbidity and mortality. Patients undergoing CEA at Addenbrooke's Hospital are admitted to the Overnight Intensive Recovery (OIR) immediately following the procedure. However, the OIR has a limited capacity, restricted to five-bed spaces that are in high demand. The primary objective of this audit was to look at complication rates following CEA with an aim to consider the usefulness of the policy of admitting all CEA patients to the OIR. The secondary objective was to look at the extent to which the problem list was updated in the medical records.

Individual medical records in the electronic medical record system (EPIC) of all patients who underwent CEA within a period of 12 months, 01 October 2022 to 30 September 2023, were perused, and data was extracted to describe complications and duration of stay. Data was analysed using Microsoft Excel and IBM SPSS Statistics.

Results indicate that 51% developed at least one complication following CEA. The commonest complication was hypotension (n=32, 39%). This was subsequently managed with metaraminol infusions, and the median duration of infusion was 16 hours and 59 minutes. Post-operative hypertension, which required vasodilator therapy, was seen in seven patients (n=7,8.5%). The median duration of stay in OIR for patients who underwent CEA is 27 hours and 04 minutes, which exceeds the planned duration for OIR admission.

Considering the proportion patients developing of post-operative complications and the care that is required for them it is important to admit patients undergoing CEA to the OIR following the procedure, However, it is evident that there is a high demand for OIR beds there is a need to increase the bed strength and human resources in the OIR.

The secondary objective of this project was the identification of the proportion of patients who did not have an updated 'Problem List' in the Electronic Medical Record System. Over half of the patients did not have an updated problem list. Therefore, this information will need to be communicated to the medical staff in the OIR while encouraging them to adhere to recommended standards of record keeping in EPIC.

Results
From 1 October 2022 to 30 September 2023, 82 carotid endarterectomies were performed at Addenbrooke's Hospital.

Patient profile, details of procedure and post-operative complications

The patient profile, details of procedure and post-operative complications are shown in Table 1.

Table 1: Patient profile, details of procedure and post-operative complications

Patient details/procedure/complications	n	%
Gender		
Male	65	79.3
Female	17	20.7
Mode of anaesthesia		
GA	79	96.3
Sedation	3	3.7
Type of GA		
TIVA	46	58.2
Sevoflurane	24	30.4
Desflurane	9	11.4
Use of peripheral nerve block		
Superficial cervical plexus block	32	39.0
Intermediate cervical plexus block	17	20.7
No peripheral nerve block	33	40.2
Hypotension requiring intra-operative metaraminol infusion		
Yes	63	76.8
No	19	23.2
Post-operative complications		
Hypotension requiring metaraminol infusion in OIR	32	39.0
Metaraminol start time following OIR admission:		
<4 hours after admission	23	71.8
>4 hours after admission	9	28.1
Hypertension requiring labetalol in OIR	7	8.5
New neurological signs	2	2.4
Bleeding requiring re- exploration	1	1.2
Other	2	2.4
Outcome		
ITU	3	3.7
Discharge to ward	44	53.7
Direct discharge from OIR	35	42.7

Most of the patients were males: 65 (79.3%), and 17 (20.7%) were females. The median age of the patients was 70 years. Most cases were done under general anaesthesia (n=79, 96.3%), and only three cases were done under sedation. The majority of patients who had general anaesthesia received TIVA (n=46, 58.2%) and sevoflurane (n=24, 30.4%), and desflurane (n=9, 11.4%), respectively. Forty-nine of the patients (59.7%) had received cervical plexus nerve block (superficial or intermediate) intraoperatively.

Sixty-three of the patients received metaraminol infusions intraoperatively (76.8%). The highest proportion of patients who required metaraminol was in the group that had TIVA (n=44 89.8%).

Eighty-one patients were admitted to the OIR for post-operative observations, and one patient was transferred to the NCCU due to capacity issues in the OIR. Fifty per cent of patients developed at least one complication following CEA. The most common postoperative complication was hypotension, requiring metaraminol infusions, which accounted for 39% (n= 32). Twenty tree patients were started metaraminol infusion with in four hours of admission to OIR and nine patients after 4 hrs. Seven patients (n=7, 8.5%) developed hypertension requiring labetalol. Two patients developed new neurological signs and had CT scans within the first 24 hours. One patient was diagnosed with a new motor deficit soon after the admission to OIR and the second patient showed sensory deficit 15 hours following admission. One patient underwent re-exploration secondary to bleeding. Other less common complications included delirium, urine retention and haematuria, which accounted for one case each.

Of those who required metaraminol post-operatively, the mode of anaesthesia was TIVA (71%), and 16% and 13% were required for those with sevoflurane and desflurane, respectively. Seven patients received labetalol for blood pressure control: two received intermittent boluses and five received infusions. The median duration of the infusion was 3 hours and 15 minutes.

Thirty-six patients (43.9%) were directly discharged from the OIR, and 46 patients were transferred to the ward before discharge from the hospital. Forty of our patients were stepped down from OIR to a ward, and 35 patients were discharged from OIR directly. Three patients were transferred to the intensive care department for level two beds for continuation of vasopressor support.

Of the patients admitted, 16 (19.5%) were those that had been postponed and rescheduled previously. The reason for postponement were time constraints (6 cases), unavailability of OIR/ward beds (5 cases), emergency surgery (1 case), unavailability of theatre (1 case), and patient-related medical problems: COVID and gastroenteritis, 1 case each.

Duration of stay and duration of infusion

Table 2 shows the median duration of hospital stay, surgery, and metaraminol infusion.

Table 2: Duration of stay and infusion

	Duration
Median duration of stay in OIR	27 hrs 04 mins
Median duration of metaraminol infusion	16 hrs 59 mins
Median length of stay in hospital	56 hrs
Median duration of surgery	2 hrs 19 min

The median duration of stay in the OIR was 34 hours and 31 minutes. Fifty-one patients stayed for more than 24 hours: Both medical and logistical factors contributed to delayed discharge from OIR. The median duration for metaraminol infusion was approximately 17 hours. The main medical reason was the use of vasoactive medications (metaraminol/ labetalol) infusions.

Problem list

The 'Problem List' was not updated in the EPIC in 61% (n=50) of the patients.

Conclusion and limitations

The objective of the OIR is to provide immediate post-operative care in the first 24 hours following major surgery for patients who require a higher level of care but do not necessarily need level 3 care. Currently, OIR at CUH offers five patient beds and provides immediate post-operative care for all the CEA cases. Management of patient flow through OIR is a challenging task due to its high demand and limited capacity.

Data from this audit suggests that 52.4% developed at least one complication following CEA, indicating the need for rigorous monitoring following CEA. Such monitoring is resource intensive and likely impossible to be done in the ward setting. Thus, patients being sent to an OIR following CEA will result in these complications being picked up early.

As seen in the data, the most common complication is hypotension. Refractory hypotension was subsequently managed with metaraminol infusions, and the median duration of infusion was nearly 17 hours. Post-operative hypertension, which required vasodilator therapy, was noted in seven patients (8.5%). Delivering such care for a prolonged period may not be a viable solution in a ward due to the limitations of staff and resources to deliver this type of care. Given this, early post-operative care provision in the OIR is a suitable option.

In some UK centers post post-operative patients have an extended stay in the recovery for 4-6 hours prior to being stepped down to a vascular ward. However, considering the proportion of post-operative complications, type of treatment required and duration of such treatment in this audit, a longer duration of care in a setting such as the OIR may be the more appropriate choice.

However, the data also reveals that the median duration of stay in OIR for patients who underwent CEA was 27 hours and 4 minutes, which exceeds the planned duration for OIR admission. Both clinical and logistical factors contributed to overstay. The main clinical reason for the extended OIR stay was postoperative hypotension. The main logistic reasons that led to overstay were the lack of capacity in the surgical ward and the delay in direct discharge from OIR. It is evident that there is a high demand for OIR beds and given that the unavailability of

OIR beds also results in CEA cases being postponed, there is a need to enhance the bed strength and human resources in the OIR.

The results of this audit indicate that it is important to continue the policy of monitoring patients in the OIR following CEA, considering the safety of patients. However, enhancing bed strength and increasing staffing at OIR also need to be seriously considered and planned for. An in-depth review of patient flow and logistical issues in the discharge of OIR patients also needs to be conducted to reduce unnecessary delays in discharge and extended stays in the OIR.

The secondary objective of this project was the identification of the proportion of patients who did not have an updated 'Problem List' in the Electronic Medical Record System. As over half of the patients did not have an updated problem list, this information will need to be communicated to the medical staff in the OIR, encouraging them to adhere to recommended standards of record keeping in EPIC.

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Lower limb revascularisation procedures under spinal anaesthetic and peripheral nerve blocks

Dr Samuel Allen, CT3 Anaesthetist
Dr Bobby Daniel, Consultant
Doncaster Royal Infirmary

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Lower limb revascularisation procedures can present anaesthetic challenges. In 2022 85.4% of open lower limb revascularisation procedures were done under general anaesthetic. 81% of these patients are current or ex-smokers, 25% have lung disease, 32.6% have ischaemic heart disease and 48% have diabetes. 5% of non-elective patients had respiratory complications following their operation, with the in-hospital mortality sitting at 4.8% for non-elective and 3.9% for elective. This shows that, as we know, these patients are potentially high risk and a general anaesthetic is not without risks, however a combined spinal-epidural technique may not be suitable in particular due to anticoagulation postoperatively.

Only 12% of these procedures were done under a regional technique. Data is not available for the method of regional anaesthetic; one proposed technique is that of a combination of a single shot spinal anaesthetic and peripheral nerve blocks. This carries the benefits of avoiding epidural catheters, and avoiding a general anaesthetic.

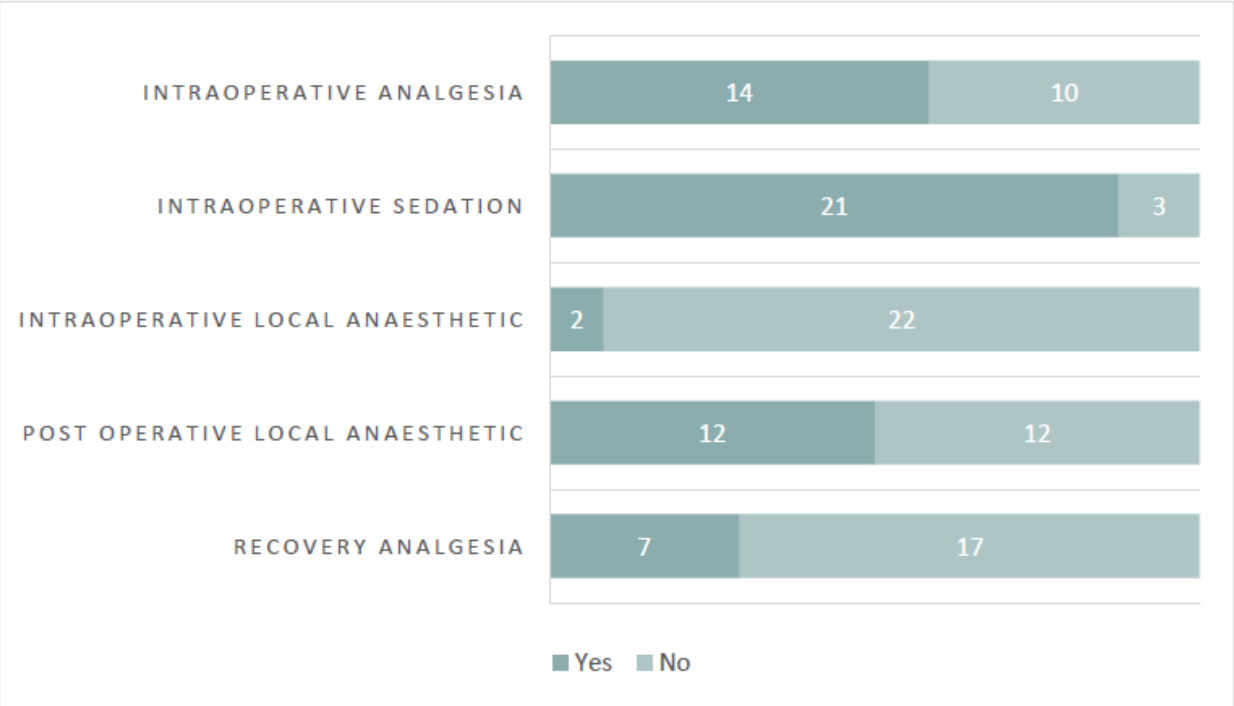
Between 2021 and 2023 24 patients had a spinal anaesthetic followed by a combination of lower limb blocks (Femoral, ilioinguinal, iliohypogastric, genitofemoral branch, popliteal sciatic and subcutaneous LA in groin area) depending on the operation type.

- The average length of procedure was 5 hours
- 58% of the patients received intraoperative analgesia
- 88% received intraoperative sedation
- 8% received intraoperative top up of local anaesthetic by the surgical team
- 50% received local anaesthetic in the wound at the end of the operation to prolong post-operative analgesia
- 28% received analgesia in recovery (Paracetamol or Fentanyl)
- One patient required intraoperative conversion to GA due to moving of the limb (no sensation)

We believe this cohort of patients shows there is a reasonable viable alternative to both general anaesthetic or CSE in a large portion of the patients presenting for either elective or emergency revascularisation procedures.

(continued on next page)

Summary of Data



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Enhancing vascular surgery outcomes through geriatric co-management: a study on the impact of the POPS team

Dr Mahmoud Bakheet, Senior Clinical Fellow
Royal Preston Hospital

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Introduction: With the UK's aging population set to increase, the prevalence of PAD and the burden on vascular teams are expected to rise. The benefit of Care of the Elderly (CoE) input is well established. However, access to CoE teams is limited, especially with increasing service demand. We evaluated the impact of selective CoE input on vascular surgery outcomes.

Methods: A prospective cohort study examined the impact of selective CoE input on predefined parameters, primarily focusing on patient outcomes and length of stay (LoS) over 12 months. Demographics, comorbidities, frailty scores, LoS, and referrals to medical specialties were recorded, compared to a snapshot retrospective audit of 50 patients.

Results: Patients in both groups were matched for comorbidities, frailty scores, and interventions. Despite a higher age in the current cohort, CoE input led to a significant improvement in LoS beyond fit-for-discharge from 11.7 days to 9 days in six months and to 6 days after 12 months. Referrals to medical specialties decreased from 77% to 40%. Patients with sepsis, renal impairment, hypoalbuminemia and those undergoing major amputation benefit most from CoE input.

Conclusions: Selective CoE team input in vascular surgery based on the above factors significantly improved outcomes, reducing LoS and referrals, demonstrating cost-effectiveness in under resourced vascular units.

Elective Open AAA Repair: A Comprehensive Practice Review

Dr Khalid Zahir, Specialty Trainee
Dr Basant Bhattarai, Specialty Trainee
Dr Ian Nesbitt, Consultant Anaesthetist
Freeman Hospital

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Introduction
The National Vascular Registry report indicate a consistent decline in the number of patients undergoing aneurysm repair. While Endovascular aneurysm repair (EVAR) has well-documented short-term advantages over open repair, open surgery has proven superior in terms of long-term survival, reduced need for re-intervention, and cost-effectiveness(1). We reviewed the practice and outcomes of patients undergoing elective AAA repair at Freeman Hospital.

Methods
Data was retrospectively collected from the SURGINET and the Vascular surgery Registry for patients who underwent open AAA repair between January 1, 2022, and June 30, 2023. To ensure consistency, all entries were validated against operative notes from Powerchart. Multiple variables were analysed, and the outcomes were reviewed.

Results
Multiple variables were analysed, including demographics, comorbidities, CPET data, anaesthetic techniques, timings, intraoperative and postoperative lactate levels, blood products, postoperative lactate, vasopressor requirements, CVVH, and ICU length of stay.

Out of 55 cases identified, 52 were male and 3 were female, with a median age of 73. Among them, 50 patients had an infrarenal aneurysm. The mean values for AT, VO2 Max, and VE/VECo2 were 14, 17.5, and 35 respectively. Patients were stratified into low, medium, and high-risk categories based on CPET data. Further analysis revealed that all high-risk patients (100%) required vasopressors upon admission. However, there was no significant difference in outcomes, although the median length of ICU stay for the high-risk group was one day longer than for the other groups.

Intraoperatively, the mean time from knife to skin was 78 minutes, with volatile anaesthesia being predominantly utilized compared to TIVA (total intra-venous anaesthesia). Thoracic epidural was the method of analgesia in all the cases, though the intraoperative use of Epidural varied. The highest median intraoperative lactate level observed was 5.5.

Postoperatively 24.5% were admitted as level 3, 61% needed vasopressors on admission. 47 % left ICU in day 2, whereas 5% were admitted for more than 5 days. Most common reason for prolonged ICU admission (more than 2 days) was related to complexity of cases (previous EVAR), supra coeliac clamp, bowel ischemia and respiratory failure.

Discussion

Discrepancies in data entry were corrected by re-verifying surgical notes. Despite variations in anaesthetic practice, with most anaesthetists favouring volatile agents with epidural analgesia, it was difficult to delineate outcomes. Prolonged, complicated surgeries, major blood loss, and unplanned additional procedure s at the time of surgery were associated with longer ICU stays. There was no direct correlation between intraoperative blood loss and length of stay in ITU.

Conclusion

Various factors influence the outcomes of open elective AAA repair. Upon analysing the data from the aforementioned cohort, it was found that the rate of complications is lower than the nationally quoted figures (2).

A service evaluation of central venous catheter insertion in simple elective open abdominal aortic aneurysm repair: are they required?

Dr Kelly Sugden, Anaesthetic Registrar
Dr Nicola Mather, Anaesthetic Consultant
Leeds General Infirmary

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The incidence of abdominal aortic aneurysm (AAA) and the number of patients undergoing repair is increasing [1]. Elective repair of open AAA is performed to prevent death from aneurysmal rupture and catastrophic haemorrhage [2]. Central venous catheter (CVC) insertion forms part of routine anaesthetic practice for AAA repair in the United Kingdom. We sought to evaluate if insertion was required in the elective setting.

We undertook a retrospective audit from August 2020 to 2022, looking at the notes of patients who underwent simple elective AAA repair.

Data was collected from electronic records, anaesthetic charts and the national vascular register. We looked at whether CVC insertion was routine, and if it was utilised in the post operative period.

Thirty-eight patients underwent simple elective AAA repair during this time. Over 90% of patients were male. The most common recorded comorbidity was hypertension, followed by chronic lung disease and diabetes mellitus. Every patient had an arterial line with 97% undergoing CVC insertion. All patients underwent general anaesthesia, with 42% also having neuraxial anaesthesia. In the immediate post operative phase, 29% of patients required vasopressor support. Ten percent required level 3 care. The average critical care stay was 2.5 days. There were 22 recorded post operative complications, with hospital acquired pneumonia being the most common.

Our findings confirm that CVC insertion for elective AAA repair is routine in our trust. In the post operative vasopressor requirement group, 82% received noradrenaline (NA) and 18% received metaraminol. The average duration of administration for NA and Metaraminol was 1.4 and 2.5 days respectively. Documented causes for post operative hypotension include sedation, epidural related, metabolic acidosis and fluid balance status requiring further fluid resuscitation. The critical care units at Leeds Teaching Hospitals have a well established protocol for peripheral NA use. The dose of NA used to maintain adequate blood pressure was within the protocol limits of peripheral infusion. To reduce waste, carbon footprint, operating theatre time, eliminate complications and the cost associated with these cases, the audit findings support proceeding with simple elective AAA repair without a CVC. At the time of the audit, an equipment cost saving of £46.70 per case could be achieved.

Around a third of cases undergoing simple elective AAA repair require post operative vasopressor support. The amount and duration of the support required is not particularly high and could be provided by a peripheral route. In an increasingly stretched healthcare climate, with a push for greener anaesthesia, not inserting a CVC for simple AAA repair could help to reduce the carbon footprint and costs associated with these cases.

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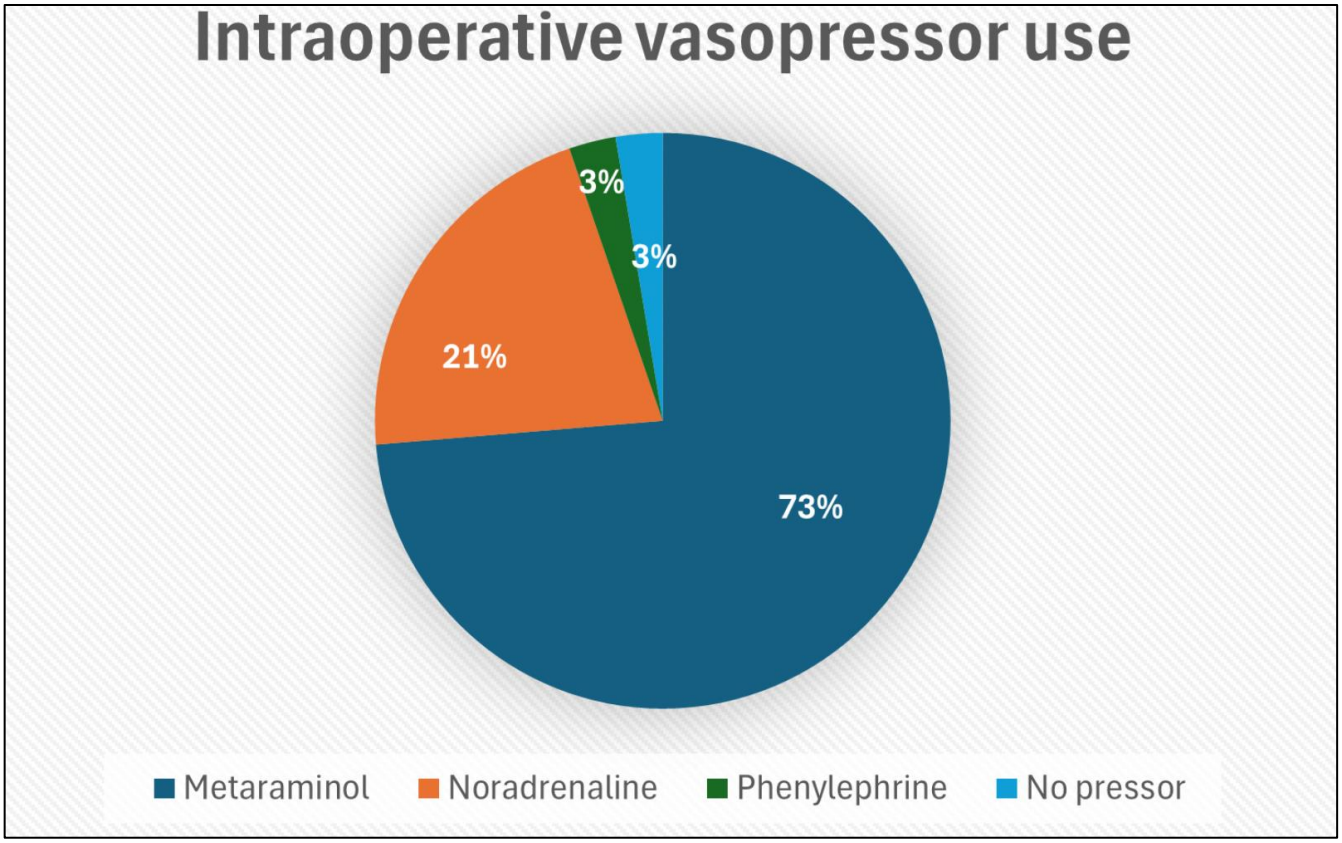
Figure

Figure: A pie chart showing intraoperative vasopressor use



Using MDT simulation to improve confidence managing hybrid theatre emergencies & develop a supporting pathway

Dr Mark McCague, Anaesthetic Registrar
Royal Victoria Hospital

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Introduction
In our tertiary vascular unit, the hybrid suite is increasingly used for complex emergency joint vascular-radiology cases. When surveyed only 61% nursing staff and 64% of anaesthetic trainees had experience of emergency work in the hybrid suite and across both groups only 44.4% felt somewhat or very confident in managing a hybrid suite emergency out-of-hours.

Aims
To improve the confidence in managing emergencies in the hybrid suite amongst nursing staff and anaesthetic trainees.

Methods
We designed and ran MDT simulation in-situ in our hybrid theatre involving HCAs, nursing staff, I.R. team, vascular surgeons & anaesthetic trainees.

We used the written feedback from the simulation and the observations of the faculty to design an emergency pathway poster.

Results
Post-simulation ?survey showed that the percentage of delegates that felt somewhat or very confident in managing a hybrid suite emergency out-of-hours had risen to 88.9%/

100% of those surveyed found the emergency pathway a helpful guide and that they would refer to it in an emergency.

Outcomes
For the continued benefit of new nursing staff and rotational trainees we plan to deliver this MDT simulation annually.

Emergency pathway laminated and tagged to anaesthetic machine in hybrid theatre and I.R. suites.

Figure
Newly developed hybrid theatre emergency pathway as a result of the MDT simulation and delegate feedback.

A Vascular Anaesthesia Society of Great Britain & Ireland (VASGBI) survey of current practice in analgesia for open surgical repair of an unruptured abdominal aortic aneurysm (AAA)

Dr Hefin Llewellyn, ST6
Dr Raj Malhorta, Consultant Anaesthetist
Leighton Hospital and Liverpool University Hospitals NHS Foundation Trust

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Thoracic epidural analgesia (TEA) has traditionally been the technique of choice in managing analgesia in the immediate post operative period following open surgical repair of an unruptured abdominal aortic aneurysm (AAA). However, the management of post-laparotomy pain is evolving, with greater focus on multimodal opioid-sparing techniques including abdominal trunk blocks [1]. Rectus sheath catheters (RSC) have been shown to be non-inferior to TEA in colorectal surgery and could provide an alternative to epidurals in elective open AAA repair [2].

Stoddard et al [2] demonstrated RSC are associated with a reduced length of hospital stay and earlier mobilisation with no difference in pain scores at 6 and 24 hours post operatively. Return to function after major surgery are important components of Enhanced Recovery After Surgery (ERAS) programmes.

To date, there has been no large randomised controlled study to assess the effectiveness of TEA over RSC following open surgical repair of an unruptured AAA. However, a recent trial has compared the two techniques within colorectal and urological cases [3]. This demonstrated that TEA provided a superior initial postoperative analgesia (only for the first 24 hours). By 72 hours, RSC provided superior analgesia and was associated with a lower incidence of unwanted effects and maybe more cost effective.

A survey was sent to all VASGBI members to complete with the intention of gaining insight to current analgesic practice of patients undergoing open surgical repair of an unruptured AAA within Great Britain and Ireland.

Eighty-two anaesthetists responded from 48 different Arterial Centres within the UK (see picture), of which 95% were consultants. The majority (68.3%) of respondents managed a case at least once every 3 months. Nearly half (47.6%) of respondents would always insert a TEA while 14.6% never used this technique. Only 42% of respondents indicated that RSC were inserted routinely, most commonly placed by the surgeon (73.2%). The survey demonstrated that a greater proportion of patients with TEA were managed in a critical care setting than those patients with RSC. Only 37.2% of respondents stated TEA could be managed on a specialist vascular / general surgical ward compared to RSC (87.2%).

The most commonest programme for TEA was infusion only (71.9%) and the commonest programme for RSC was also continuous infusion only (69.5%). The survey indicated that TEA are typically removed at 48 – 72 hours whereas RSC are usually removed at 72 - 120 hours.

The results from this survey show that TEA remains the most common method of analgesia post operatively. We were surprised to see such a large proportion of patients having RSC inserted routinely and we feel this may reflect the growing trend of moving away from TEA. Ultimately, further research is required to compare TEA and RSC in managing patients undergoing elective repair of an unruptured AAA.

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Figure

Map showing location of responding VASGBI members

Activated Clotting Time Guided Heparinization in Endovascular Abdominal Aortic Aneurysm Repair - A Review of Compliance and Effectiveness of Trust Guidelines

Dr Alexander Menzies, Clinical Fellow FY3
Dr Judith Gudgeon, Consultant Anaesthetist
Frimley Park Hospital

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Historically 5000IU of heparin has commonly been administered to provide perioperative anticoagulation during vascular surgery with little near patient testing available (1-3). Following the introduction of activated clotting time (ACT) monitoring at Frimley Park Hospital and earlier studies, an ACT guided heparin administration guideline was introduced in 2016. This guideline recommended recording baseline ACT, administering 100 units/kg of heparin at the time of arterial puncture and guidewire insertion with an ACT target of greater than 250 seconds. This study aims to review compliance with these guidelines and its effectiveness in achieving target ACTs after heparin administration.

The National Vascular Registry was used to identify patients who had undergone endovascular abdominal aortic aneurysm (AAA) procedures between June 2022 and November 2023. Initially 85 endovascular AAA cases were identified, and the electronic patient record EPIC was used for data collection. Patients were excluded if the procedure was converted to open surgery, the patient did not survive the procedure, or the patient data was incomplete. A total of 64 cases were included; infrarenal (n= 36), complex (n= 22) and revision (n= 6). Patient weight, heparin dose and baseline and post-dose ACT data was collected.

Figure 1 demonstrates the relationship between heparin dose in IU/kg and post heparin ACT. 54.7% of cases reached the ACT target with an average heparin dose administered of 75IU/kg. The lowest dose used to achieve target ACT was 35.1 units/kg. 55% of patients received 5000IU of heparin regardless of patient weight, with 21.8% of those given 5000IU achieving the desired ACT target. One patient was given the guideline dose of 100IU/kg dose and achieved the ACT target.

This study demonstrated very poor compliance with the 2016 guideline for heparin administration and is unable to confirm whether a dose of 100IU/kg leads to patients achieving target ACT after a single heparin dose. The data demonstrates that there is little linear correlation between heparin dosing and ACT in this cohort. At Frimley Park, there appears to be a reluctance to use larger initial doses of heparin than historically used. We will propose recommendations to change the initial heparin dose to at least 75IU/kg to improve compliance with guidelines, ultimately leading to a higher proportion of patients achieving ACT targets. Updated guidelines will stress the need to proactively monitor ACT regularly throughout these procedures and further studies will assess compliance and relevance of the recommendations.

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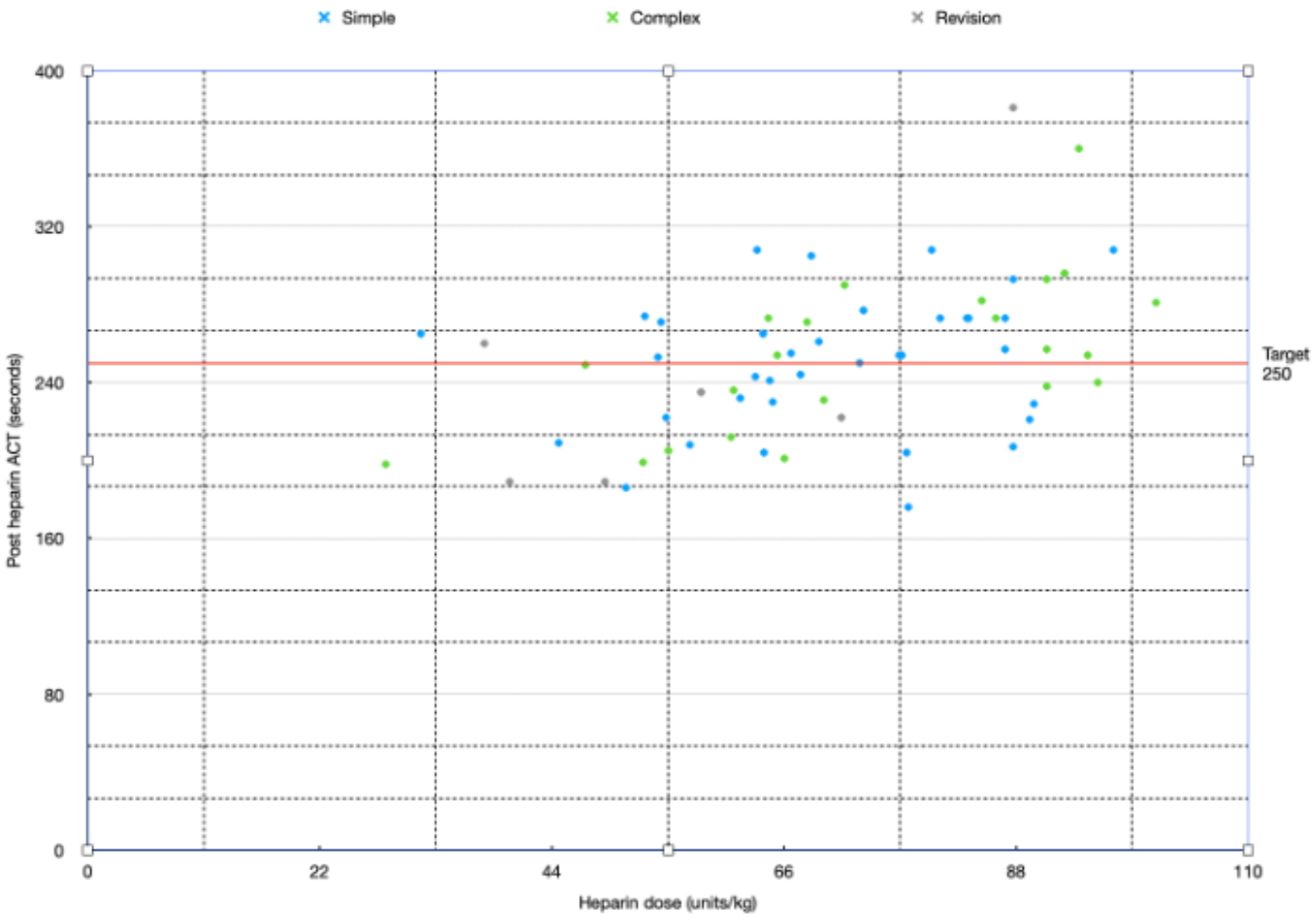
Figure

Post heparin ACT measurements in simple (n=36), complex (n=22) and revision (n=6) EVAR cases (n=64). Target post dose ACT set at 250 seconds as per local protocol. 54.7% cases achieving target ACT following heparin administration.



Can we Save Money and the Environment? A Review of Intraoperative Cell Salvage (ICS) in a Vascular Centre in the West of Scotland

Dr Jordan Lau, Anaesthetic Trainee
Dr John O'Donoghue, Anaesthetics Consultant
Royal Alexandra Hospital and University Hospital Hairmyres

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Advantages of ICS stem from reduction in allogenic blood transfusion, no restrictive triggers associated with blood management principles, superior oxygen delivery compared to donor blood, and lack of adverse immunological effects. (1) Current guidelines suggest collection of blood for potential salvage ('collect only' mode) should be considered for procedures where blood loss may exceed 500ml. (2) The project aims were to evaluate use of ICS in vascular procedures in our hospital. We sought to develop a Standard Operating Procedure (SOP) that would allow reduction in costs and environmental impact by reducing plastic waste. Following review we hope to have an SOP that is more accurate than current guidance while maintaining patient safety.

Retrospective data on ICS use between 2015-2022 was collected. Operation type; acuity; time; volumes processed; blood salvaged and transfused were recorded in spreadsheet. Lowest, highest, median/mean volumes for each procedure (and requirement for further transfusion) were calculated and further analysed in above categories. For purpose of the SOP a table of Maximum Allowable Blood Loss (MABL) was created to plot a figure for patient weight against initial haemoglobin using the formula developed by Gross (3) to calculate volume of blood loss to reach transfusion threshold of 80g/L.

ICS was used in 404 operations over 2015-2022. This included 215 aortic vascular cases of which there were 147 abdominal aortic aneurysm (AAA) repairs and 58 aorto-bifemoral grafts. ICS was used mainly for AAA in hours (94%) vs out of hours (6%) and in more elective (81%) than emergency procedures (19%). Median volume processed was 3779mL with median transfusion 923mL. Average blood loss was 2500mL with additional transfusion in 49% cases. Blood loss was higher out of hours vs in hours (2800vs2500ml) and in elective procedures vs emergency (2500vs2099ml). There was higher rate of additional transfusion out of hours (75% vs 48%) and in emergency cases (54% vs 49%).

The data is useful in creating a more efficient SOP for set up of ICS. We feel that distinction between high and low probability of transfusion may enable targeted ICS use between full set up and collection only mode: advantages include cost of processing kit and potential waste. Initial decision making flowchart will include full set up for Emergency AAA; given demonstrated blood loss and high peri-operative transfusion requirement. For all other procedures we use the MABL table for each case; if high risk of reaching transfusion threshold (MABL less than 1500ml) we advise full set up, and if medium risk (MABL 1500-2000mL) we suggest considering full set up. Weight of plastic for processing kit by Haemonetics® is

926g. From our dataset, had we used ICS in collect mode (139 cases from retrospective review of non-AAA with blood loss under 1500ml) there is potential saving of £6428.75 in consumables and 128.7kg of plastic waste (equivalent to 6435 bottles of paracetamol). Next steps are to develop an extension to the SOP taking into account starting haematocrit and thus volume in collection vessel that would prompt a change from collection only to full processing mode. It is pertinent to monitor and QI the use of the SOP in particular any variation in additional allogenic transfusion.

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Figure

Table of Maximum Allowable Blood Loss.

Orange: Advise Full Set up; Yellow: Consider Full Set Up; Green: Collection Only

MALE	Starting Hb (g/L)						
Weight (kg)	100	110	120	130	140	150	160
50	833	1184	1500	1786	2045	2283	2500
60	1000	1421	1800	2143	2455	2739	3000
70	1167	1658	2100	2500	2864	3196	3500
80	1333	1895	2400	2857	3273	3652	4000
90	1500	2132	2700	3214	3682	4109	4500
100	1667	2368	3000	3571	4091	4565	5000
110	1833	2605	3300	3929	4500	5022	5500
FEMALE	Starting Hb (g/L)						
Weight (kg)	100	110	120	130	140	150	160
50	722	1026	1300	1548	1773	1978	2167
60	867	1232	1560	1857	2127	2374	2600
70	1011	1437	1820	2167	2482	2770	3033
80	1156	1642	2080	2476	2836	3165	3467
90	1300	1847	2340	2786	3191	3561	3900
100	1444	2053	2600	3095	3545	3957	4333
110	1589	2258	2860	3405	3900	4352	4767

Implementation of multi-disciplinary team training programme in the management of vascular emergencies in a tertiary vascular centre

Dr Mysoon Alabdah, Anaesthetic Trainee
Dr Georgina Findlay, Anaesthetic Speciality Trainee
Dr Stephen Biggart, Consultant Anaesthetist
Royal Infirmary of Edinburgh

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Emergency vascular surgery presents significant challenges both with the type of surgery and patient cohort, with open repair of ruptured abdominal aortic aneurysm (AAA) associated with an in-hospital mortality of 50%. This is reflected in National Audit Report (NAP) 7, with patients undergoing vascular surgery being 5 times more likely to have a cardiac arrest compared to other surgical populations. The report identified certain time points as being high risk for peri-operative cardiac arrest, with induction technique, agent choice and management of reperfusion injury raised. One of the recommendations from this was for departments to have a regular training in the management of vascular emergencies. The aim of this project was to introduce regular multi-disciplinary team (MDT) training sessions in our department to increase confidence of non-vascular anaesthetists managing vascular emergencies.

A baseline survey was sent to the anaesthetic department to ascertain the level of exposure and confidence in management of ruptured AAAs, and what aspects of management they could benefit from more training and support on. Following this, a teaching afternoon was organised with a simulation session and talks delivered by a vascular surgeon and vascular anaesthetists. The talks were delivered in person and online. The talks were recorded to allow individuals who were unable to attend to access later to ensure greater reach across our department. The session was attended by members of the multi-disciplinary team, including anaesthetists, surgeons, operating department practitioners and blood transfusion lab representatives.

The baseline survey demonstrated that only 10 respondents out of a total 42 felt confident or very confident in managing patients with ruptured AAAs. The areas that respondents wanted further training on were ‘Decision making regarding appropriateness of surgery’, ‘Familiarity with anaesthetic for endovascular options’ and ‘Management at induction’. The results of the survey allowed us to target the learning outcomes for the sessions. Following the training session, attendees felt they had gained increased confidence in managing a ruptured AAA, with all respondents stating the talks were ‘somewhat useful’ or ‘extremely useful’.

The management of vascular emergencies, particularly ruptured AAAs, can require complex decision making in a short frame of time, which can be particularly challenging when there is limited exposure to vascular surgery. Our aim is to continue regular training sessions in our department to improve management of vascular emergencies.

Major Lower Limb Amputation: a 1 year re-evaluation of outcome

Dr Jordan McVey, ST5 Anaesthetist
Royal Victoria Hospital, Belfast

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In this study the 30 day, 90 day and 1 year mortality rate will be calculated for patients undergoing major lower limb amputation (MLLA) in the Royal Victoria Hospital (RVH), Belfast, with the aim of producing an accurate reflection of the true numbers of MLLAs performed in Northern Ireland and the resulting mortality rate. The mortality rate following MLLA was initially captured in 2015/16 and these figures have been used frequently in preparing court reports to inform declaratory orders in cases where surgery is required in patients lacking capacity. This audit will be useful in updating these figures to present the most accurate information to court.

Methods
This is a 1 year retrospective audit of MLLA performed at RVH, Belfast between 1st January 2021 – 31st December 2021. This is the same time period as is reported in the 2022 NVR report. MLLAs are defined as any amputation above the ankle, comprising BKA, through knee amputations (TKA) or AKA. Patients were identified using a Theatre Management System (TMS) and the total number of patients presenting for major lower limb amputations as well as the individual proportions of BKA, AKA and TKA were calculated. The Northern Ireland Electronic Care Record (NIECR) was utilised to collect 30 day, 90 day and 1 year mortality data. This was obtained from the medical certificate of death published on NIECR and compared to original operation date. Total mortality for all MLLA was calculated along with mortality data for BKA and AKA separately. These findings were compared with the previous audit performed between 1st August 2015 to 31st July 2016 on MLLAs performed at RVH, Belfast

Results
173 MLLAs were performed on a total of 150 patients. 56.1% BKA, 41.6% AKA and 2.3% TKA. AKA:BKA ratio is 0.74.

Outcomes
All MLLA 2021: 30 day mortality 9.2%, 90 day mortality15.6%, 1 year mortality 30.1%
All MLLA 2015/2016: 30 day mortality 9.5%, 90 day mortality 20.0%, 1 year mortality 30.5%

Discussion
The 2022 NVR report that 119 MLLA were performed at RVH in 2021 with an AKA:BKA ratio of 0.65. This is in line with the proposed target of a ratio of AKA:BKA less than 1 and our figures would also support this. The adjusted in-hospital 30 day mortality rate is reported as 4.5% which is lower than the national average of 6.6%.
There were 54 more cases identified in this study than are reported in the 2022 NVR report and this represents a 69% capture rate. There is significant room for improvement in the proportion

of cases reported to the NVR in our centre. The best practice clinical care pathway for Major Amputation Surgery states a target capture rate of greater than 95% which we are underachieving on at present.

In the audit performed between 1st August 2015 to 31st July 2016 there were 117 major lower limb amputations performed on 108 patients. 64.1% BKA and 35.9% AKA (AKA:BKA ratio 0.56). This represents a 48% increase in MLLA performed from 2015/2015 to 2021, although alongside this we have found a small decrease in early post-operative mortality. 1 year mortality remains largely unchanged which most likely reflects pre-operative co-morbidity and the sequelae from major amputation surgery. The resulting mortality remains significantly greater following AKA compared to BKA with AKA still carrying around twice the mortality rate of BKA.

Inflammatory aneurysms - the balancing act of managing disease modifying agents in the peri-operative period

Dr Joshua Singleton, Anaesthetist
Dr Gregory Fraser, Anaesthetist
Dr Harriet Gardiner, Anaesthetist
St Mary's Hospital

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A 78 year old male presented for an elective open infra-renal abdominal aortic aneurysm repair for an incidental 6cm aneurysm.

The patient reported an active lifestyle including Antarctic expeditions. His medical history included fully treated chronic lymphocytic leukaemia. He had a normal resting echocardiogram with no diagnosed cardiac disease. He had a mild obstructive pattern on spirometry with moderate post COVID19 emphysematous changes on CT chest. He had a significant rheumatological history with giant cell arteritis/polymyalgia rheumatica (GCA/PMR) overlap and an inflammatory arthritis. These were managed with leflunomide and he was steroid free. Rheumatology advised to stop leflunomide 2 weeks pre-op to optimise wound healing. 5 days pre-op he presented to clinic with symptoms of a PMR flare of and was managed with a steroids injection.

On the day of surgery, he had ongoing symptoms but was systemically well with no fevers and normal observations. Anaesthetic risks were discussed with the surgical team and patient, with operating in an active inflammatory state highlighted. This was balanced against the ongoing risk of rupture, issues with re-instating drugs and achieving PMR remission and re-organising surgery whilst not guaranteeing PMR relapse. Given the patient was systemically well surgery proceed.

Anaesthetic technique included a thoracic epidural and total intravenous anaesthesia. Blood management included regular thromboelastrography (TEG), arterial blood gases alongside the use of two cell salvage machines and a Belmont rapid infuser attached to a centrally placed rapid infuser line.

The surgery proved extremely complex with an inflammatory aneurysm and diffuse atherosclerotic and aneurysmal disease throughout the aortic tree. Baseline bloods performed on admission revealed a CRP of over 400. Difficulties arose with the distal anastomoses due to severely diseased, calcified and friable iliac vessels. The right common iliac was anastomosed but the left side required a jump graft to the left femoral artery.
The estimated blood loss was 15L, with 4.5L returned via cell salvage and required over 65 blood products.

After the 12 hour procedure he was transferred to the intensive care unit ventilated with a normal blood gas and TEG. The intensive care team pulsed him with methyl-prednisolone (day

1 and 2 post op) based on the pre-operative CRP. This was stopped on day 3 after discussions with rheumatology.
The patient was extubated on day 1. He returned to theatre (day 7) for wound dehiscence and received a course of antibiotics for a mild pneumonia. He denied any flare related symptoms. He was discharged from ICU on day 11 and home on day 22.

GCA/PMR causes inflammatory aneurysms which are linked to worse patient outcomes. Whilst an element of surgical complexity can be attributed to a lifelong state of chronic inflammation, it is likely that his active acute inflammatory state also contributed.

Difficulties arise in maintaining a quiescent inflammatory state prior to surgery whilst optimising wound healing and recovery. Expert consensus is to stop cytotoxics prior to surgery but on reflection in the context of a difficult to manage inflammatory condition one wonders whether bridging with steroids might have been appropriate.

Tired of surgical cancellations & complications? Get a vascular physician! Improving patient outcomes & productivity in vascular surgery: Vascular physician use in the care of surgical patients

Dr Aynkaran Dharmarajh, Consultant
Khiloni Dodhia, Medical Student
Ankita Menon, Medical Student
Neelaanjana Pradeep Chandran, Medical Student
Jasmin Ravindra, Medical Student
Northwick Park Hospital

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Our study aimed to find the baseline statistics for vascular surgery patient outcomes & cancellations at Northwick Park Hospital, to help us determine whether the introduction of a vascular physician (VP) could be useful. VPs could aid patients with multiple co-morbidities, thereby reducing post-operative complications, cancellations, readmissions, length of stay (LOS) and mortality rate. As a result, this may improve productivity in vascular surgery.

Utilising the theatre data and CERNER, we extracted data required. This included: pre-operative comorbidities, length of hospital stay, ASA status, surgery type, reasons for cancelled surgeries, post-operative complications, 30-day readmission and 3-month mortality rate.

Over a 6-month period from August 2023-February 2024, 16.8% (33/196) of vascular procedures were cancelled. Of these, 36.3% (12/33) were due to medical reasons. The average LOS was 7.64 days (± 11.4), 30-day readmission rate was 13.8%. The 3-month mortality rate was 2.5%.

The 2 most common comorbidity groups were cardiovascular (29.5%) and endocrine (18.2%), with hypertension and type 2 diabetes mellitus being most prevalent within these groups, respectively. 84.1% of patients assigned had an ASA status of 2/3. The comorbidities with the longest lengths of stays were haematological (mostly anaemia) and infectious (mostly osteomyelitis), with the total median LOS being 1.5 days.

The surgeries with the most post-operative complications were amputations and emergencies, with the most common complication being infection.

Around 25 per 400 procedures are cancelled due to medical reasons, not only having a huge effect on readmission rates but also costing nearly £400 million a year nationally. Our study has shown a need for VPs, since the most common reasons for cancellations could be tackled by managing pre-operative comorbidities; the types of comorbidities, as well as which surgeries to target have also been highlighted by our study.

Ultimately, the cost of VPs could be offset by the financial benefits of lower cancellation rates, complications and LOS. This would also result in a decrease in inter-departmental caseload

and investigations requested and an increase in bed spaces and staff availability. Fundamentally, these are desirable outcomes on both a patient-level and on a national scale, and we recommend VPs are made a staple of surgical care.

Post-operative pulmonary complications following endovascular aortic repair: risk factors and long-term impact

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Background
Despite the minimally invasive nature of endovascular aneurysm surgery, a significant proportion of patients undergoing endovascular aortic repair (EVAR) develop postoperative pulmonary complications (PPC) (1). These complications are a major source of postoperative morbidity and mortality (1–3). The impact of PPC on medium- and long-term outcomes has not been accurately determined. The aim of this study was to assess the incidence rate of PPC, identify associated risk factors, and evaluate their impact on long-term survival following EVAR.

Methods
This was a single-centre, retrospective study of consecutive patients with infrarenal (IRAAA) and juxtarenal abdominal aortic aneurysms (JRAAA) undergoing endovascular repair at a UK tertiary vascular referral centre between January 2010 and December 2020. The primary outcome was the incidence of PPC. Secondary outcomes included the association between PPC and clinical, anatomical, and procedural factors, as well as long-term survival. The impact of covariates on PPC and long-term survival was evaluated using multivariable logistic regression and the Cox proportional hazards model.

Results
The study included 656 patients (median age 75 years [IQR 70–80]; 597 male; 356 IRAAA and 300 JRAAA; median aneurysm diameter 61 mm [IQR 58–67]). PPC occurred in 35 of the 656 patients. These patients had a significantly higher 30-day mortality rate (OR 9.97, 95% CI 2.46–34.28, p=0.002). Juxtarenal anatomy (OR 2.68, 95% CI 1.28–5.62, p=0.009) and COPD (OR 2.90, 95% CI 1.45–5.81, p=0.003) were identified as independent risk factors for the development of PPC. Patients who developed PPC had poorer overall survival (HR 2.21, 95% CI 1.45–3.35; p<0.001). PPC was an independent risk factor for long-term survival in patients undergoing aortic aneurysm repair (HR 1.90, 95% CI 1.22–3.00; p=0.004).

Conclusion
PPC are common following EVAR and are significantly associated with both early and long-term mortality.

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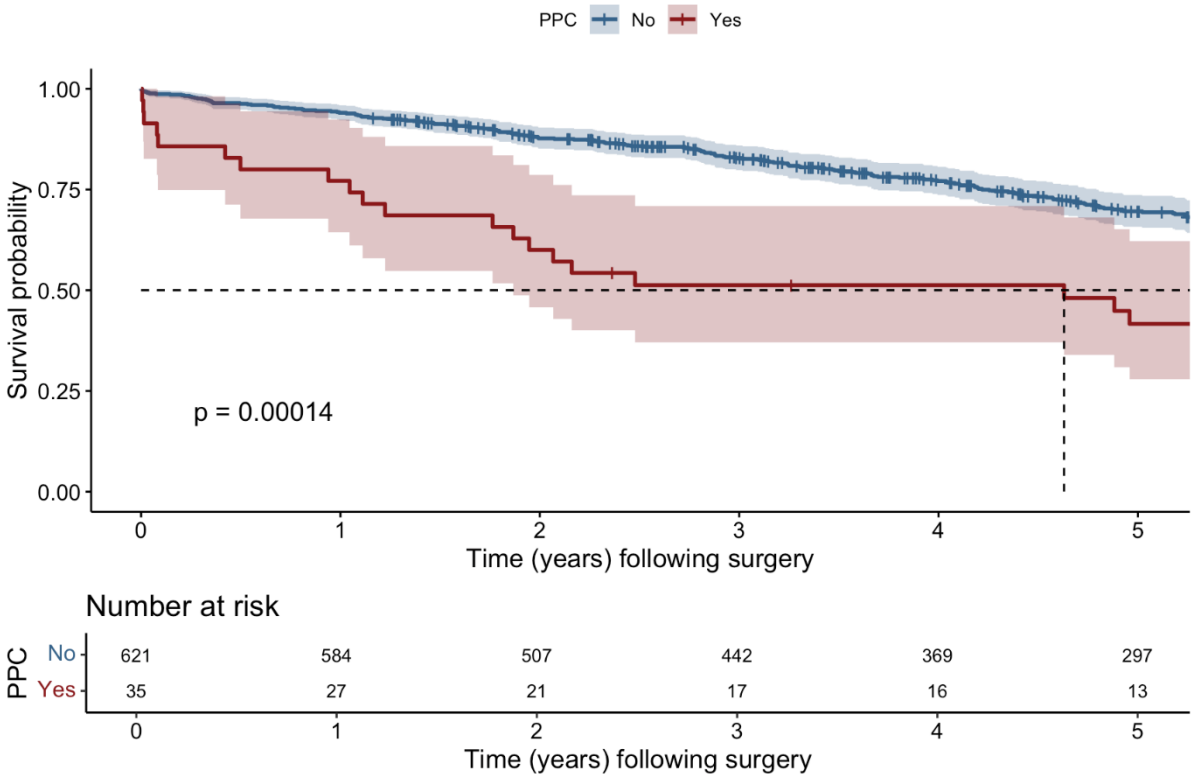
No funding was received for delivery or dissemination of this study.

Figure

Survival of patients after endovascular repair of abdominal aortic aneurysms stratified by presence of postoperative pulmonary complications (PPC).



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