

CHASM

Annual Report 2021



CLINICAL
EXCELLENCE
COMMISSION

CHASM 2021 Annual Report

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Chairman's foreword

The Collaborating Hospitals' Audit of Surgical Mortality (CHASM) reviews deaths within 30 days of surgery, or under the care of a surgeon regardless of whether a procedure was performed or not. The majority of deaths notified are of elderly patients who are urgently admitted for care. Despite our best efforts, untoward events can occur, like unexpected complications where the patient is unable to recover.

In 2021, the monthly average of patients admitted for emergency surgery was 8,361, with the highest monthly count recorded in March 2021 (n=8,894).¹ The calculated monthly average for deaths occurring in 2021 and notified to CHASM was 140.

It is important that surgeons are afforded the time to discuss the case examples in this report so that future events may be avoided. Analysing the lessons learnt and sharing different perspectives brings diversity and inclusion into the operating theatre.

In this report CHASM sees the need to reiterate some lessons from previous publications. Decision to operate, including whether a lesser or greater procedure should have occurred, is still the highest area of concern identified by peer review assessors.

Decision-making seems to be complicated with unrealistic post-operative outcomes for the elderly, often without a current advance care directive in place. In these situations, decision-making should be made at a senior level, or in an MDT / ASU setting, particularly when dealing with surgery which may seem non-beneficial. Clear clinical notes must be entered into the patient record on the discussion and outcomes when speaking to the patient and their family.

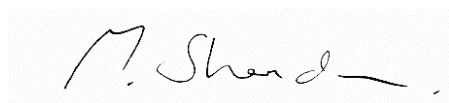
It is also important to ensure continuity of care throughout the patient's admission, despite weekend rotations or public holidays. Medication management issues are a constant area of concern highlighted in CHASM cases. Whether it is an error, delay or omission to administering the charted recommendation, written orders need to be clear.

Being aware of these factors, considering the potential complications or challenges which may be possible during a patient's surgical admission, and ensuring clear communication amongst all persons involved in clinical management is essential to ensure *patients and carers have positive experiences and outcomes that matter*.

I would like to extend my gratitude to the surgeons of New South Wales who have participated in CHASM by sharing their operative experiences, and the First- and Second-Line Assessors who provide a professional perspective to their peers.

Special thanks to the surgeons appointed as CHASM committee members for their time, expertise and dedication to the program. Thanks also to the CHASM office staff who keep the administrative wheels turning, liaise with hospital stakeholders, and provide timely assistance to surgeons for a variety of issues.

CHASM provides this insightful educational report for guidance to surgeons in challenging situations. It is hoped that all health facilities across the state may find opportunities for improvement from the shared lessons learnt.



Associate Professor Mark Sheridan
Neurosurgeon and CHASM Chairman

¹ Data provided by the System Information and Analytics Branch | System Sustainability and Performance Division, NSW Ministry of Health. NB: Excludes all surgeries related with caesarean. Extracted 04/04/2023.

CHASM members

The Collaborating Hospitals' Audit of Surgical Mortality (CHASM) in New South Wales is a statewide program which aims to improve surgical care in public and private hospitals through reflection and peer review. The program is overseen by its Ministerial Committee, with members appointed by the Secretary, NSW Health, under delegation by the Minister for Health, and is administrated by the Clinical Excellence Commission.

The Committee meets approximately every two months, usually on a Monday evening, to review the CHASM cases which were referred for second line assessment to discuss the feedback. If any areas of consideration or concern were identified by the Assessor, the Committee deliberates on how to address these issues from a quality improvement and patient safety perspective.



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CHASM overview

CHASM was established for registered surgeons practicing in public and private hospitals across NSW. It is not the intention of the program to be performance driven, but rather, to inform and initiate conversations that drive improvement. This is done through the confidential feedback (protected as specially privileged information under the *Health Administration Act 1982*) provided to surgeons and peer review assessors, as well as through the program's shared clinical lessons.

The program provides a safe environment in which to enable peer review of patient care and promote further reflection on the techniques used, the decisions made, and the clinical care provided to the patient. Through the course of the peer review, both the surgeon and the assessor benefit from the process of reflection, with many Second Line Assessors discovering insights when reviewing the medical record or writing their report.

Completing a surgical case form

When completing an electronic surgical case form, it is crucial to fill all the text fields and select all the radio buttons. When using an electronic platform to collect data and free text from many individual users, it is critical that the data is of high quality.

Attention should be given when completing Question 9 - *Please describe the course to death*. This response allows the surgeon to share their unique surgical journey and should not be used to “copy and paste” the clinical notes, as this makes for a burdensome review by the independent peer reviewer.

Analysis on Question 9 indicates that a higher proportion of delegated forms receive second line assessment, as the First Line Assessor questions the details to determine whether there is a genuine concern, consideration or adverse event which may need second line assessment. It is important for consultants to fully review delegated forms to ensure an accurate account is provided to CHASM.

CHASM encourages surgeons to allocate sufficient time to complete Question 25 - *In retrospect, would you have done anything differently?* This question allows surgeons to reflect on events which occurred *during the duration of the patient's admission* and share insights that may become apparent in hindsight.

Completing a first line assessment

CHASM encourages all surgeons to register as a First Line Assessor to conduct peer reviews for their specialty. The review process is simple and requires a short timeframe to complete. If you would like to become a First Line Assessor, you can select your level of participation using fellows interface or contact the CHASM office by phone or email.

Conducting a second line assessment

Second line assessment occurs when an independent peer is selected from the same specialty, or sub-specialty, and is provided with a copy of the patient medical record and the completed surgical case form to review. Second Line Assessors are required to review the case to address any possible areas of consideration, concern, or an adverse event (ACON), raised by the First Line Assessor following review of the surgical case form. The Second Line Assessor provides a written report which is populated into a feedback letter to the surgeon.

Some cases are referred to second line assessment because there is insufficient information for the First Line Assessor to make a clear determination. To avoid unnecessary second line assessments, these cases are referred to the CHASM Chairperson for consideration as it may be necessary to contact the operating surgeon to request further information. The additional information should provide enough detail for the Chairperson to decide whether to close the case at first line or proceed to second line assessment.

Accessing the reporting system

CHASM has its own access point for fellows interface on the RACS Bi-National Audits of Surgical Mortality landing page due to the legislative requirements to keep state health data backed-up in New South Wales. It is preferable to sign-on using your ANZASM credentials; CHASM username (e.g., BloggsT-CHASM) and password. If you do not have a CHASM username, or you are unsure what your username is, please contact the office on **9269 5530** or email: CEC-CHASM@health.nsw.gov.au

Access ANZASM fellows interface using this QR code to self-report to CHASM.



Log-on to fellows interface, select the “self notify” tab on the far left of the page, (this will automatically create a new case) and go to the “notification of death” screen to generate a report.

Point of view: How do professionals get better at what they do?

How do they get great? There are two views about this, one is the traditional view, that is that you go to school you study you practise you learn you graduate and then you go out into the world and you make your way on your own. That's how doctors learn, lawyers do, scientists. Now the contrasting view comes out of sports, and they say, "You are never done. Everybody needs a coach." The greatest in the world needs a coach. So, I tried to think about this as a surgeon pay someone to come into my operating theatre, observe me and critique me. That seems absurd! Expertise means not needing to be coached. So then, which view is right?

Turns out there are numerous problems in making it on your own. You don't recognise the issues that are standing in your way, or if you do, you don't necessarily know how to fix them. And the result is that somewhere along the way, you stop improving. And I thought about that, and I realised that was exactly what had happened to me as a surgeon. So, I asked a former Professor of mine who had retired – his name is Bob Osteen. He agreed to come to my operating room and observe me.

The case - I remember that first case - it went beautifully. I didn't think there would be anything much he'd have to say when we were done. Instead, he had a whole page dense with notes. "Just small things", he said. "Did you notice that the light had swung out of the wound during the case?" "Another thing I noticed," he said, "Your elbow goes up in the air every once in a while. That means you're not in full control." It was a whole other level of awareness. He was describing what great coaches do, and what they do is they are your external eyes and ears, providing a more accurate picture of your reality. They're recognising the fundamentals. They are breaking your actions down and then helping you build them back up again. After two months of coaching, I felt myself getting better again. And after a year, I saw my complications drop down even further. It was painful. I didn't like being observed, at times I didn't want to have to work on things. I also felt there were periods where I would get worse before I got better. But it made me realise that the coaches were on to something profoundly important. I think it's not just how good you are now, I think it's how good you're going to be that really matters

Atul Gawande, TED2017, *Want to get great at something? Get a coach* (April 2017). Available at: <http://t.ted.com/wCSBuKq> (Accessed: 14 June 2023).

Personal Profile Bio: <https://www.ted.com/profiles/1073022>

Dr Atul Atmaram Gawande, MD, MPH, is an American surgeon, writer, and public health researcher. He practices general and endocrine surgery at Brigham and Women's Hospital. He is Professor in the Department of Health Policy and Management at the Harvard T.H. Chan School of Public Health and the Samuel O. Thier Professor of Surgery at Harvard Medical School.

He is also Executive Director of Ariadne Labs, a joint center for health systems innovation, and Chairman of Lifebox, a non-profit organization making surgery safer globally. Atul has been a staff writer for The New Yorker magazine since 1998 and has written four New York Times bestsellers: *Complications*, *Better*, *The Checklist Manifesto*, and most recently, *Being Mortal: Medicine and What Matters in the End*.

He is the winner of two National Magazine Awards, AcademyHealth's Impact Award for highest research impact on healthcare, a MacArthur Fellowship, and the Lewis Thomas Award for writing about science.

Committee Recommendations

During review, the Committee voiced concerns over several general surgery cases as the peer review reports indicated that the operating surgeon may not have had adequate training to perform the surgery undertaken. Apparent conflicts in decision-making seemed evident, when considering minimally invasive surgery versus open surgery. These case reviews seem to indicate surgeons are not considering an open approach and believe laparoscopic approach is a safer option, which is not always the case.

General Surgery is consistently the highest represented specialty for CHASM each year. This publication includes several case examples from that specialty, including the two case summaries, below, where the Committee believes there may be a failure to recognise potential problems with the use of Clexane in more complex patients. In some instances, such as following extensive dissection, it may be warranted for a longer inpatient stay to monitor for signs of bleeding.

However, in these cases, it appears the surgeon has not had adequate training or experience to transition from laparoscopic to open approach. In this type of patient with comorbidity an open approach should be considered.

The first case summary shared in this publication was re-reviewed by Dr David Blomberg, General Surgeon. He has provided a perspective which supports open surgery as the first choice of operation, at least in this instance. The Committee would like to remind surgeons that an open procedure should be considered for these higher-risk patients and may yield a more favourable outcome than laparoscopic surgery, which can have a higher chance of post-operative haemorrhage and other complications.

The second case summary shared was discussed at length and the Committee considered the surgery may be performed under local anaesthesia if necessary, and extraperitoneal dissection in the laparoscopic approach as in this case, is much more prone to post-operative haemorrhage. The second line assessment was very-well written and correctly focussed on the inappropriate dosing of Clexane for an inguinal hernia patient, in presence of renal failure, where bleeding into the cavity is high-risk.

CASE SUMMARY A: General Surgery

A patient in their early 60s was referred by the Local Medical Officer (LMO) with a subacute large bowel obstruction secondary to a splenic flexure tumour. Past medical history included lower segment caesarian section, breast augmentation, skin cancer, surgery including a melanoma (20 years earlier), and a left knee reconstruction.

The patient was admitted to the hospital early afternoon on a Friday. A flexible sigmoidoscopy was performed on the following day, confirming a tumour of the proximal descending colon. On day 3 of admission, a left hemicolectomy was performed with a side-to-side stapled anastomosis with the end stapled with Tac 100 linear cutter. A leak test was performed and drain inserted. The patient received a thoracic epidural for this operation.

The patient was admitted to the HDU and a thorough assessment was made by the Resident Medical Officer (RMO) and concerns about pain and hypotension escalated to the critical care Senior Medical Officer (SMO). The surgical registrar and ICU consultant were updated on day 4 about deterioration of the patient's condition.

A CT confirmed intra-abdominal free gas and fluid. At laparotomy, an anastomotic leak was confirmed: the end staple line had completely separated resulting in feculent peritonitis. Post-operatively, there was progressive deterioration from sepsis and multi-organ failure. Following family discussion, no further escalation in care was implemented. The patient died early on day 5 of admission.

COMMITTEE'S POINT OF VIEW: End to end hand sewing preferred

This case of a patient dying following surgery for an obstructing splenic flexure tumour presents an opportunity to review current surgical practice. While it is accepted surgical practice to perform stapled primary anastomosis with large bowel obstruction, it is the opinion of the Committee that other techniques should have been considered.

Often obstructed bowel is thickened and oedematous and staple devices may cut through, as possibly happened in this case. Although a leak test was done, the breakdown occurred in the first 24 hours post-operatively.

Other factors that could be implicated included inotrope need; possibly related to epidural, but more likely related to the early leak. Inotrope use predisposes to leak and is more likely necessary in an acute situation, which again would suggest an option other than staples may be safer.

With obstructed bowel, end to end hand sewing should be considered to confirm adequate blood supply in this area of unreliable marginal vessels and ensure full thickness colonic tissue is included in the anastomosis.

Other options include an extended right or subtotal colectomy. In an unstable patient a stoma either end or defunctioning is reasonable. It is clear there were some haemodynamic issues in this patient, which may have contributed to their demise, however the major issue was technical.

This case highlights the difficulty with large bowel obstruction and the challenge it presents for a surgeon, be they general or specialty colorectal. It highlights the benefit of early diagnosis of bowel cancer with screening programmes and astute primary health care. These cases are most commonly performed by an on-call General Surgeon, raising the ongoing need for good general surgery training.

Dr David Blomberg, General Surgeon. (MBBS, FRACS)
CHASM Committee member (2019-2021)

CASE SUMMARY B: General Surgery

This case is a patient in their early 80s who died following readmission 3 days after surgical repair of a recurrent left inguinal hernia. The patient had a significant medical background that included chronic renal disease and atrial fibrillation which was managed with warfarin. They represented with hypovolaemic shock from massive extraperitoneal bleeding which appears to have been due to a Clexane dosing error on discharge. Despite maximal efforts, the patient succumbed to end organ failure from hypoperfusion and pre-existing disease.

This patient was known to be a high-risk patient pre-operatively and a good plan was made regarding pre-operative anticoagulation bridging as well as post-operative support and observation in the surgical HDU. However, it seems the same degree of care was not taken in coming up with a post-operative anticoagulation plan.

The Clexane dose on discharge of 70mg bd was more than likely the reason why bleeding from small vessels occurred, leading to a slow but continuous oozing over the next 48 hours, resulting in readmission. Angioembolisation failed, as no large vessels were identified as the source of the bleed.

This case highlights the issue of post-operative anticoagulation plans and their need to be properly documented. Although we are often mainly concerned that patients are not coagulopathic during surgery, similar concerns need to be directed towards the issue of restoring anticoagulation post-operatively. It is the responsibility of the home team to come up with that plan, document it, and make sure it is implemented safely.

COMMITTEE'S POINT OF VIEW: Inappropriate anticoagulant dosage

This is a timely reminder to surgeons that although the TEP (totally extraperitoneal) procedure is quite safe and usually involves only the usage of blunt dissection, often there are tiny/small oozing vessels, and bruising (sometimes significant) of the genitalia is not uncommon.

Normal coagulative physiology is imperative for any small vessels to stop oozing, and careful checking of the operative site prior to desufflation is mandatory. No mention of this is made in the operative report (but it can be assumed that all looked well, as the patient was well overnight with no suggestion of significant bleeding).

Other case examples of post-operative complications due to inappropriate or absent Clexane doses are included in the 2019 CHASM Annual Report (Cases 1 & 13) and the 2020 CHASM Annual Report (Case 15).

- Consideration of minimally invasive surgery versus open surgery
- Awareness of Clexane dosages and decreased renal function
- Oversee handover and/or discharge by the non-treating team

Case One – General Surgery: Care continuity and futile surgery

SUMMARY

A patient in their mid-80s had a background of hearing loss, hypertension, gastric reflux, previous TURP and previous Hartmann's operation and reversal (possibly for malignancy). They were frail and lived with their partner and mobilised with a four-wheel walker. The patient was transferred from Hospital A to Hospital B with a contained transverse colon perforation on a public holiday. Initially they were treated nonoperatively but failed to improve. An operation was carried out 10 days later and a perforated cancer was identified and resected. Despite initial slow progress, the patient ultimately failed to thrive and had issues with fluid overload causing respiratory failure and died on day 8 post-operatively.

The contained transverse colon perforation was identified on a CT scan at Hospital B on the public holiday admission day. They were admitted under Consultant A that evening and made nil by mouth and placed on intravenous antibiotics. The next day, also a public holiday, they were reviewed by the colorectal registrar (for Consultant B who took over the patient's care) and discussions were had with the patient's partner. The patient was made not for CPR, and it was agreed that it would be better to keep them comfortable rather than have to suffer through surgery. It is noted that the patient had been having regular colonoscopies for polyps until only 2 or 3 years ago.

On day 2 of admission, the patient appeared to be improving with down-trending inflammatory markers. It was explained to the patient's partner that an operation may be offered if there is clinical deterioration. It was also explained that surgery would be high risk, may lead to functional decline and may require the formation of a stoma. Plans were made to commence total parenteral nutrition.

A note on day 5 of admission described the patient as complaining of pain, however, they had improving inflammatory markers and their bowel was working. Allied health referrals were made. Generalised oedema was noted. On day 6 of admission, it was decided to operate on the patient due to increasing pain. This decision was made by Consultant C, who had now taken over care, but it is not exactly clear when this occurred from the notes. The patient was transfused due to low Hb (77 g/L). An anaesthetic review that day described the patient as *"high anaesthetic risk, in view of frail premorbid status"*.

On day 10 of admission, the patient underwent a laparotomy, adhesiolysis and extended right hemicolectomy to treat a perforated transverse colon cancer. They were admitted to ICU for short lived inotropic support. Over the next few days, they became even more fluid overloaded, and transfused for low haemoglobin and developed runs of AF.

On day 4 post-operatively the patient's bowels were active but by this stage requiring full feeding assistance due to dysphagia. They were placed on a thickened fluid diet and the IV antibiotics were stopped. On day 5 post-operatively the patient was deemed as suitable for ward care but was quite deconditioned and remained grossly oedematous. Once on the ward, they became anuric, despite being clinically fluid overloaded. Over the next couple of days, patient was reviewed by geriatric medicine, cardiology and ICU.

A transthoracic echo was planned to check cardiac function. Pleural effusions were noted on chest X-Ray.

On day 8 post-operatively, the patient became tachypnoeic and acidotic. IV antibiotics were recommenced. The patient commenced non-invasive ventilation as they were not for CPR or intubation. The patient's GCS dropped, and they suffered from a cardiac arrest and died.

DISCUSSION

The early discussions with the patient and partner about the reasoning for the non-operative management are sound and the potential drawbacks of surgery are reasonably addressed. However, these discussions fall short on eliminating the potential of surgery altogether, which is certainly a very difficult discussion to have. Given that the patient was already frail, surgery may have been better performed early on, or not at all, as leaving it as a "last resort", when the patient has deteriorated, all but eliminates any chance of salvage.

The other factor, which is very difficult to address, is the frequent change of surgeons over a public holiday period, which is very common in many hospitals. Consultant C clearly disagreed with his colleagues' initial diagnosis (as per Consultant C's report) and felt compelled to operate because he suspected a missed malignancy. If a plan had been made from the start that the patient was not for surgery at all, then Consultant C may not have had to make that decision at that late stage. Nevertheless, this could not have been helped and the plans from the earlier surgeons did include the option of surgery if there was a failure of non-operative management, which was the case. As a side note, it was not unreasonable for the earlier surgeons to not suspect colonic cancer initially, given that the patient had been having regular colonoscopies.

Finally, it seems that the patient suffered from intractable fluid overload, perhaps due to a failing heart, presumably exacerbated by sepsis. Given how difficult this was to treat, it would seem that this was overlooked, as this is a fairly significant predictor of poor post-operative outcome.

CLINICAL LESSONS

The main learning points here relate to the management of frail patients and futile surgery. Given that everyone agreed that this patient was a very high-risk surgical candidate, a firm decision at the start that states that the patient is not for CPR, intubation or surgery would have removed the prolonged ICU admission and prolonged post-operative failure to thrive.

The outcome would have been the same, meaning that surgery was futile and that could have been avoided.

Case Two - General Surgery: Airway protection and decision to operate

SUMMARY

A patient in their late 80s with history of large complex hiatus hernia was managed non-operatively one year prior and previous PEG insertion for management of this issue. They presented to hospital with profuse vomiting and inability to tolerate oral intake. Investigations showed an obstructed hiatus hernia which was managed non-operatively with nasogastric tube insertion, and for consideration of elective repair.

The patient subsequently self-removed the NG tube as they couldn't tolerate it and likely aspirated with hypotension requiring ICU admission. The patient was delirious and first attempt at repeat CT scan was abandoned despite midazolam. Subsequently, a repeat CT scan reconfirmed the diagnosis, and the decision was made to perform an acute operation (hiatus hernia repair). The choice of operation was appropriate however the timing was delayed to the next day. It appears the patient made a slow recovery and subsequently, had on-going medical issues (urosepsis, recurrent aspiration pneumonia, acute kidney injury, atrial fibrillation, and delirium secondary to the on-going medical illnesses). During the prolonged ICU/hospital stay, the patient continued to deteriorate and may have aspirated during a follow-up Gastrografin® study. The patient had a significant aspiration event the night prior to their death.

DISCUSSION

The medical management of this patient's hospital stay was appropriate (IV antibiotics, multiple teams involved, ICU care, surgical care). An initial decision was made to manage this patient non-operatively when they presented to hospital. When the patient deteriorated, the decision was made to perform an operation.

This patient had clearly deteriorated (hypotension, rapid atrial fibrillation) compared to on admission when the decision was made not to operate. Would a non-operative approach with medical stabilisation be more appropriate in the first instance rather than performing an operation on an unwell late 80s patient? This would allow a period of observation on how they would progress and to stabilise them medically.

Once the decision was made to perform an operation, it may have been better not to have a delay to theatre in an unwell late 80s, i.e., it probably should have been performed that same day/evening if possible. The delay may not have changed the outcome, but it would be better not to leave an unwell late 80s patient another day of being unwell.

Once the operation was performed, the patient's recovery was complicated by multiple medical issues, and this was probably expected given their age and condition peri-operatively. The post-operative care was appropriate.

CLINICAL LESSONS

This case highlights the difficulty in managing an unwell elderly patient with a complex surgical issue. The decision to operate and the timing of the operation are difficult issues to solve. The communication with the family was open and was done well in this case, and that is also a good learning point to always keep in touch with family especially when managing difficult/complex surgical patients.

Case Three - General Surgery: Sepsis and delay in recognising anastomotic leak

SUMMARY

A 67-year-old patient presented to a metropolitan emergency department with an acute large bowel obstruction (LBO) and was appropriately transferred to a higher-level care facility. This is on a background of type 2 diabetes mellitus (on metformin), hypertension and iron deficiency anaemia. The CT scan suggested partial obstruction with transition point in the proximal sigmoid. The ileo-caecal valve was competent.

The care plan was for a restorative procedure rather than a Hartmann's operation (a colostomy). The patient had an open anterior resection with an "on-table lavage". On post-operative day 4 the patient suffered a leak from the anastomosis and developed over-whelming sepsis. The patient was returned to theatre, at which time the anastomosis was resected, and an end-colostomy was performed. A full wash-out of the abdominal cavity was also undertaken. The patient died on day 10 after initial presentation due to overwhelming sepsis associated with the anastomotic leak.

DISCUSSION

This patient may not have died if the initial operation had been a Hartmann's procedure. However, it is well established that resection and primary anastomosis is a reasonable approach with LBO, as this approach avoids 3-6 months with a colostomy and the morbidity and potential mortality of a second laparotomy to reverse the Hartmann's procedure. There is an associated risk of around 5% of an anastomotic leak when a resection and primary anastomosis is performed - which is what unfortunately occurred.

The patient underwent emergency open anterior resection with primary anastomosis by the colorectal consultant and senior colorectal fellow. No covering loop ileostomy was utilised. Frank peritoneal contamination was noted, but there were no signs of malignancy. Histopathology later revealed diverticular disease with active chronic colitis and patchy ulceration.

The patient remained intubated and ventilated in the post-operative period due to concerns about their difficult airway. Nasogastric tube insertion was noted to be difficult and therefore not completed after multiple attempts by the intensive care and anaesthetics team. The patient required inotropic support with noradrenaline at 5 ml/hr initially. The noradrenaline dosage was increased to 8 ml/hr the following day with a plan to extubate. Total parental nutrition was considered and commenced early. Oliguria and fevers up to 38.6°C were noted on post-operative day 1. The patient's bowels opened on the same day however, they remained septic with tachycardia and ongoing inotropic support was required.

On post-operative day 2, they were extubated, however, inotropic requirement continued to increase to 10ml/Hr as the patient progressed into possible vasoplegic/septic shock. C-reactive protein (CRP) was noted at 383 mg/L.

Inotropes were reduced and the patient was cleared for transfer to the ward with arterial and central lines removed. However, fevers were noted at 38.4°C later that evening, with desaturations, and Aramine® required for hypotension. ICU senior consultant involvement remained throughout this time. The patient was subsequently intubated to facilitate a CT scan, which noted free fluid and pneumoperitoneum as well as segmental pulmonary emboli with features of right heart strain. Bilateral pulmonary consolidation was also noted.

Urgent transfer to theatre was arranged that night with 4 quadrant feculent peritonitis noted from an anastomotic leak. A Hartmann's procedure was performed. Histopathology revealed acute ischaemic necrosis at the join with an 18mm defect.

Intra-operative inotropic requirement increased to quad strength noradrenaline 50ml/hr, vasopressin and dobutamine. The patient became acidotic with obstructive shock (secondary to pulmonary embolism) and acute kidney injury. They were commenced on continuous veno-venous haemodialysis. A purpuric rash was noted suggestive of SJS/TEN (Stevens-Johnson Syndrome and toxic epidermal necrolysis) by dermatology, and they were coagulopathic secondary to acute liver failure. Multi-organ failure ensued, with acute liver failure leading to coagulopathy, a reduced level of consciousness, and the stoma became necrotic. The patient then developed upper intestinal bleeding. Supportive care was provided and family discussions about care limitations were attended. The patient died day 10 after initial presentation.

CLINICAL LESSONS

This patient was significantly compromised in the peri-operative period with sepsis in combination with their pre-existing comorbidities. The initial management of primary anastomosis performed by the colorectal team was appropriate. Once the decision was made to operate, the sequence of events was appropriate and timely. The patient's age and clinical condition certainly warranted anastomosis as the preferred choice in experienced hands. The *American Society of Colon and Rectal Surgeons* guidelines recommend this approach².

The post-operative course was difficult due to the ensuing initial sepsis thought to be related to a normal post-operative response. However, in hindsight it is noted that the patient deteriorated early and perhaps extubating early was premature. CRP was noted to be >300 mg/L for two consecutive days³. The ICU team identified that the patient began to experience septic shock post-extubation, and appropriately organised urgent CT imaging and surgical review. The good collaboration between critical care and surgical teams is highlighted in this case. The patient's subsequent severe decline into multi-organ failure after second laparotomy was not unexpected.

It is debatable whether earlier identification of anastomotic leak would have affected the final outcome for the patient. However, concerns remain in the delay to diagnosis for cause of sepsis. Changes suggested would be a lower threshold to consider anastomosis leak as cause for early post-operative deterioration. Possible noradrenaline counter effects on anastomotic ischaemia cannot be ruled out.

Care deficiency centred on non-early recognition of the anastomotic leak as potential cause for high CRP, fevers, and inotrope requirement after the initial operation. Areas of good practice, however, included good communication between teams, and that the patient was operated on by experienced surgeons who utilised up-to-date techniques. There was prompt return to theatre once the established diagnosis of leak was made. Multi-disciplinary care involvement was good, along with other care once the palliative trajectory was identified.

² Hall J, Hardiman K, Lee S, Lightner A, Stocchi L, Paquette IM, Steele SR, Feingold DL; Prepared on behalf of the Clinical Practice Guidelines Committee of the American Society of Colon and Rectal Surgeons. The American Society of Colon and Rectal Surgeons Clinical Practice Guidelines for the Treatment of Left-Sided Colonic Diverticulitis. *Dis Colon Rectum*. 2020 Jun;63(6):728-747. doi: 10.1097/DCR.0000000000001679. PMID: 32384404.

³ Stephensen BD, Reid F, Shaikh S, Carroll R, Smith SR, Pockney P; PREDICT Study Group collaborators. C-reactive protein trajectory to predict colorectal anastomotic leak: PREDICT Study. *Br J Surg*. 2020 Dec;107(13):1832-1837. doi: 10.1002/bjs.11812. Epub 2020 Jul 16. PMID: 32671825.

Case Four - General Surgery under ENT: PEG complication leading to peritonitis

SUMMARY

A patient in their late 60s with significant comorbidities was admitted electively for a wide local excision of floor of mouth, marginal mandibulectomy, bilateral neck dissection, and tracheostomy under the ENT team. The co-morbidities included Childs B cirrhosis with hepatosplenomegaly, atrial fibrillation (AF), epilepsy, alcoholism, cigarette smoking and an anterior resection for colorectal cancer (CRC) in 2019 (chemotherapy for this until three months preoperatively). They were monitored in ICU post-operatively, and inspection of the free flap performed the next day showed it was viable. For the next month, the patient seemed to have steady progress.

One-month post-operatively, due to continued poor oral intake, the upper gastrointestinal (UGI) team was consulted for insertion of a percutaneous endoscopic gastrostomy (PEG) feeding tube. The UGI team felt this was likely to be unsafe due to previous abdominal surgery (in view of prior two laparotomies for CRC and later small bowel obstruction with division of adhesions) and ventral hernia and the risks would need to be weighed against simply continuing the nasogastric feeds. If to proceed, the UGI consultant felt that it would require an open feeding gastrostomy. Due to issues with the nasogastric tube (neck pain, aspiration and oropharyngeal oedema), ENT reconsulted UGI, asking once again for a PEG tube to be considered. UGI suggested that the gastroenterology team be consulted.

The gastroenterology team performed a simple gastroscopy in the first instance. Given that there was good transillumination of the scope light through the abdominal wall, it was felt that a PEG tube insertion would be safe. A week later, a PEG tube was inserted by the gastroenterology team.

Day 1 post PEG insertion, the patient had severe abdominal pain, prompting a CT, which demonstrated a haemoperitoneum. Day 2 post PEG insertion, the fellow reviewed the patient (who was tachycardic and febrile) and suggested the patient needed a laparotomy. At this point, the patient did not wish to have an operation. Later that evening, the patient was re-reviewed by the fellow, and the patient stated that he was now agreeable to surgery. However, given that there were no major haemodynamic status changes, the decision was made to monitor the patient overnight.

Over the course of the next few days, the patient was reviewed by different acute surgical unit (ASU) consultants each day. The patient remained clinically unchanged with ongoing abdominal pain, persistently elevated C-reactive protein (250's mg/L) and mildly tachycardic to 100-110bpm, and occasionally febrile.

On day 5 post PEG insertion, a repeat CT abdomen with tubogram (linogram) was performed, now demonstrating pneumoperitoneum, but no contrast extravasation. On the morning rounds after the CT, a decision was made to commence PEG flushes four times daily but not to commence feeds. The UGI fellow once again reviewed the patient and scans. An impression was given of "*likely micro-perforation/leak and large volume haemoperitoneum*". The plan was given to continue flushes, and if tolerating well, to commence feeds at 10ml/hour the next day. Later that day, the patient had a code blue for fever and tachycardia (T 38.2, HR 144, BP 115) and was transferred to ICU.

On day 6 post PEG insertion, the patient now was in AF with a rate of 134bpm and now commenced on noradrenaline. The ENT team who reviewed the patient felt that the abdomen was "grossly distended" but "less tender than yesterday".

On day 7 post PEG insertion, the patient was reviewed by the night ASU team for increasing abdominal distension and increasing noradrenaline requirements. The ASU consultant in the morning suggested an urgent laparotomy. Two hours later, the patient arrived in the operating theatre. On arrival to the anaesthetic bay, the patient had a systolic blood pressure of 65mmHg with high dose noradrenaline and vasopressin. On transferring the patient to the operating table, the patient lost consciousness and cardiac output and CPR was commenced.

Arterial blood gases showed pH 6.8 and potassium 8 mmol/L. After return of circulation, a laparotomy was performed. Five litres of haemoperitoneum mixed with gastric content was evacuated. The stomach wall was found to be very loose around the PEG tube leading to easy dislodgement. The PEG was removed, the abdomen washed out, and a new PEG placed through the same gastrotomy with the stomach wall tightened around the PEG with multiple interrupted 3-0 PDS sutures. The stomach was then hitched up to the abdominal wall with further interrupted 3-0 PDS. The abdominal fascia was primarily closed with interrupted nylon sutures.

Post-operative laparotomy day 1, the patient was in multi-organ failure (anuric, dialysis dependent, vasopressor-resistant vasoplegia requiring methylene blue infusion, ischaemic hepatitis, thrombocytopenia). A week later, due to lack of improvement in any of these parameters, a discussion with the family was held by ICU and a decision was made to palliate the patient. The patient died shortly thereafter.

DISCUSSION

The failure to recognise this deteriorating patient led to a delay in definitive management. Plans for post-operative feeding could have been anticipated preoperatively by ENT, and therefore discussions had with UGI before the index operation. There was a lack of recognition of risk of malnutrition prior to major head and neck surgery.

It is not clear when the need for gastrostomy had become more pressing, and as to why the general surgical team did not proceed to open gastrostomy. Instead, there was a decision to allow the gastroenterology team to do the PEG insertion, which had already been decided to be too risky. There was a delay in recognition of evolving peritonitis in a critically unwell patient as the patient continued to deteriorate. The patient had persistent tachycardia and intermittent fevers, but inconsistent findings on abdominal examination. Septic screen was performed rather than proceeding to surgery.

This care was clouded by the patient's initial refusal to have more surgery (the necessary laparotomy). Perhaps there were unforeseen delays in getting the patient to theatre once the decision had been made to operate. This was not recognised, possibly due to rotating ASU and ICU teams. The importance of thorough handovers and maintaining continuity of care is emphasised.

Care was somewhat fragmented with varying surgical and medical teams having care input. There was no clear decision maker once the patient had the PEG tube inserted and the complication recognised requiring the later laparotomy.

Area of good practice, however, included the primary operation by ENT and plastics was well performed. The dietetic, speech pathology and physiotherapy treatment were well documented and planned, and ICU support was satisfactory.

CLINICAL LESSONS

Surgical causes of sepsis should be considered following a procedure, and laparotomy was required much earlier. The patient continued to decline, and appreciation of their deteriorating status was not recognised.

This case highlights the need for improved communication and decision making. Having a clear hierarchy of responsibility will help to prevent lack of continuity of general surgical assessment when problems are developing.

The need for PEG tube feeding was not anticipated in a patient having complicated oral surgery and reconstruction who also had a chequered surgical history.

Case Five - Cardiothoracic Surgery: Prolonged bypass and cross-clamp times

SUMMARY

A patient in their early 60s presented to the emergency department with chest pain and in pulmonary oedema. A diagnosis of a NSTEMI was made. Significant past health included Type I diabetes, a smoking history of over a hundred packets a year, previous cerebrovascular accident (CVA), resulting in significant residual ataxia and instability. Due to ongoing chest pain, the patient underwent urgent coronary angiography which demonstrated severe diffuse triple vessel coronary disease with no clear culprit lesion.

The patient was medically stabilised with dual anti-platelet therapy, IV heparin, non-invasive respiratory support, with resolution of the chest pain.

Transthoracic echo performed two days after admission, demonstrated near normal left ventricular size and function. The patient was referred for inpatient coronary artery bypass surgery which the patient initially did not want to pursue. Following further discussion, the patient agreed to proceed with CABG. After extensive work up including carotid dopplers demonstrating bilateral 50-69% stenoses, preserved left ventricular function and given their relatively young age, the patient seemed an acceptable candidate although there was a degree of chronic renal impairment and chronic obstructive pulmonary disease.

The patient underwent a CABG x 6 on day 12 of admission. The operation was a lengthy five-hour procedure, with a prolonged cardiopulmonary bypass and cross-clamp times. The patient was extubated about 12 hours post-operatively and had a fairly straightforward initial post-operative course. They were discharged to the ward on post-operative day 5 following step down in the cardiothoracic ICU. The patient had episodes of paroxysmal atrial fibrillation which was managed medically which included anticoagulation with warfarin. The patient required ongoing rehabilitation and mobility assistance due to the previous CVA and sternal precautions. The patient remained as an inpatient but was otherwise clinically well.

On the afternoon of post-operative day 11, the patient vomited and complained of shortness of breath. Their vital signs appeared to be normal at this time, however nasal prong oxygen for mild desaturation was required. The patient was reviewed by the ward RMO and charted for calcium carbonate to treat a high phosphate, but no other changes were made, or concerns identified. The morning blood pathology had demonstrated worsening renal failure with a potassium 5.7 mmol.

An advanced life support call was made at 6:05pm for asystole and an ECG performed just prior to this demonstrated junctional bradycardia of 40/min. There is scant documentation to explain the patient's condition at the time the ECG was performed pre-arrest. Cardiopulmonary resuscitation was instituted with some return of spontaneous circulation. The interim diagnosis was asystole due to hyperkalaemia. A potassium of 7.2 mmol was noted on the initial arterial blood gases with a profound metabolic acidosis with a pH 6.98 and a lactate 8.1. The patient was transferred to ICU for urgent dialysis. The patient then went into ventricular fibrillation about two hours later from which they could not be resuscitated.

DISCUSSION

This was a high-risk patient with post-acute myocardial infarction angina who was unable to have percutaneous coronary intervention due to diffuse disease and complexity. There were significant risk factors with the previous CVA, poor mobility, and chronic renal failure. The patient was also a smoker with chronic airways limitation, diabetes, and recent unstable angina pectoris following acute myocardial infarction.

According to the European System for Cardiac Operative Risk Evaluation (EuroSCORE II), the patient had a 6% risk of surgical mortality (elective mortality for CABG is 1% in the modern era). The angiography report demonstrated significant left anterior descending and first diagonal artery disease. There was moderate disease in the circumflex artery and right coronary artery with reasonable left ventricular function.

At operation the patient underwent standard CABG surgery employing the left internal mammary artery and long saphenous vein as conduit. Aortic cross-clamp with cardioplegia was employed for myocardial preservation. The cardiopulmonary by-pass and cross-clamp times were prolonged notwithstanding the six CABG procedures performed. The wean from bypass was uneventful, however with modest standard support.

Given the patient's co-morbidities, perhaps more limited surgery and targeted revascularization with grafts to the major vessels may have been an appropriate alternative. The patient had six bypasses; it may have been preferable to limit this to three or four. The post-mortem report noted there was a thrombus in one of the graft vessels and the patient died from a combination of multi-organ and cardiac failure.

It seems a combination of the recent acute myocardial infarction and prolonged surgery with by-pass and cross-clamp times being major contributors to the outcome. Grafting the small diagonal vessels probably would have had limited positive effect on the outcome and be detrimental in taking up time. Limiting the cross-clamp time may have offered better myocardial protection.

The early recovery was uneventful, but demise was likely secondary to chronic congestive failure, multi-organ failure and likely terminal arrhythmia. The post-mortem report of lateral left ventricular infarct with thrombus in the first diagonal artery graft, may have been either pre- or post-operative.

The cardiothoracic team was not informed about the deterioration in the patient's condition on post-operative day 11. Following this, after the arrest call the cardiothoracic registrar was informed once cardiopulmonary resuscitation/advanced care life support had been in progress for 50 minutes. Possibly if the cardiothoracic service registrar had been asked to review the patient earlier in the afternoon/evening they could have been moved to a higher level of care and more closely monitored/assessed, and the significance of a raised serum potassium in a patient with renal failure noted.

The good points regarding care, however, were that the surgical team offered surgery when percutaneous coronary intervention was declined by cardiology.

It seems the patient's early recovery was on pathway but, not unexpectedly, multi-organ failure set in with an acute deterioration. The patient would be a demonstrable significant risk CABG given the preoperative morbidities and recurrent unstable angina pectoris with recent acute myocardial infarction.

CLINICAL LESSONS

It is well known that in patients with recent unstable angina pectoris, acute myocardial infarction and significant risk factors, that longer cardiopulmonary bypass and aortic cross-clamp times increases mortality and morbidity, which can show after initial survival post procedure. Perhaps a more limited and targeted revascularization with grafts to the major vessels and shorter cardiopulmonary bypass and cross-clamp times would have improved the outcome.

Communication with the cardiothoracic team about the patient's acute deterioration and worsening renal failure was delayed. The opportunity to do anything pre-emptive was limited by the delay in communication. The consultant was informed of events one hour after resuscitation had been underway. Earlier contact may have facilitated change in care plan.

Each surgeon will have their own approach and tolerance. Although complete revascularization would have been achieved in this case (accepting the thrombus in one graft/vessel) sometimes less is more in high-risk patients.

Case Six - Cardiothoracic Surgery: Post-operative ventricular arrhythmia

SUMMARY

A patient in their early 70s was admitted to Hospital A under the cardiology team for ongoing heart failure, secondary to aortic regurgitation, aortic root dilatation, mitral regurgitation, tricuspid regurgitation and poor ventricular function. The estimated ejection fraction was between 25-35% on echocardiography, and subsequent coronary angiography was normal.

The patient had declined aortic root surgery offered three years previously under Consultant A at Hospital B. The patient was an overseas visitor with basic private health insurance and was accepted for full care on that basis. Preoperatively they had inotropic support with dobutamine and diuretic management with some improvement in their acute on chronic renal failure. A multi-disciplinary team discussion documented the issues quite well and recommended surgery as their only hope.

A preoperative EuroSCORE II was performed. Depending on some variables, this showed up to 59.1% mortality, on the assumption that the patient had pulmonary hypertension above 55mmHg, left ventricular ejection fraction of 25-35%, and needing multi-component surgery.

The patient had aortic root replacement with tissue valve and composite graft, mitral valve replacement, tricuspid annuloplasty, and top end anastomosis of the prosthetic aortic root was performed under deep hypothermic circulatory arrest. The aortic cross clamp time was 177 minutes and cardiopulmonary bypass time was 300 minutes, with a deep hypothermic circulatory arrest time of 32 minutes. This operation would be uncommon, and in the setting of poor ventricular function it carried significant risk. Myocardial protection was provided by del Nido cardioplegia (DNC) solution hourly with half doses after the first hour. In the notes, there was no mention of cerebral protection when deep hypothermic circulatory arrest at 18 degrees Celsius was performed.

Myocardial protection was adequate as the patient managed to be weaned from cardiopulmonary bypass after such a long procedure. They were managed with modest inotropic support and needed some haemostatic assistance with blood products, which is standard.

The early post-operative period seemed uneventful with good progress; with the patient transferred relatively early from cardiac ICU. Whilst on the ward they were observed to be agitated requiring a psychiatric assessment, but most likely the cause of this was possibly low cardiac output, culminating in an episode of ventricular arrhythmia. This may well have been exacerbated by the fact the patient was loaded with Amiodarone and was on Bisoprolol relatively early, with a combination of Amiodarone and Beta blockers being known to promote Torsade des Pointes ventricular arrhythmia.

There was delayed recognition of no cardiac output. An assistant in nursing had been supervising the patient but failed to recognize that the patient had slumped forward as an arrest event. The patient was successfully resuscitated and transferred to the intensive care unit, but progressively developed neurological as well as multi-organ failure. Treatment was withdrawn at an appropriate time.

DISCUSSION

There was excellent multi-disciplinary team presentation including input of Consultant B. Accepting a high-risk patient like this knowing that surgery is really the only option is to be commended. The patient could die within three months of heart failure without an attempt at surgery. Technically the surgery seemed very well performed although most surgeons would think a clamp time of three hours and a bypass time of five hours if at all should be avoided, except in exceptional circumstances. The myocardial protection was obviously adequate as the patient survived the post-surgery period. Early cardiac output and bleeding management was well executed.

The decision to operate with high predicted mortality is a difficult choice and there would be a reasonable spread of opinions regarding this case. Should simpler surgery have been performed? i.e., no deep hypothermic circulatory arrest for the top end of the aortic anastomosis, given the aortic clamping for the proximal root replacement and mitral valve surgery. This potentially could have saved significant time with the heart arrested and on cardiopulmonary bypass with only moderate issues with the residual dilated distal ascending aorta.

The patient was high risk for ventricular arrhythmia, and this was likely to be worsened by both Beta blocker and Amiodaron administration. Generally, cardiothoracic surgeons would use monotherapy with Amiodarone one, and Bisoprolol is often at times commenced by cardiology or the intensive care unit, to manage the heart failure component. Ventricular arrhythmia is an independent risk for patients with poor ventricular function, but also increased with dual medications.

A coronial notification was not performed as it was noted that this is not an unexpected outcome after this type of surgery. However, it would be reasonable to formally notify the coroner and give the coronial staff the chance to decline a review rather than assume.

CLINICAL LESSONS

This case highlights three main learning components:

1. The importance of multi-disciplinary team meetings before such complex cases are performed.
2. The question as to whether the procedure can be rationalised, if there are multiple components and some are not absolutely required, to help reduce aortic cross clamp and cardiopulmonary bypass time.
3. Such complex patients with pre-existing heart and renal failure really require prolonged management in a cardiothoracic intensive care unit/high dependency unit setting with cardiothoracic surgery determining most management in conjunction with cardiology and intensive care input.

2021 Data and Trend data (2016-2021)

Part 1: Notifications of Death

The following charts depict the deaths identified by hospital groups and notified to CHASM. Each notification of death (NOD) is reviewed by the CHASM Office to ensure it meets the criteria of the program, as stated in its Terms of Reference. A case is created in the database from the notification and an email issued to the surgeon, requesting a surgical case form be completed and submitted via the fellows interface.

CHASM was notified of 1,901 deaths in 2021, of which 63.81% (n=1,213) were deaths occurring in 2021. Although more notifications were received in 2021, a higher percentage of same-year notifications (73.26%; 1,266) was seen in 2020. Figure 1 below, shows the number of notifications submitted per month for 2021 compared to 2020.

For these reporting years we need to consider the working environment and the impact that COVID-19 had to our services and operations. There was a sharp decline in notifications from March to May in 2021, presumably as the health system pivoted in response to the Delta outbreak. The high in March 2021 (n=267), shows 70.79% (n=189) of notifications were for deaths occurring between March and December 2020. This aligns with the slight plateau seen in variant outbreaks, as such, staff were able to retrospectively review patient deaths and notify CHASM. Likewise, for notifications in August 2020 (n=284), which overall, was the highest month for notifications.

Notifications created 2021 vs 2020

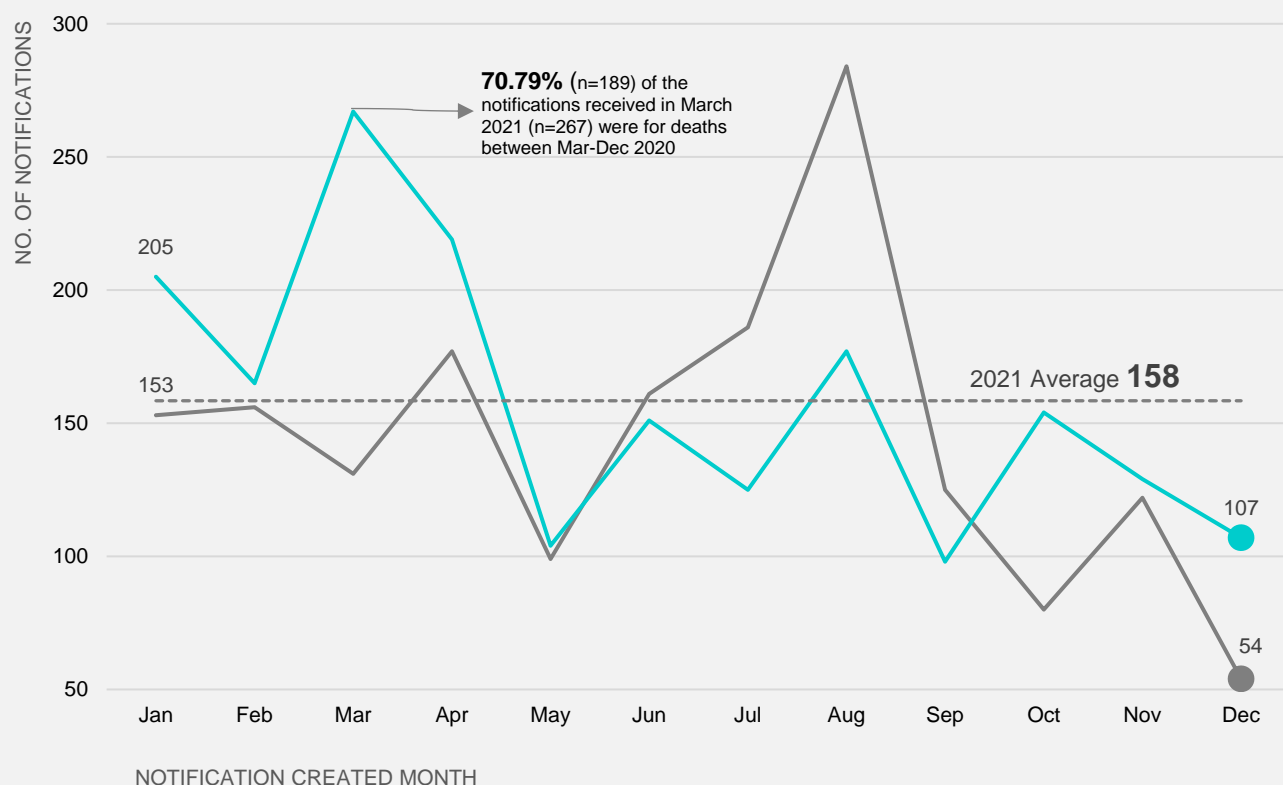


Figure 1: Monthly comparison of notifications submitted to CHASM – 2021 v 2020.

From these notifications we are able to ascertain the distribution for each surgical specialty. Figure 2 below, depicts the number of notifications submitted from highest to lowest. General Surgery ranks the highest with 38.03% (n=723) of total notifications.

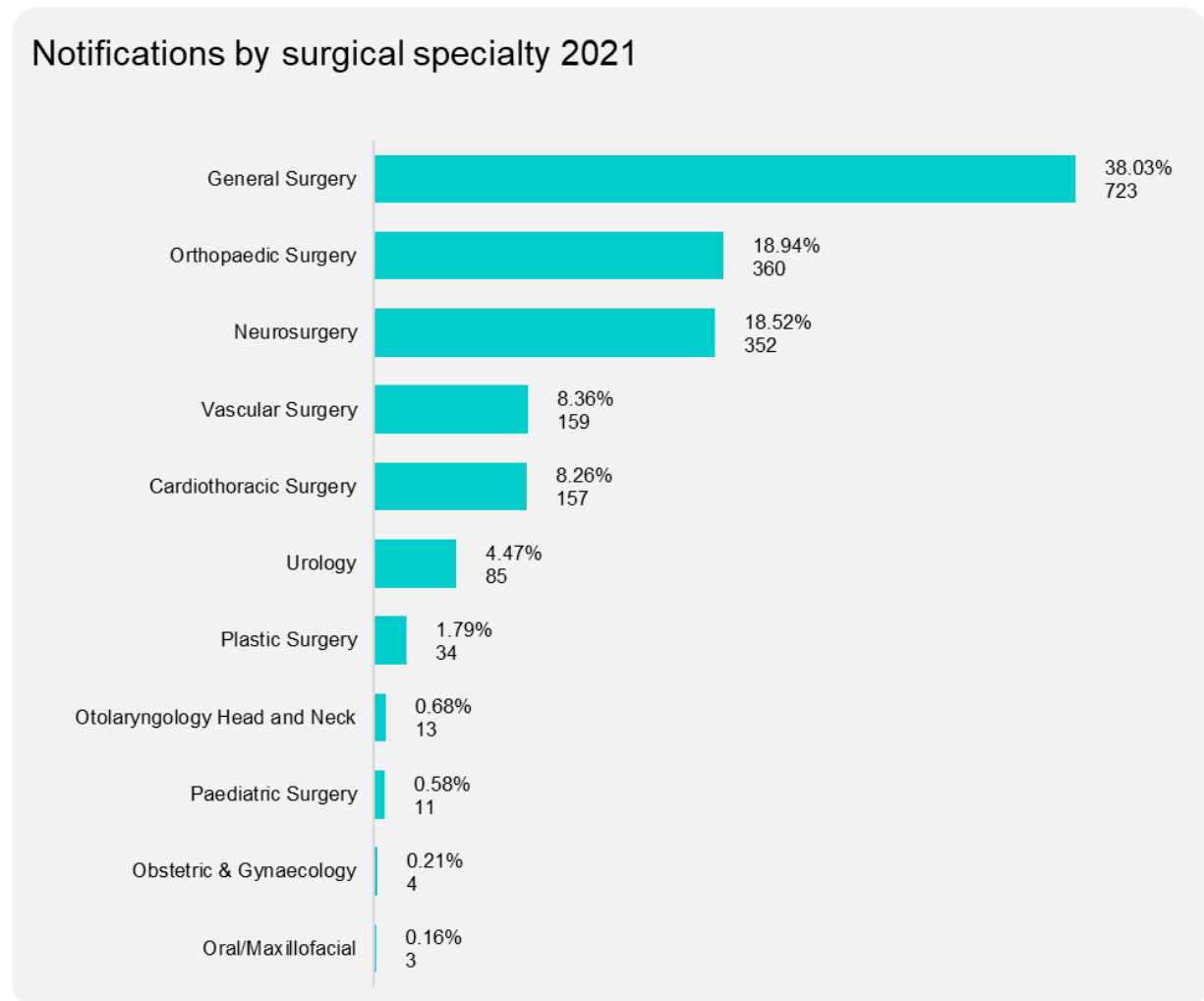


Figure 2: Distribution of notifications submitted in 2021 by specialty.

However, it is important to note that General Surgery has the highest number of registered surgeons practising in the state. It consistently has the highest representation of deaths notified to CHASM, as shown by the trend data for the 2016-2021 reporting period, in Figure 3 below.

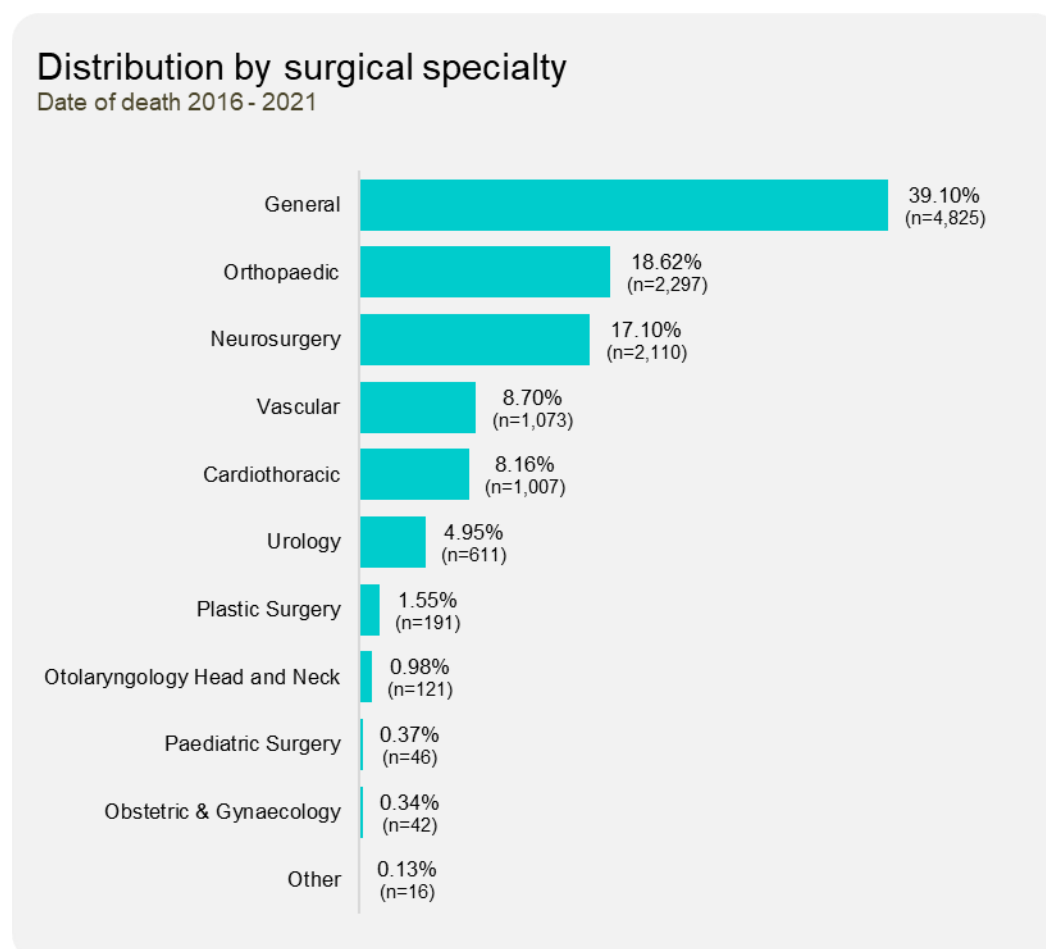


Figure 3: Distribution of notifications for 2016-2021 by specialty and date of death.

Further analysis on the trend data for general surgery, as shown in Figure 4 below, charts the trajectory of total notifications per year against the average number of notifications per year. See **Appendix 1** for all specialties.

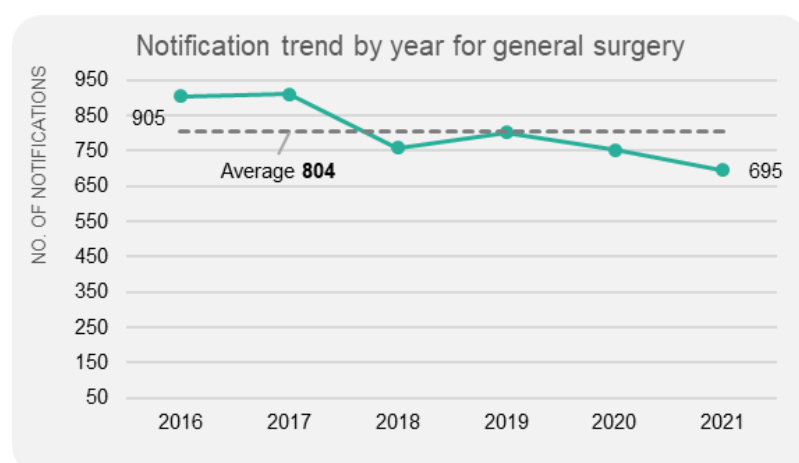


Figure 4: General surgery notifications by year for 2016-2021.

Figure 5, below, shows the distribution of notified surgical deaths for each year of the reporting period, with the highest result in 2017 (n=2,307).

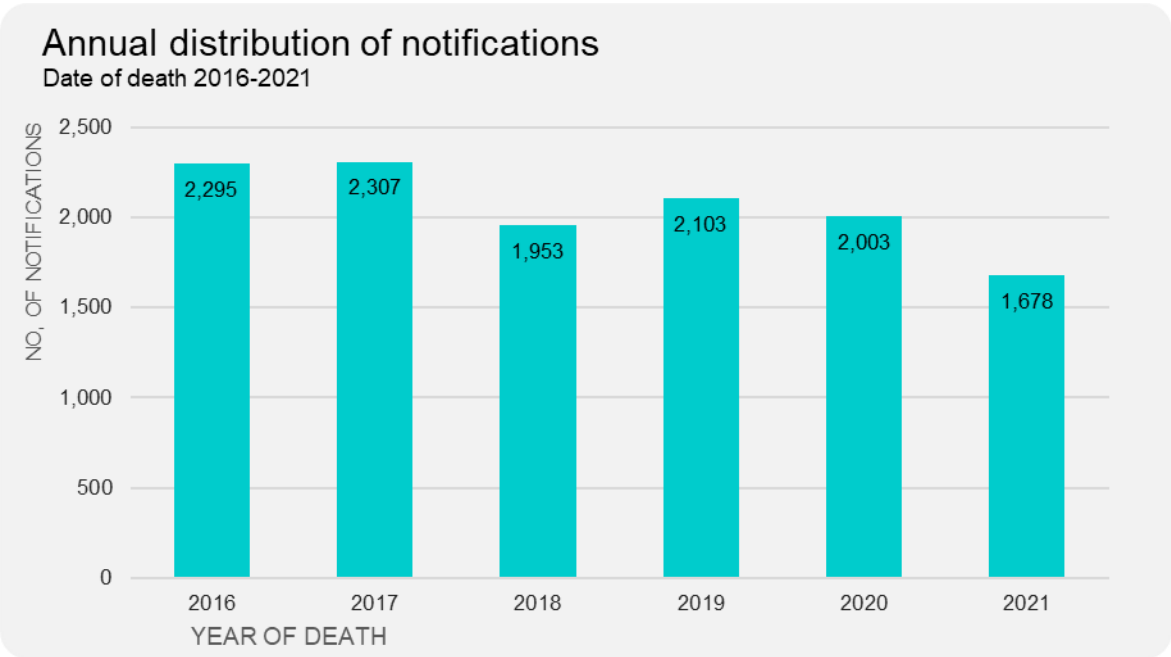


Figure 5: Distribution of notifications by year and date of death (2016-2021).

Appendix 2 is a 6-year trend of the breakdown of notifications by month, including upper (n=211) and lower (n=132) controls. The calculated average is 171 notifications per month.

Analysis on the gender representation across the reporting period identifies male deaths as 11.36% higher than female deaths, as shown in Figure 6, below. The median age was calculated at 52.5 years for both male and female deaths.

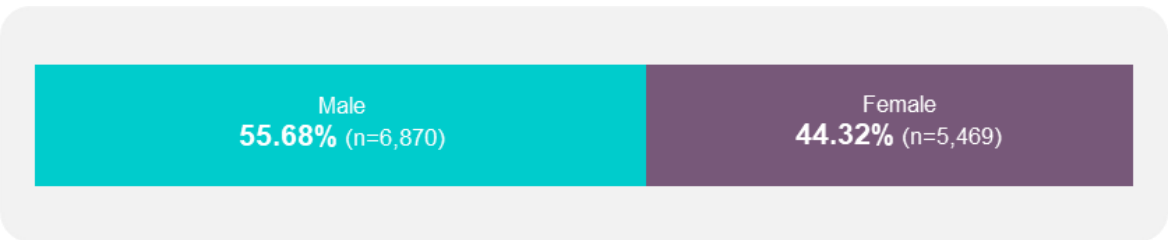


Figure 6: Distribution of notifications by gender (2016-2021).

Appendix 3 is a 6-year trend of the distribution of deaths for young persons aged 20 to 24 years and 25 to 29 years. The highest representation is shown in 2019 (n=22) for young persons aged 25 to 29 years.

Analysis on gender representation for CHASM deaths, as shown in Figure 7, below, shows the distribution by age band for the reporting period. The highest concentration of deaths for males was in the 80-84 years age band, and 85-89 years for females.

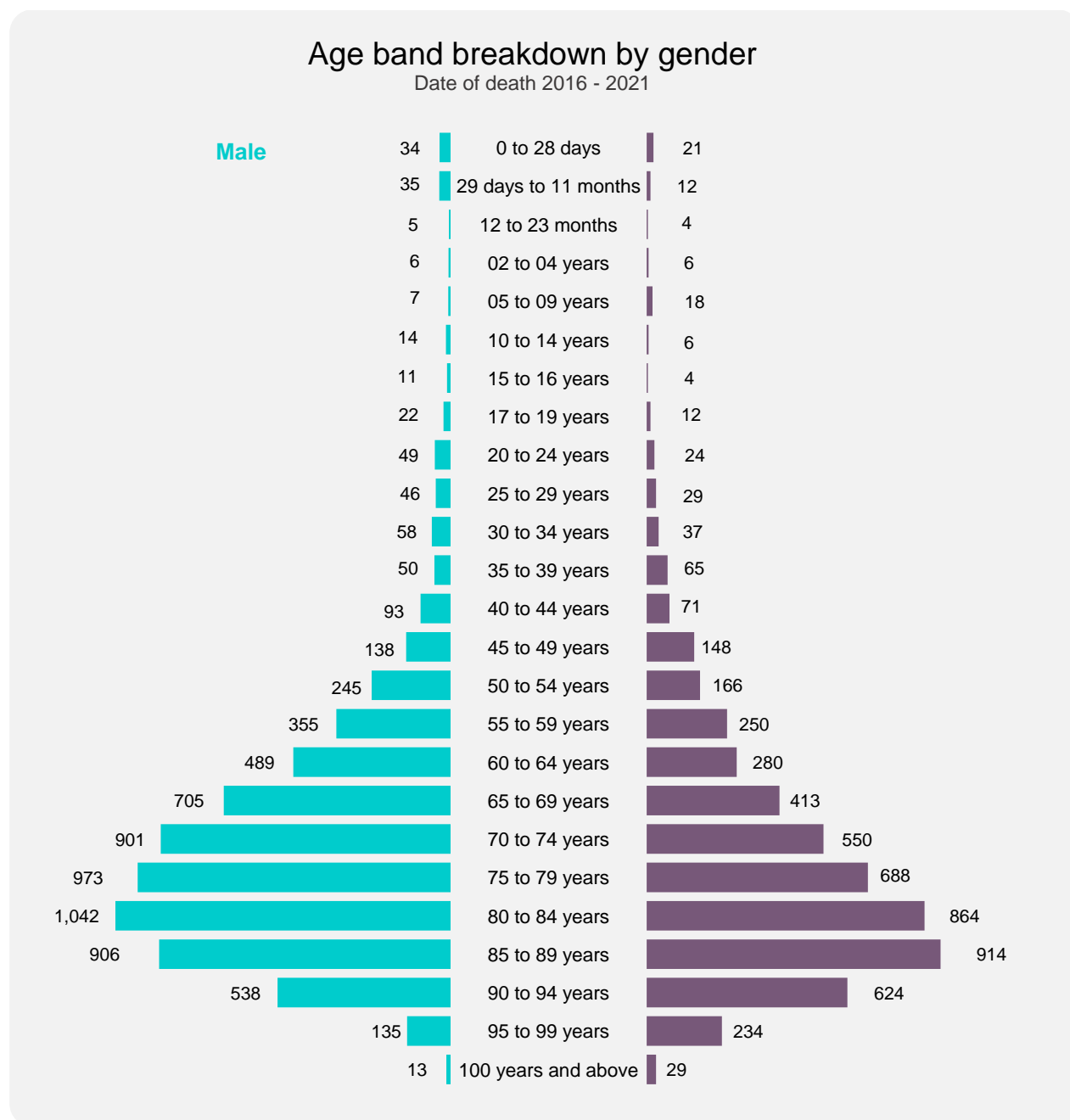


Figure 7: Notifications of death by age band and gender (2016-2021).

Analysis on response rates, as shown in Figure 8 below, depicts the time taken for surgeons to submit case forms to CHASM following the death of a patient. The average response rate was 85.36%, which 9 hospital groups achieved.

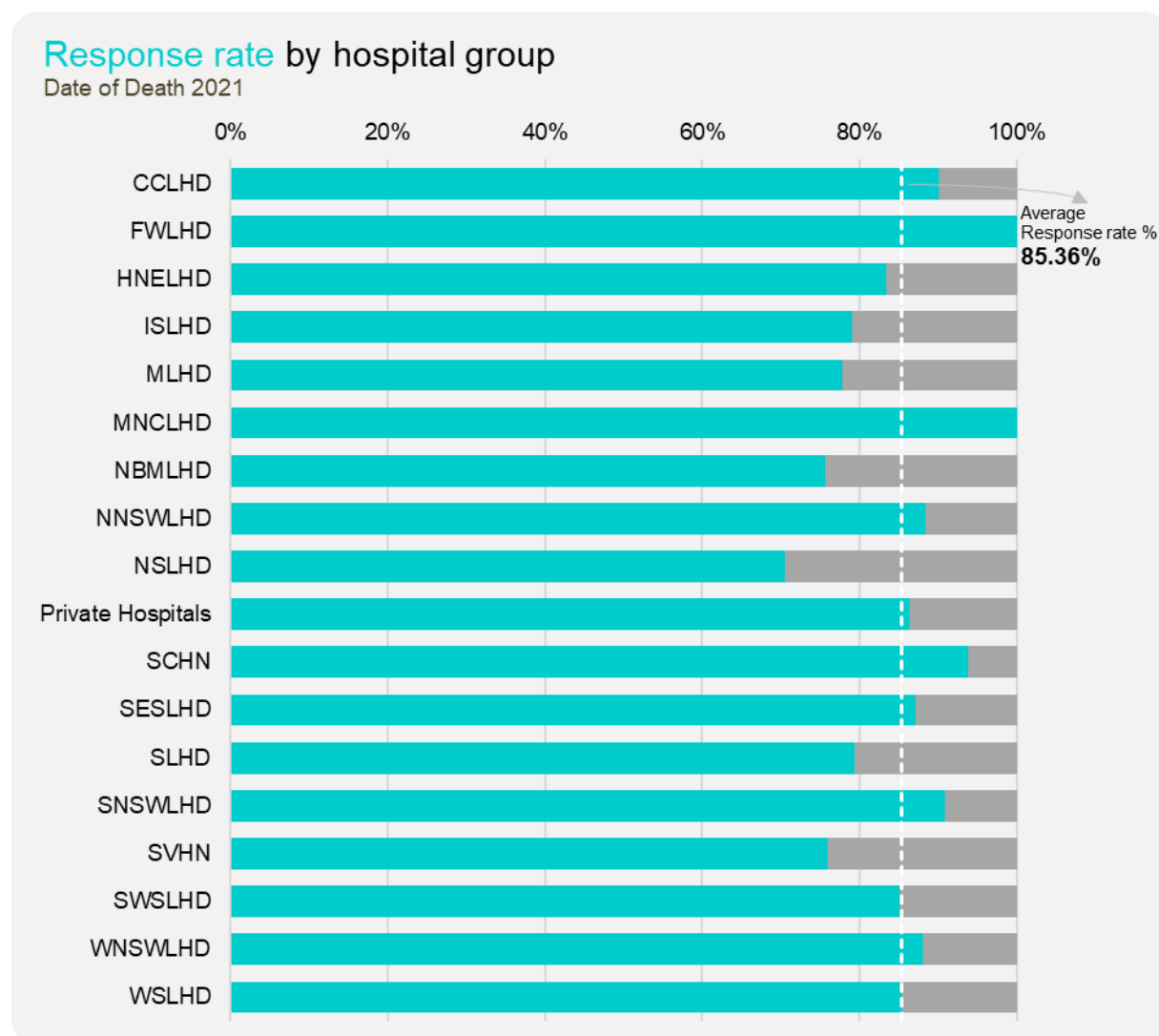


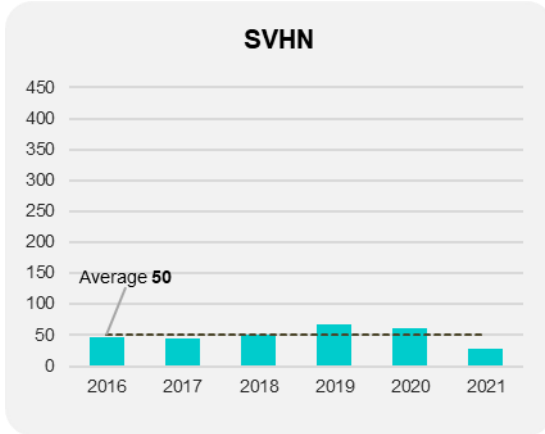
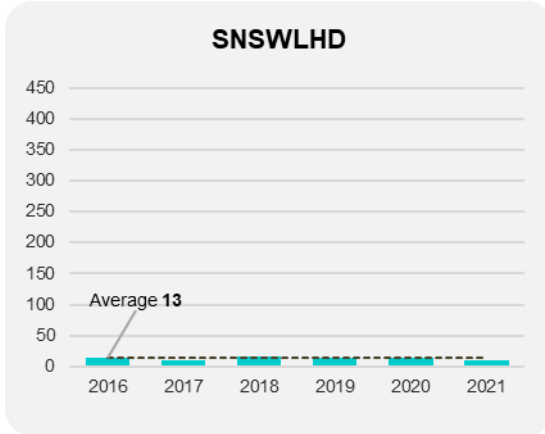
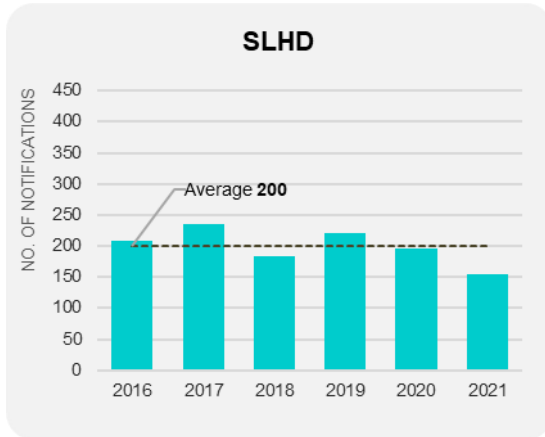
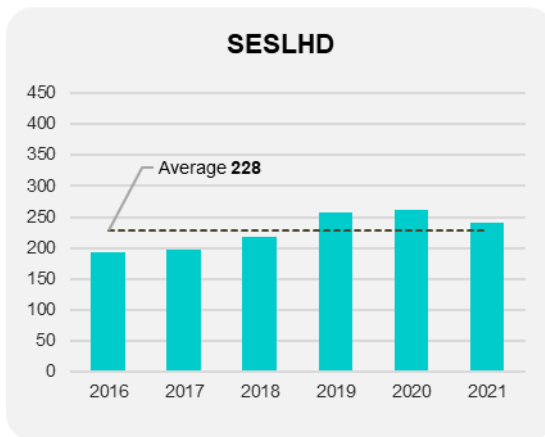
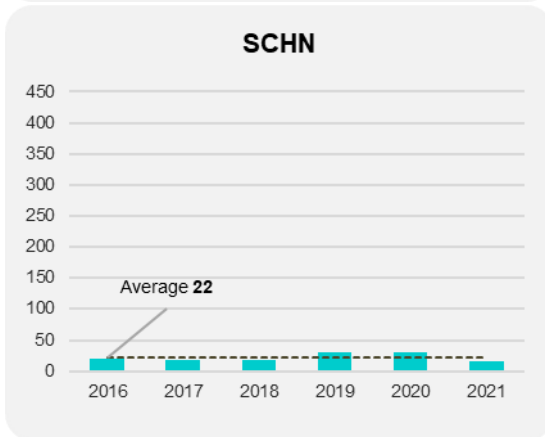
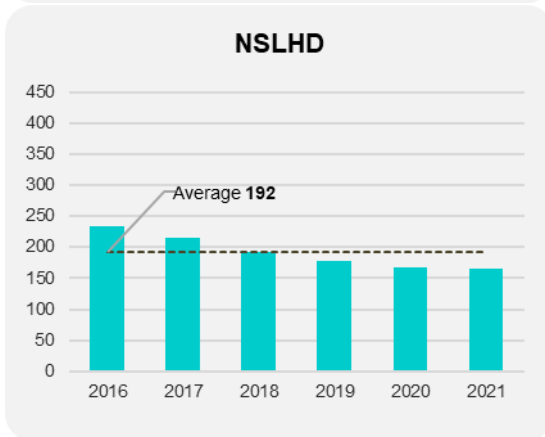
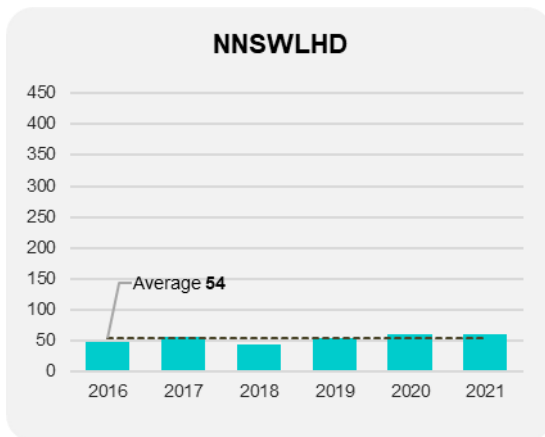
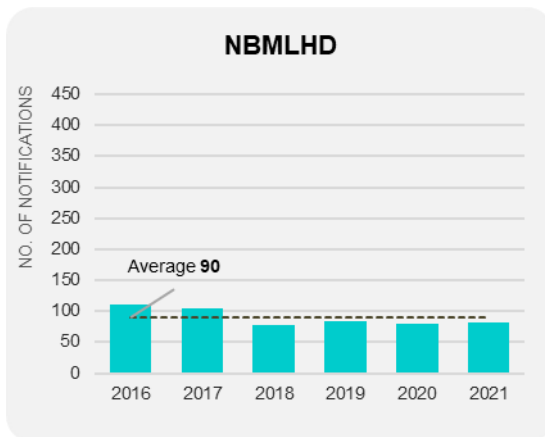
Figure 8: Response rates by surgeons for 2021 deaths by LHD.

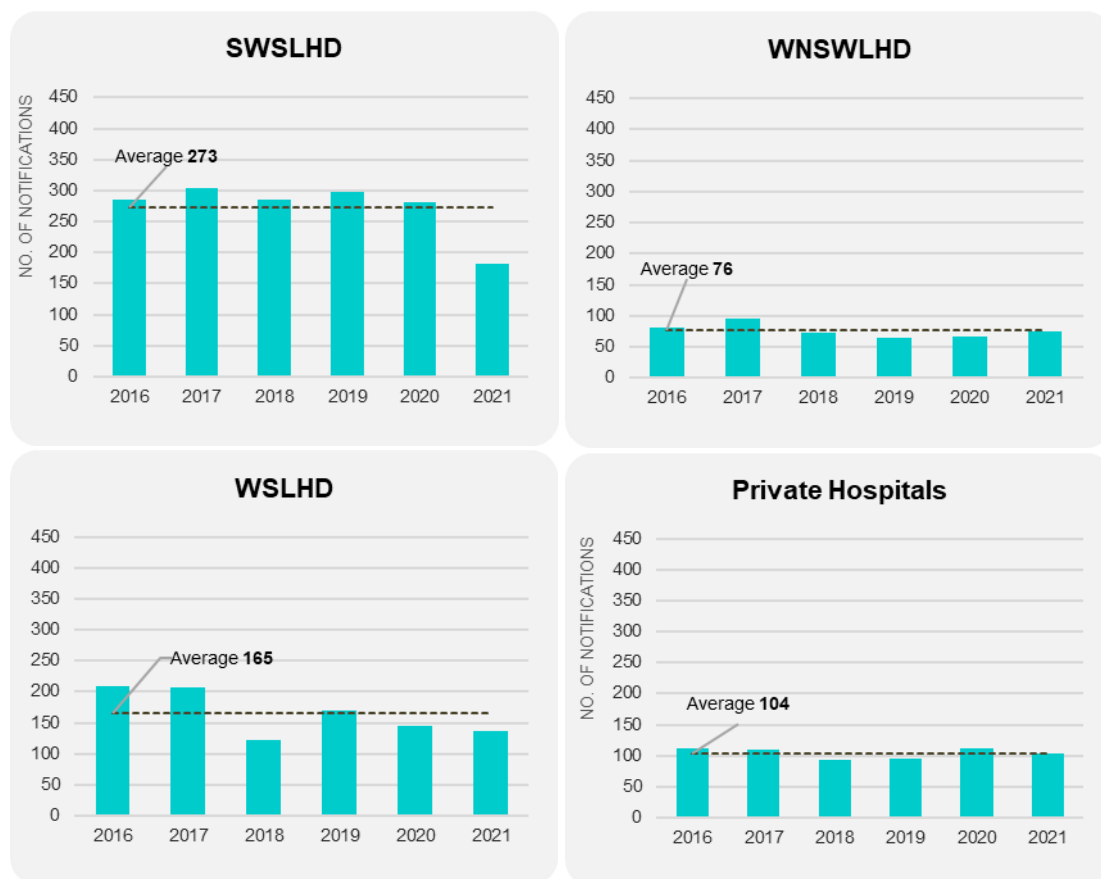
Note: MNCLHD only has self-reported cases submitted for 2021.

A further breakdown for response rates by year and hospital group for the reporting period is provided the Figure 9. The increase depicted in 2020 for Murrumbidgee is due to specific death review screening training provided by the Clinical Excellence Commission to improve local processes. The decrease depicted in 2021 for Mid North Coast is due to CHASM receiving only self-reported deaths from participating surgeons.



Note: Only self-reported cases submitted in 2021.





Note: Breakdown by entity shown in Figure 10.

Figure 9: Notification trend by year for hospital groups (2016-2021).

A breakdown of notifications received by CHASM from private hospital entities is provided in Figure 10, on the following page.

Surgeons also self-reported deaths (n=36) for several smaller private entities across the reporting period, including:

- The Mater Private Hospital (n=9)
- St George Private Hospital (n=5)
- Mater Hospital, North Sydney (n=4)
- Gosford Private Hospital (n=3)
- Lake Macquarie Private Hospital (n=3)
- Lingard Private Hospital (n=3)
- Newcastle Private Hospital (n=2)
- Strathfield Private Hospital
- Campbelltown Private Hospital
- Forster Private Hospital
- Bondi Junction Private Hospital
- Wollongong Private Hospital
- Calvary Health Care Riverina
- Norwest Private Hospital

The Top 8 private entities (n=587), below, show the number of submissions annually and the average for the reporting period.



Figure 10: Top 8 private entities submitting notifications of death to CHASM (2016-2021).

Note: Northern Beaches Hospital has no reporting prior to 2019 as it was established on 30 October 2018. Prince of Wales Private and St Vincent's Private have no CHASM activity reported for 2020 or 2021.

Data analysis for 2021 identifies the time taken to submit notifications to CHASM after a patient's death, as shown in Figure 11, below. Most hospital groups (n=10) demonstrated results above the 60th percentile.

Notifications **within** or **outside** 90 days of death by hospital group 2021

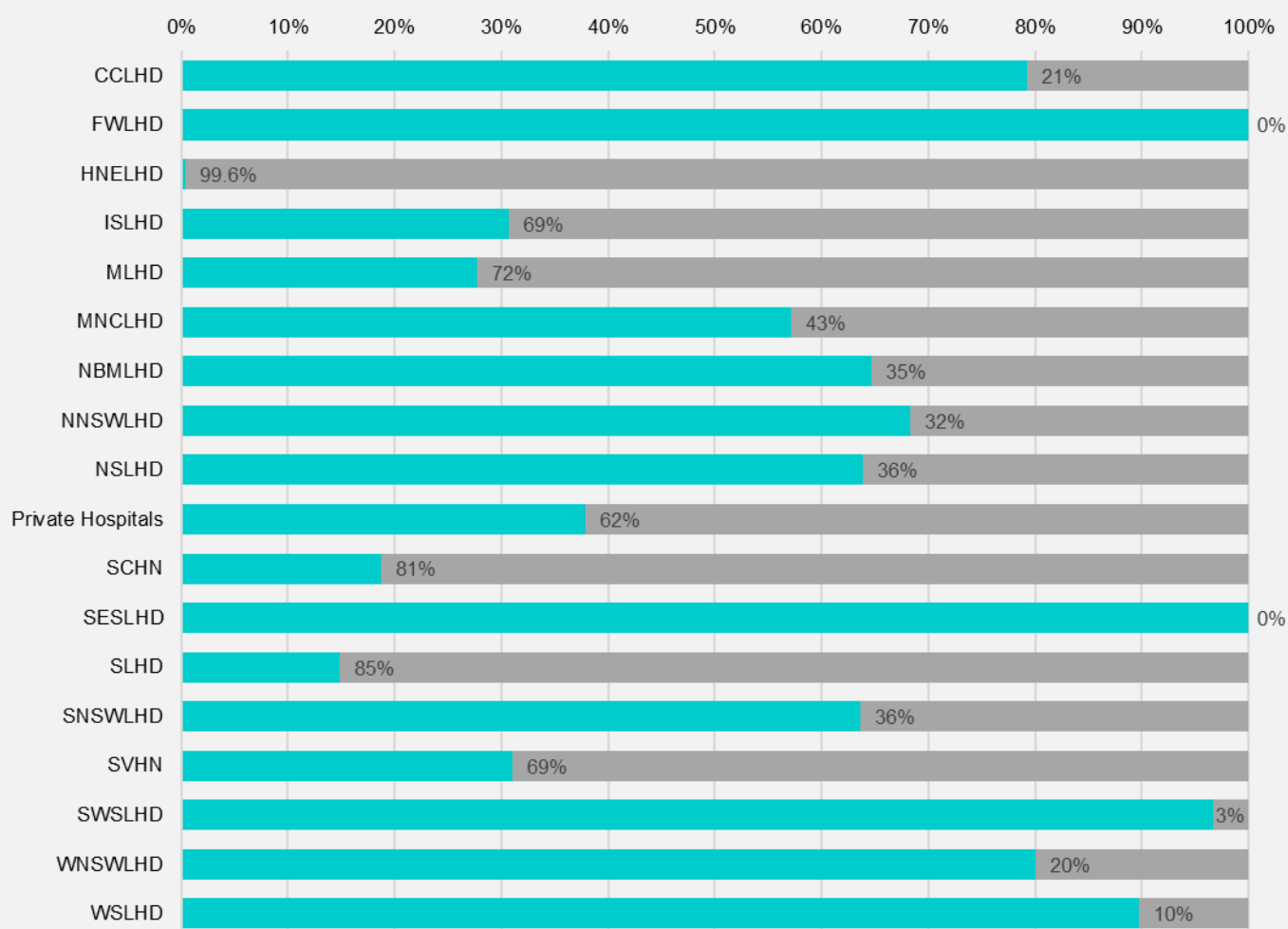


Figure 11: Distribution of submissions by hospital group over and under 90 days of death.

Note: MNCLHD only has self-reported cases submitted for 2021.

A comparison of notifications submitted outside 90 days of death for 2021 and 2020, is shown in Figure 12, below. An obvious expression of delays is apparent for 2020, which aligns itself to the impact that the COVID-19 pandemic had on the health system. Many large metropolitan hospitals had to deploy multiple staff members to support the delivery of frontline services to manage the influx of COVID-19 positive patients.

Notifications outside 90 days of death by hospital group 2020 vs 2021

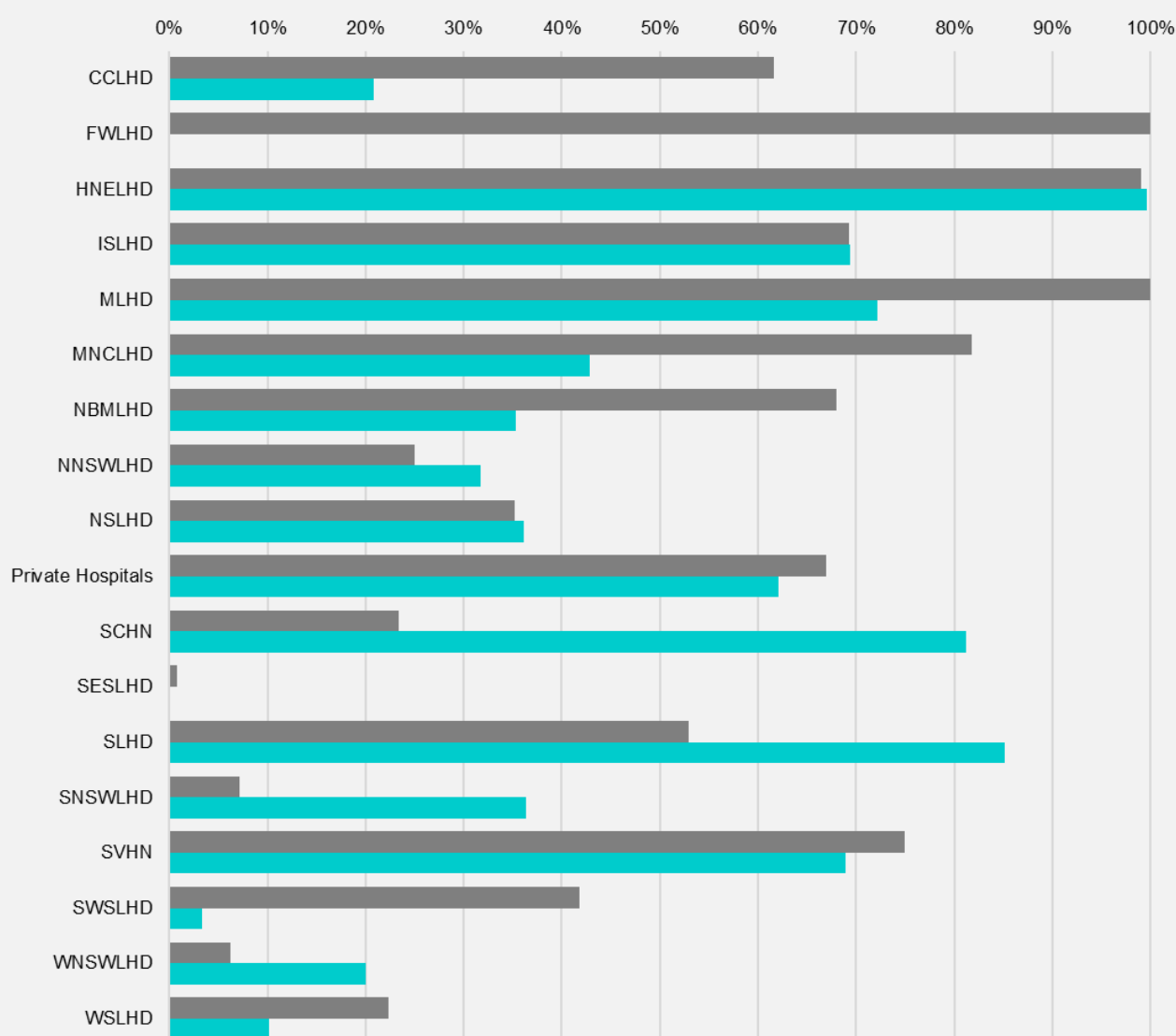


Figure 12: Comparison of notifications submitted outside 90 days of death (2021 v 2020).

A comparison of notifications submitted within 90 days of death for 2021 and 2020, is shown in Figure 13, below.

Notifications within 90 days of death by hospital group 2020 vs 2021

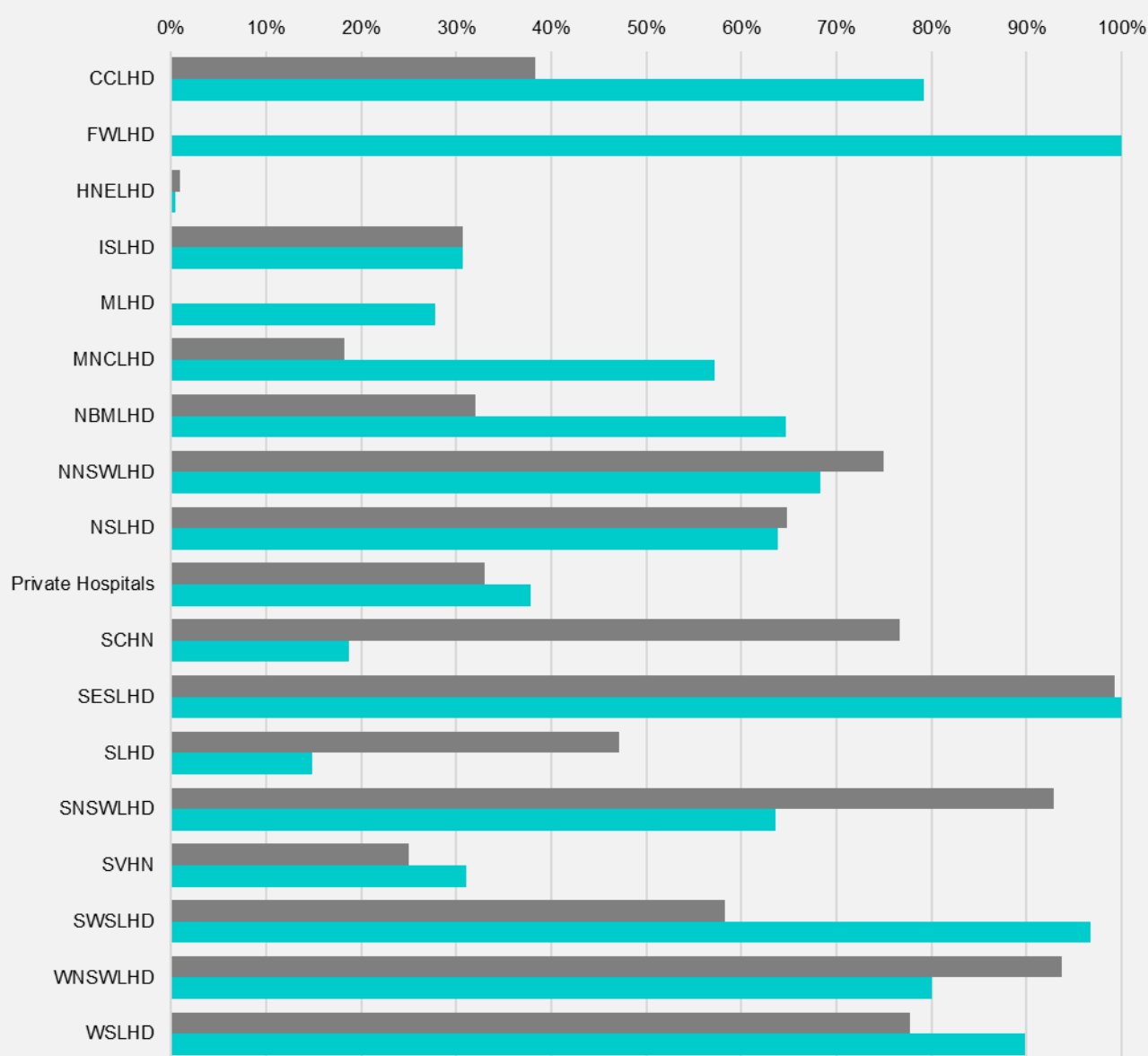


Figure 13: Comparison of notifications submitted within 90 days of death (2021 v 2020).

Further analysis on the responsiveness of hospital groups, as shown in Figure 14 below, identifies that 58.94% (n=989) of notifications of death were submitted to CHASM within 90 days of the patient's death. The highest concentration of notifications in 2021 was seen in the 31-60 day period after death.

Distribution of notifications for 2021 by days variance

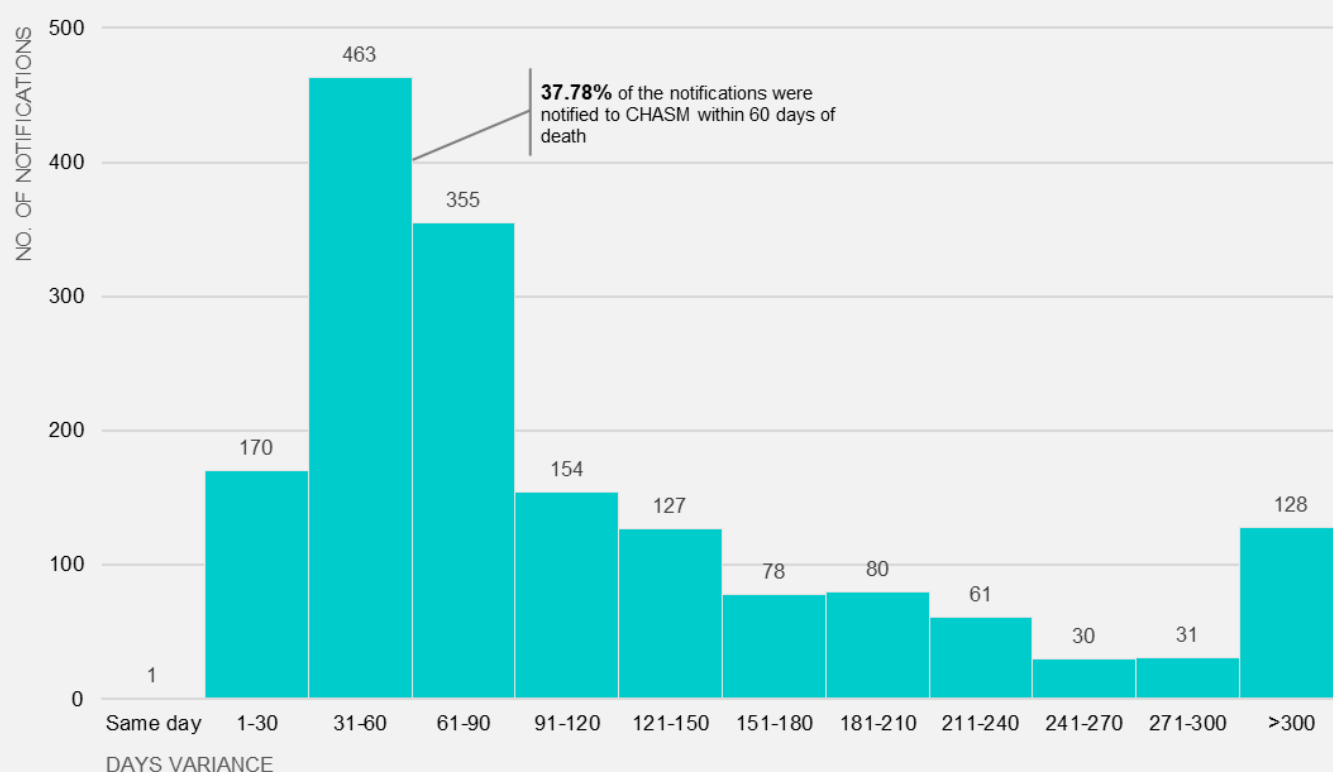


Figure 14: Time taken for hospital groups to submit notification following death (2021).

Trend analysis on notifications submitted to CHASM within 90 days of death for the reporting period is shown in Figure 15, below. It identifies that from 2017, the 31-60 day period has a consistent trajectory for the highest concentration of notifications annually.

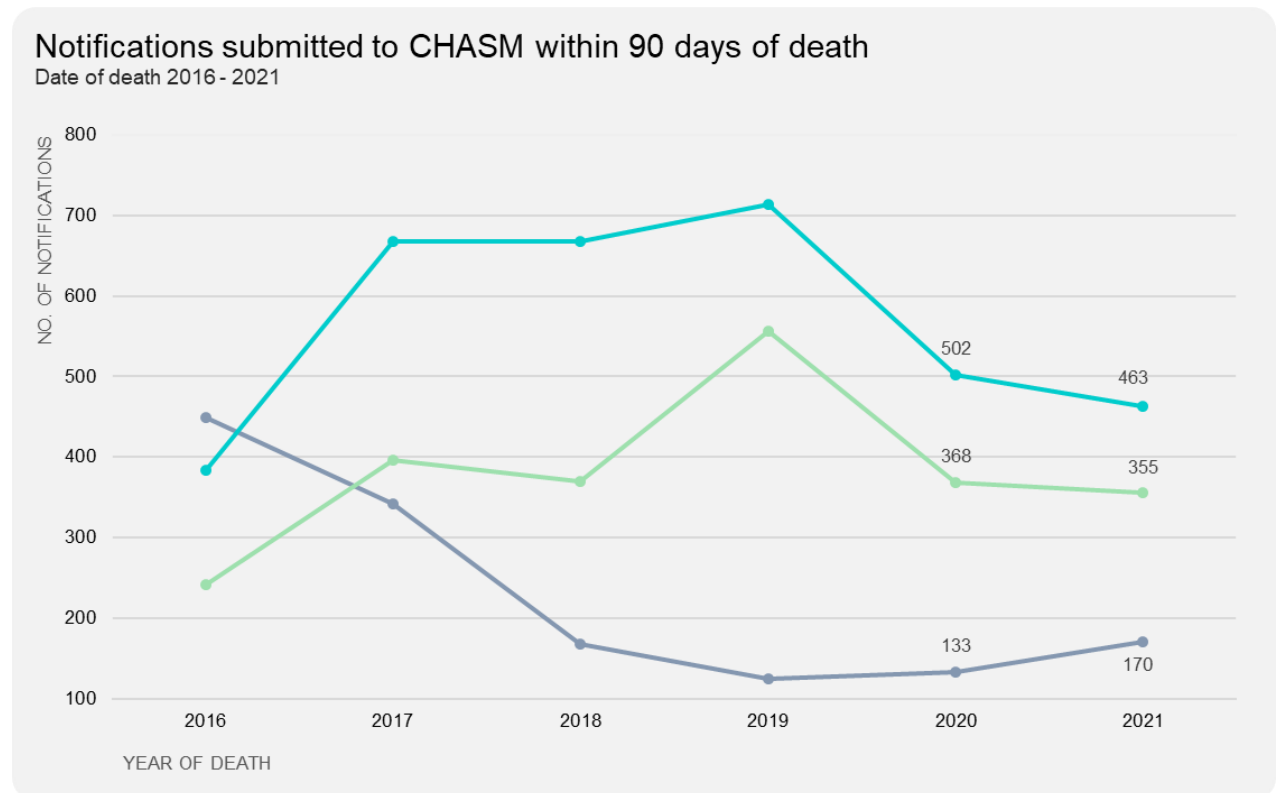


Figure 15: Comparison of days variance within 90 days of death for notifications submitted to CHASM (2016-2021).

Part 2: Surgical Case Forms

Comparative analysis for 2020 and 2021 on the responsiveness of surgeons to the requests issued by CHASM is shown in Figure 16, below. The time taken for surgeons to submit a surgical case form has the highest representation in 2021 for the 1-30 period (36.13%), followed by the over 90 days period in 2020 (35.78%). 2021 also showed an increase in same day responses which is supported by the online reporting system.

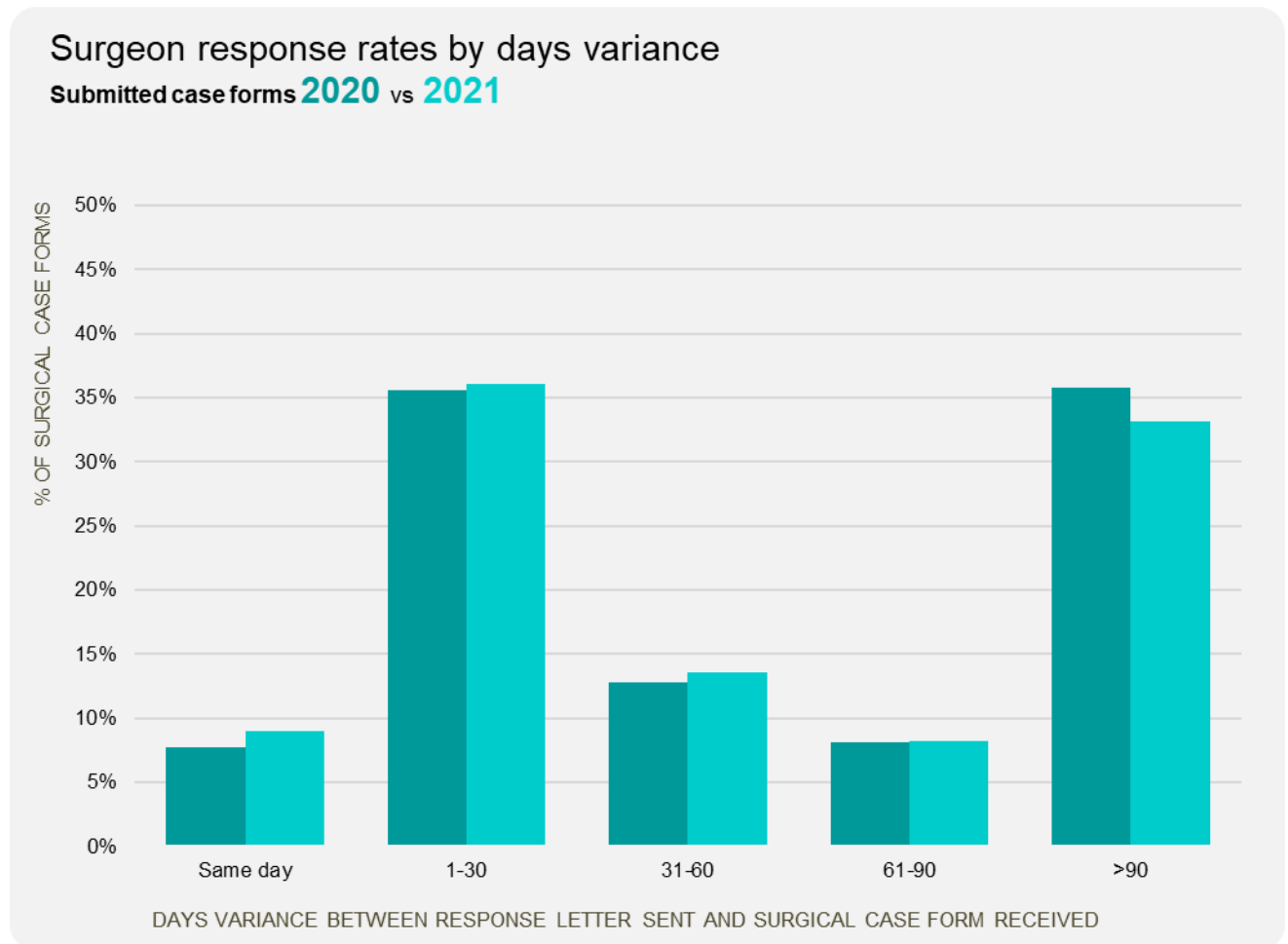


Figure 16: Comparative distribution of days variance for submitted case forms.

Analysis on the Top 20 responses to Question 3 on the surgical case form is shown in Figure 17, below. From the deaths which occurred in 2021, the highest concentration of responses was for the parent code known as “Fracture of neck of femur” (n=157). General surgery diagnoses were seen for ranks 2 and 3 with “Intestinal obstruction without mention of hernia” (n=83) and “Vascular insufficiency of the intestine” (n=59). “Other surgical diagnosis” included “Fracture of prosthetic joint component” (n=12), “Trauma” (n=10) and “Ruptured intracranial aneurysm(s)” (n=8).

Top 20 confirmed main surgical diagnosis

Death of death 2021



Figure 17: Top 20 main surgical diagnoses for deaths in 2021.

A breakdown of the confirmed surgical diagnosis parent code “Fracture of neck of femur” (n=157) identifies the highest response for its child codes is for S30; “Fracture of neck of femur”, which represents 59.24% of responses for the parent code.

Analysis on the trajectory for the child code responses for “Fracture of neck of femur”, as a diagnosis, is shown Figure 18 below, and demonstrates a consistent decrease in numbers from 2017 (n=145) to 2021 (n=93).

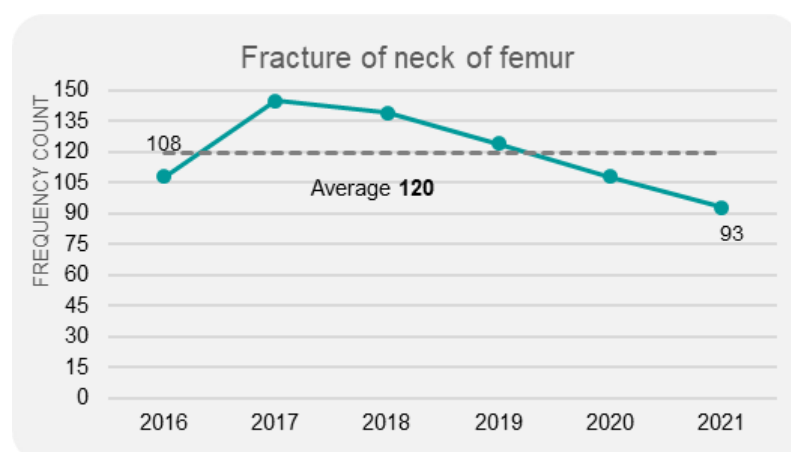


Figure 18: Trend analysis by year for “Fracture neck of femur” diagnosis (2016-2021).

Analysis on the responses to Question 7 is shown in Figure 19, below. Of the total responses for the reporting period, 93.65% (n=8,805) were in the negative, with only 5.41% confirming a delay in diagnosis. A consistent increase in ‘no delay’ responses was identified in the trend analysis, with the highest response of 95.81% for 2021.

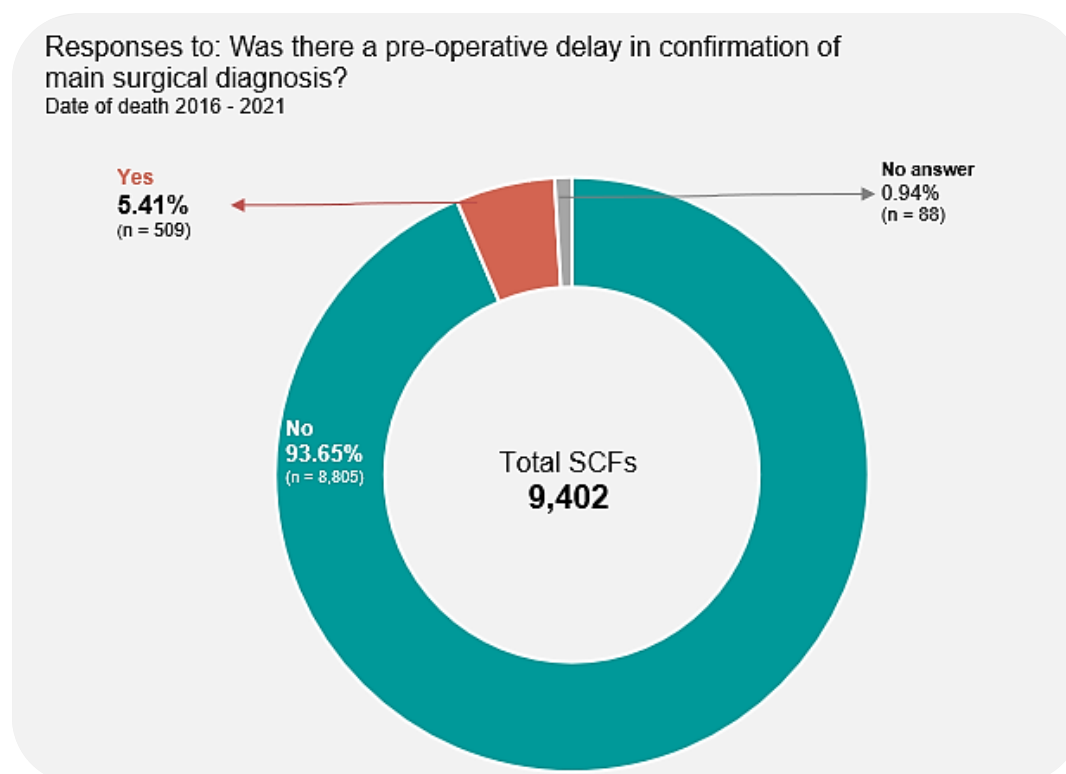


Figure 19: Trend report on pre-operative delay to main surgical diagnosis (2016-2021).

Analysis on the 'Top 15' responses to Question 12 for deaths occurring in 2021 is shown in Figure 20, on the next page. The highest concentration of responses is for the neurosurgical procedure "Burrhole(s) for ventricular external drainage" (n=66), followed closely by the orthopaedic procedure "Primary open reduction and internal fixation of proximal femoral fracture with screw/nail device" (n=65). These two procedures equate to 21.48% of total responses.

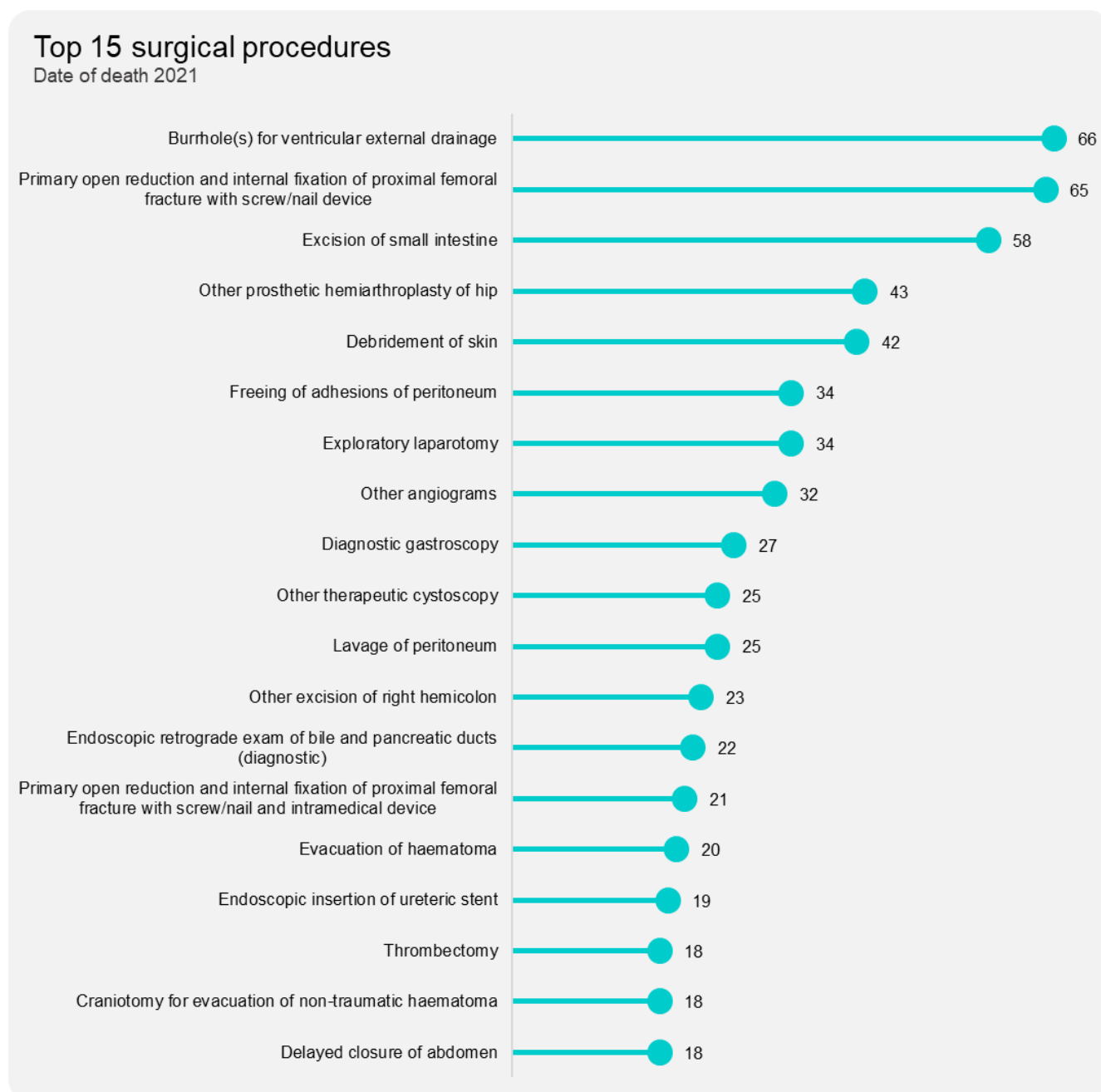


Figure 20: Top 15 operations for deaths in 2021.

Further analysis on responses to Question 12 by surgical specialty are shown in Figures 21 - 26, below. The Top 5 operations for 2021 are identified for 6 specialties and the counts compared for each year of the reporting period. For General surgery, Figure 21 below, the highest response in 2021 was for “Excision of small intestine” which has steadily decreased in frequency over the last five years.

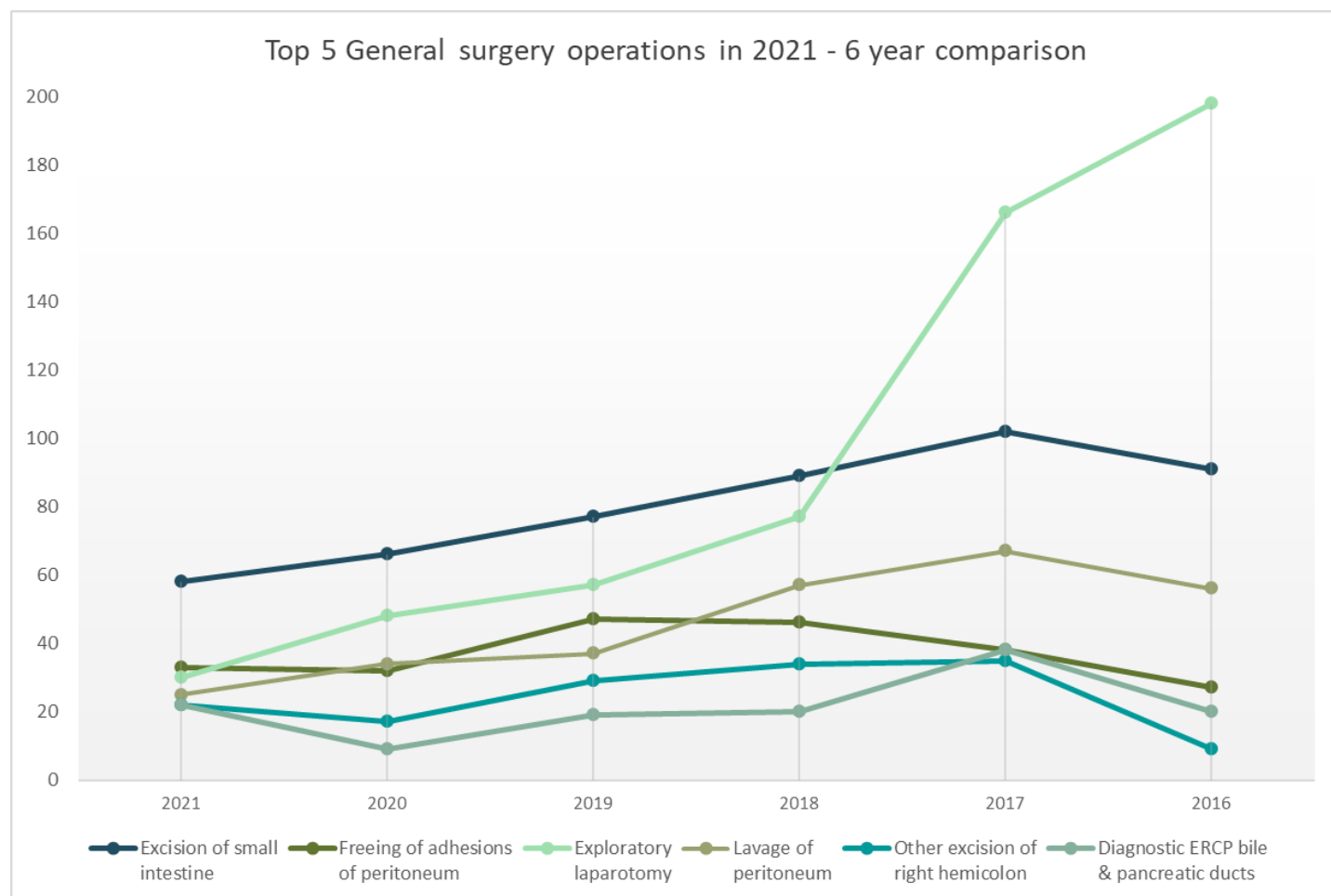


Figure 21: General surgery Top 5 operations (2016-2021).

In Figures 22-26, the Top 5 operations for 2021 are identified for Orthopaedic surgery, Neurosurgery, Vascular surgery, Cardiothoracic surgery and compared across the reporting period. For Orthopaedic surgery, Vascular surgery and Neurosurgery the trajectory for the highest operation remained consistent for each year.

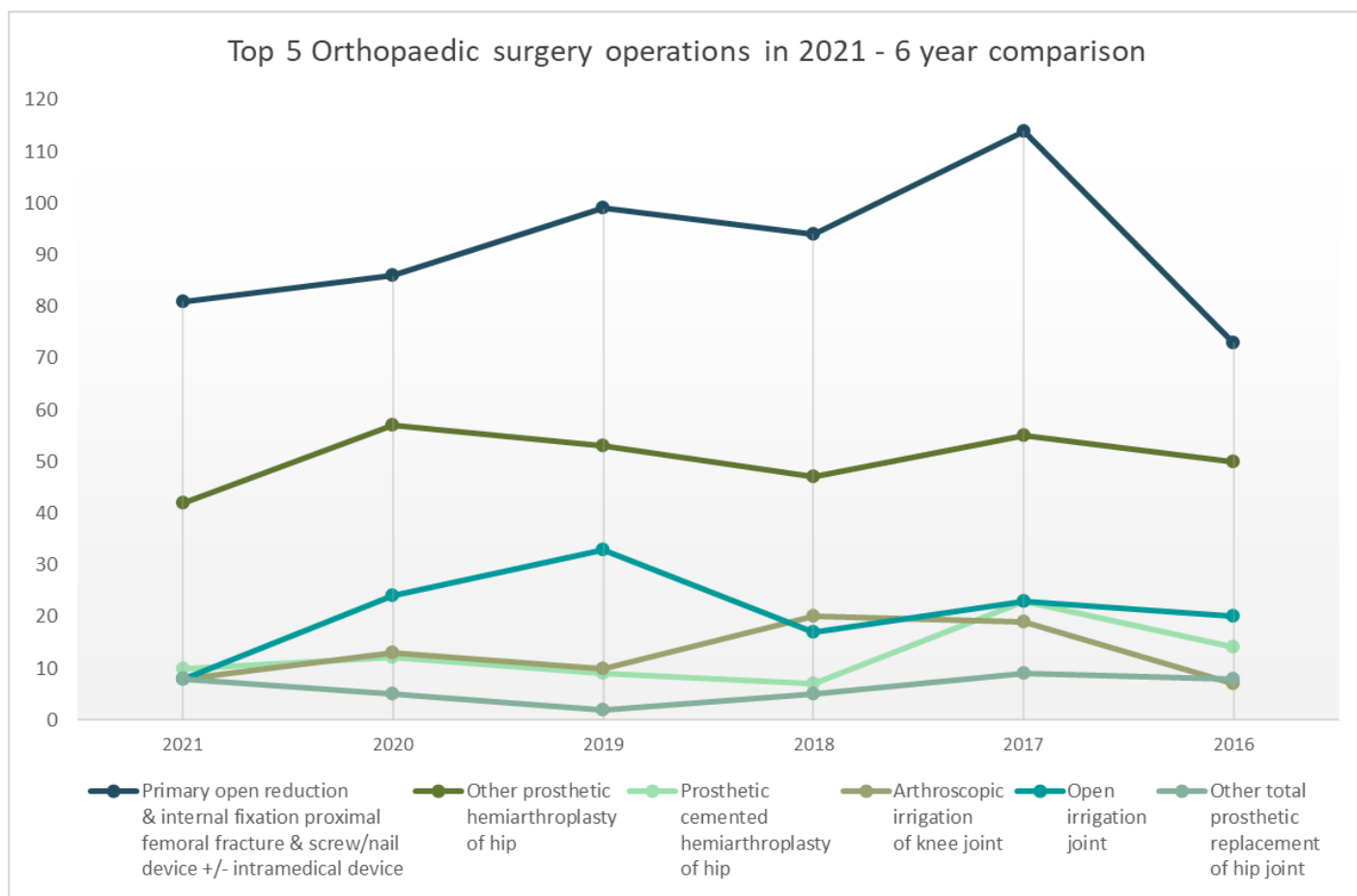


Figure 22: Orthopaedic surgery Top 5 operations (2016-2021).

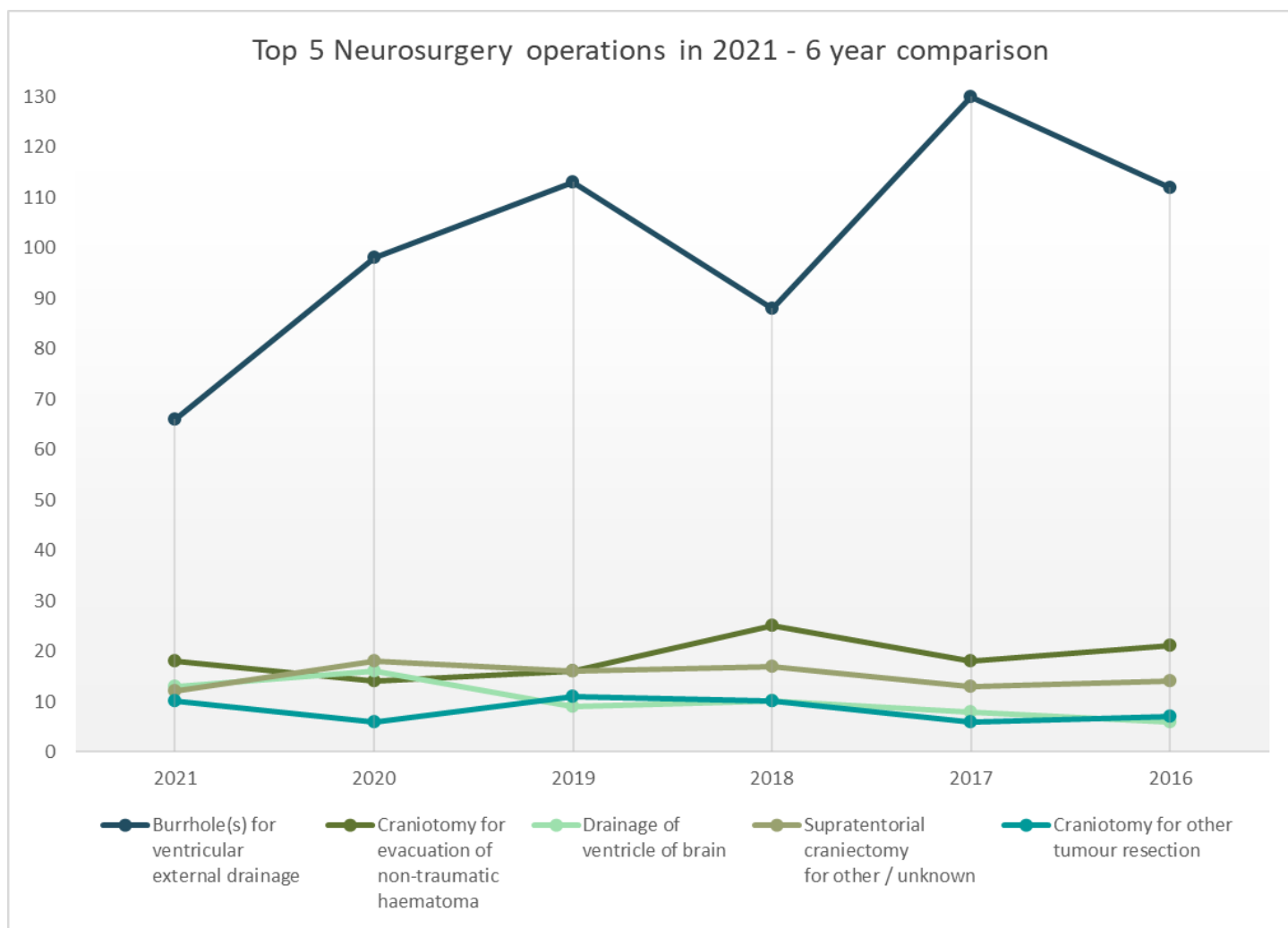


Figure 23: Neurosurgery Top 5 operations (2016-2021).

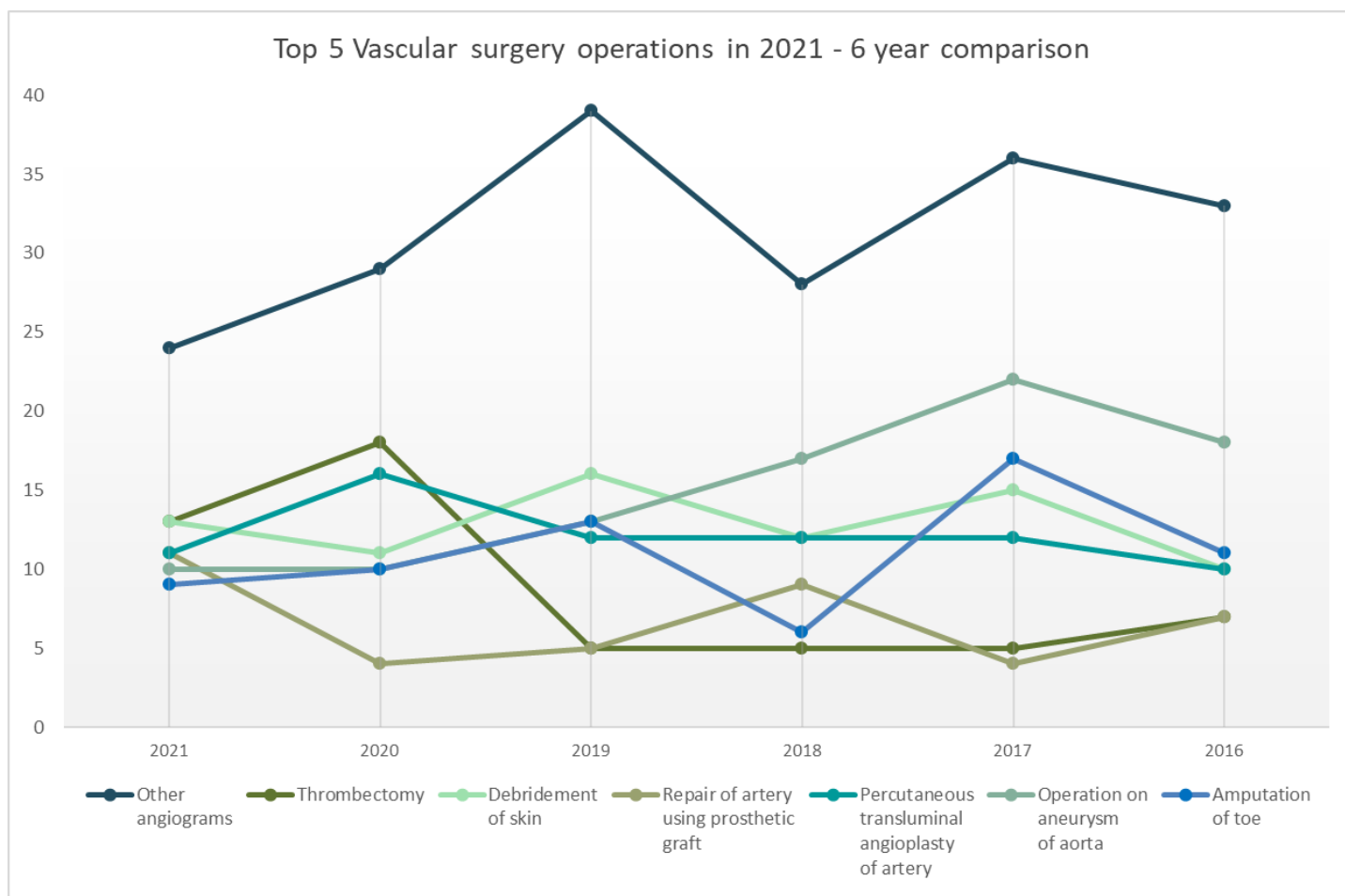


Figure 24: Vascular surgery Top 5 operations (2016-2021).

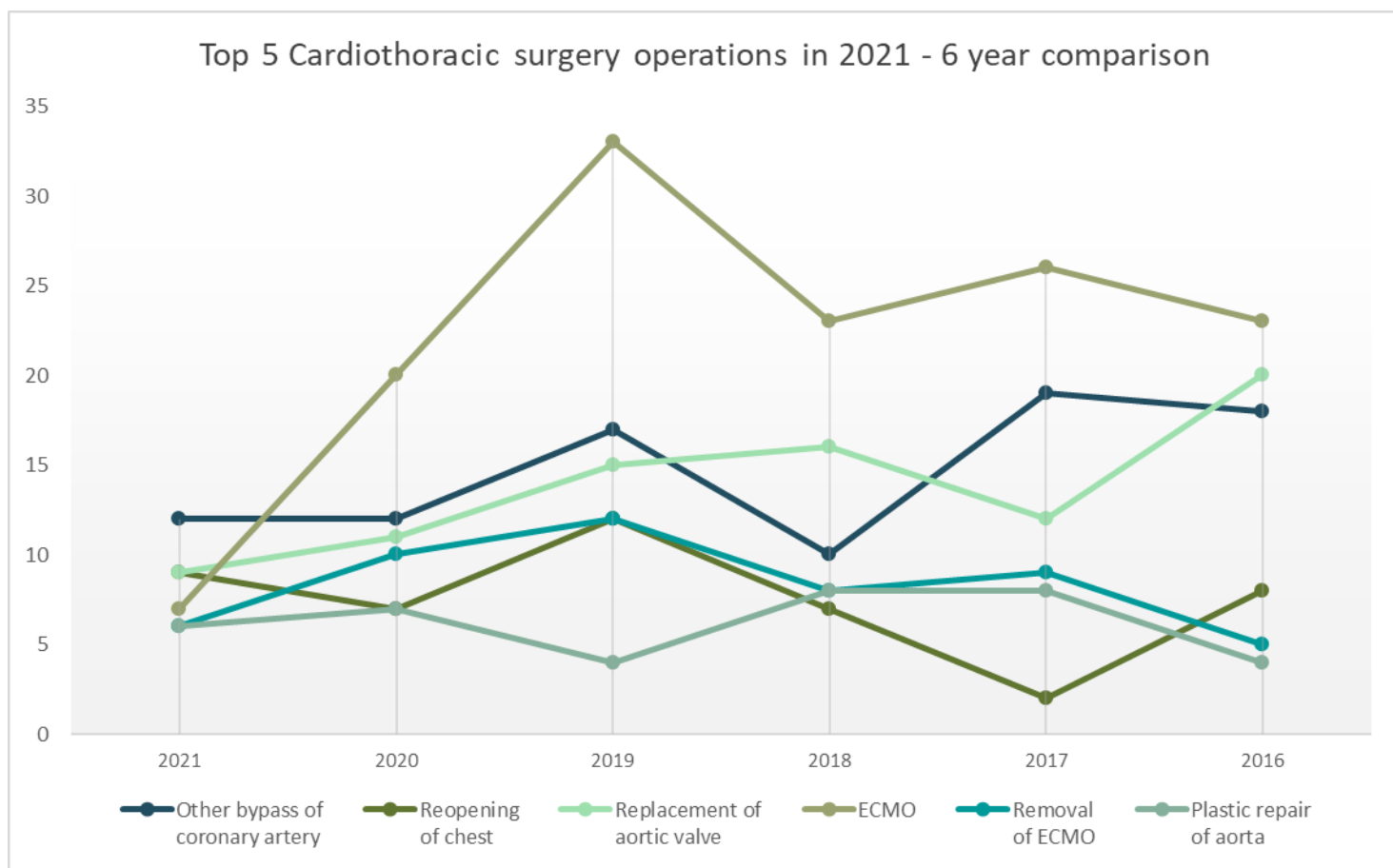


Figure 25: Cardiothoracic surgery Top 5 operations (2016-2021).

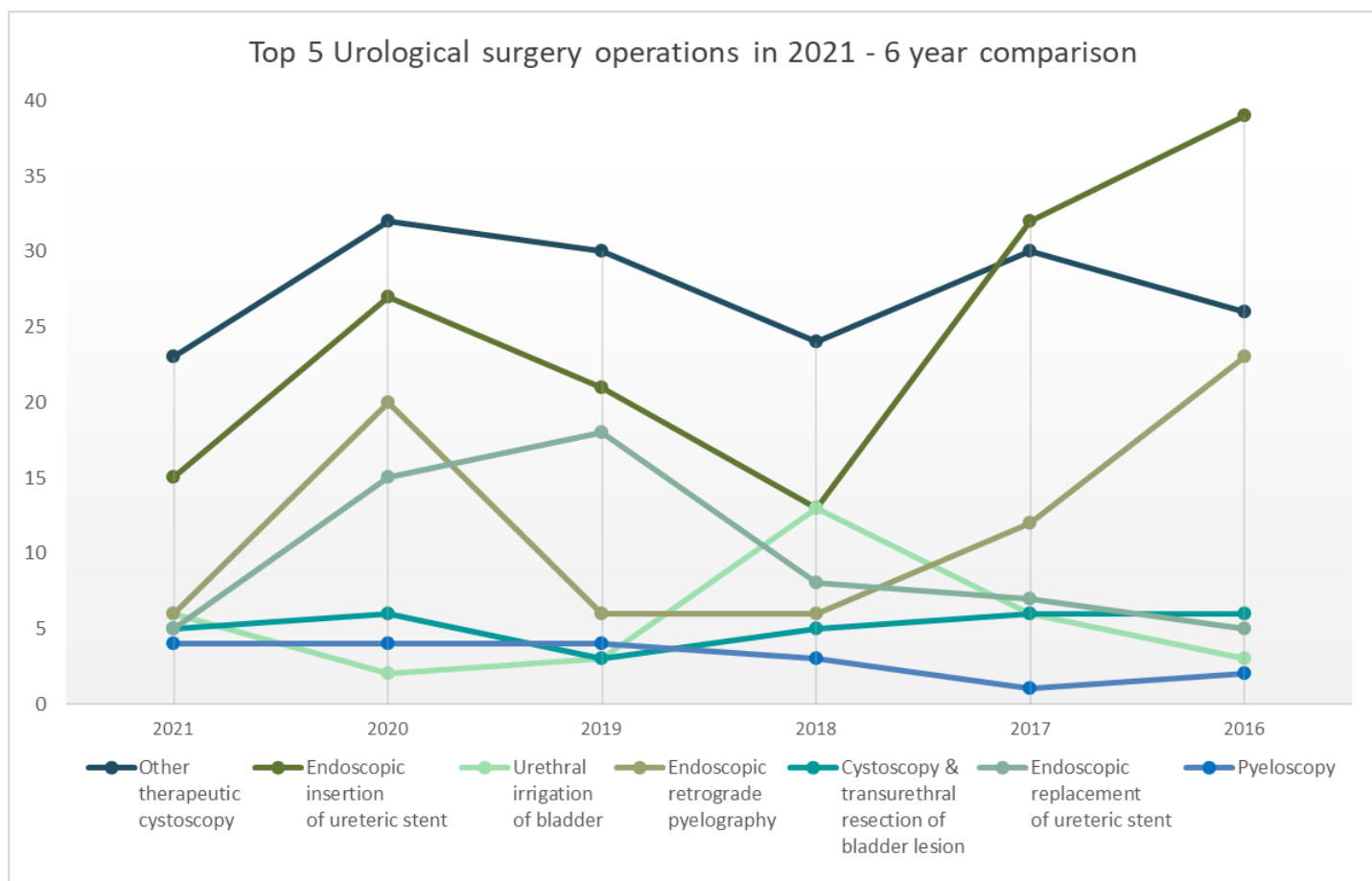


Figure 26: Urology surgery Top 5 operations (2016-2021).

In Question 16, surgeons are asked to confirm whether there was a definable post-operative complication. If the response is affirmative, the surgeon is then asked to confirm the type of complication and whether there was a delay in recognising that complication. Figures 27-29 display the various responses to these questions.

Was there a definable post-operative complication?

Date of Death 2016 - 2021



Figure 27: Post-operative complications over the reporting period (2016-2021).

The trajectory for delay to recognition, in Figure 28 below, shows a decline in “no” responses from 2017, and a plateau in “yes” and “no answer” responses for 2019-2021.

Responses to: Was there a definable post-operative complications?

Date of Death 2016 - 2021

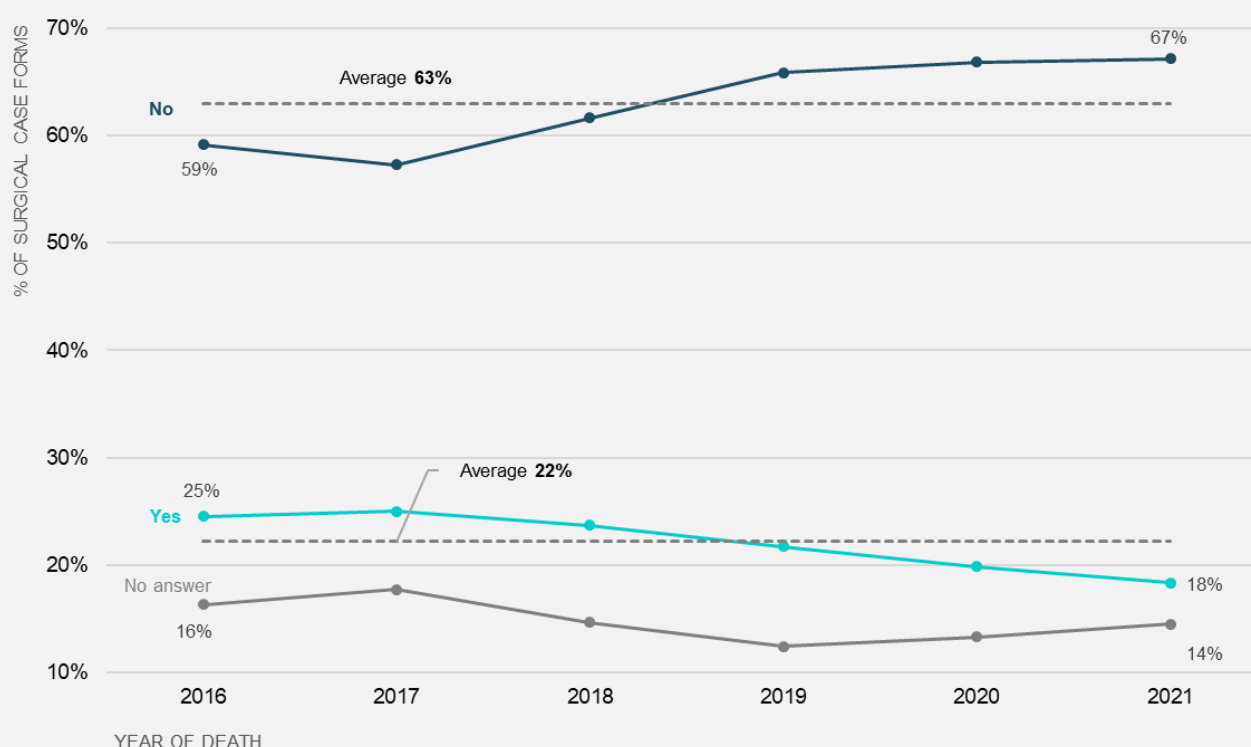


Figure 28: Was there a delay in recognising post-operative complications? (2016-2021).

Figure 29, below, demonstrates a consistent decline from 2019 for “no” responses and “yes” responses to Question 20, which suggests an improvement in surgeons recognising and managing post-operative complications in their patients.

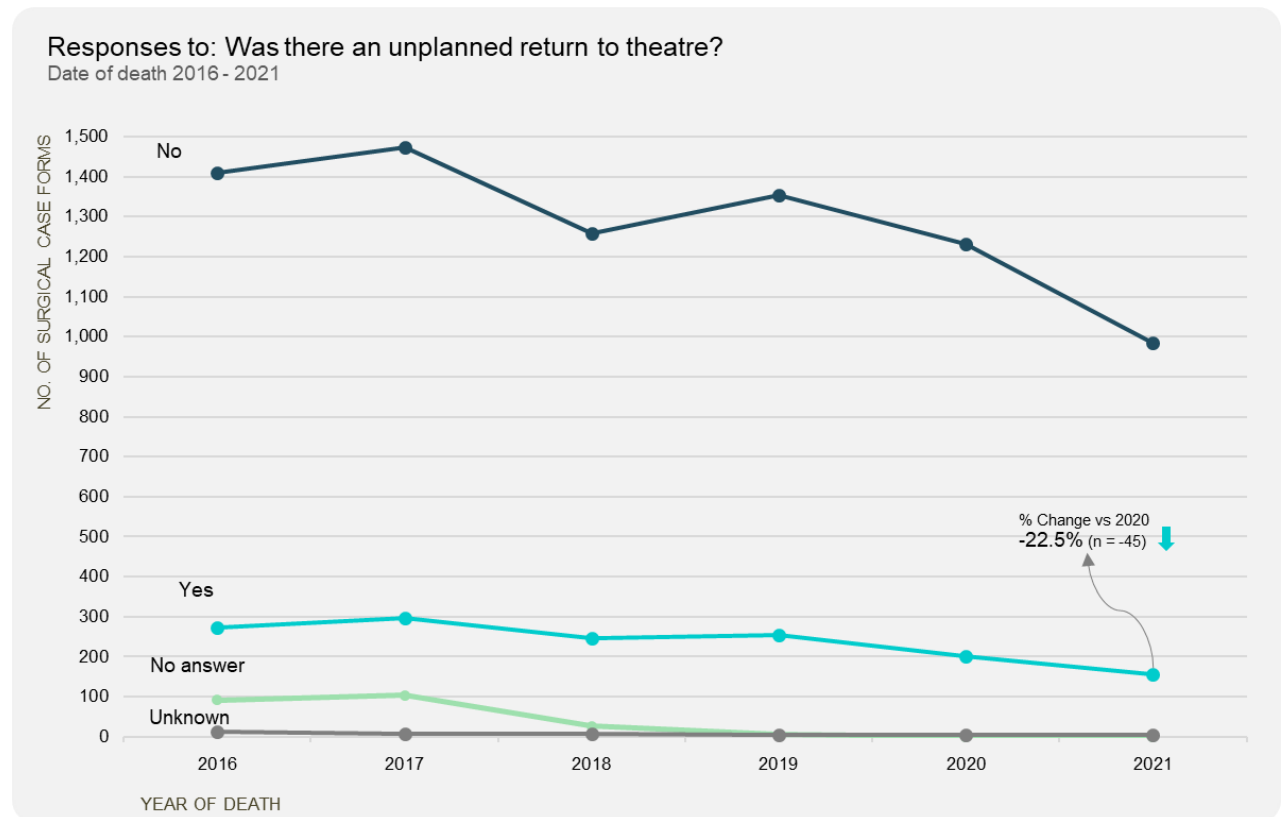


Figure 29: Was there an unplanned return to theatre? (2016-2021).

Comparative analysis on post-operative complications for deaths occurring in 2020 and 2021, is shown in Figure 30 below, depicting a higher overall count for 2020 (n=402).

Responses to: Was there a definable post-operative complication?

Date of Death **2020** - **2021**

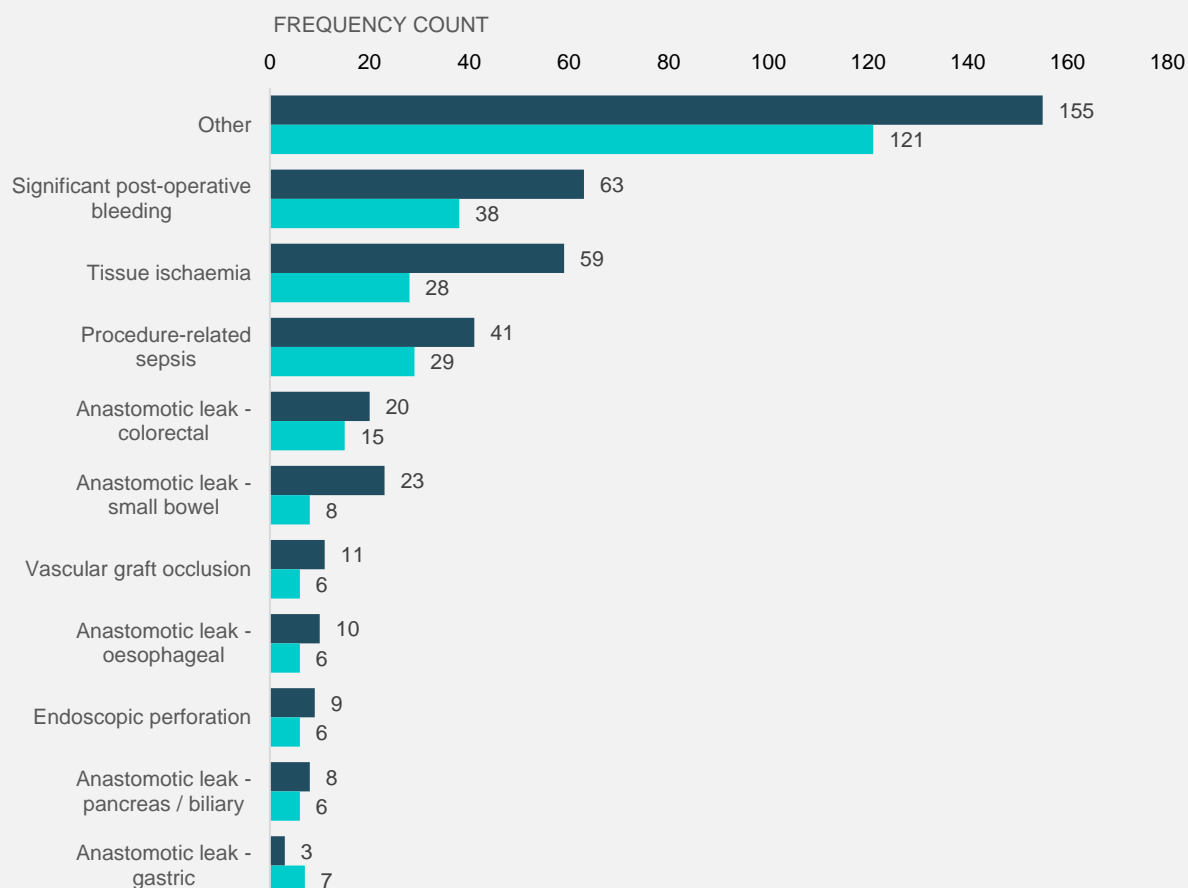


Figure 30: Comparison of post-operative complications for 2020 and 2021.

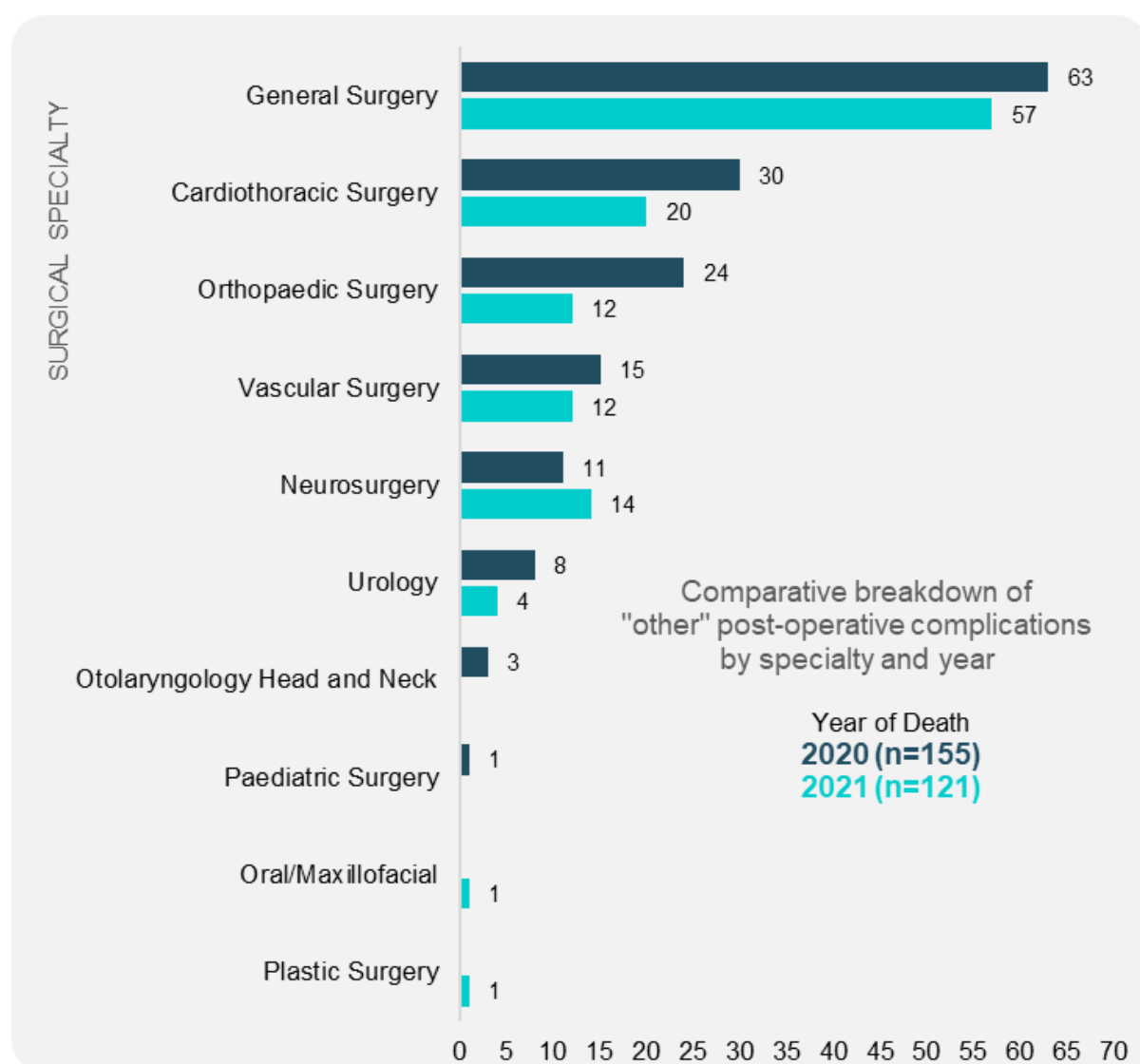


Figure 31: Comparison of “other” post-operative complications by specialty (2020-2021)

A further breakdown of post-operative complications in 2021 for the “other” category (n=121) is shown in Figure 32, below. The highest count was for respiratory issues (n=28), followed closely by cardiac issues (n=26).

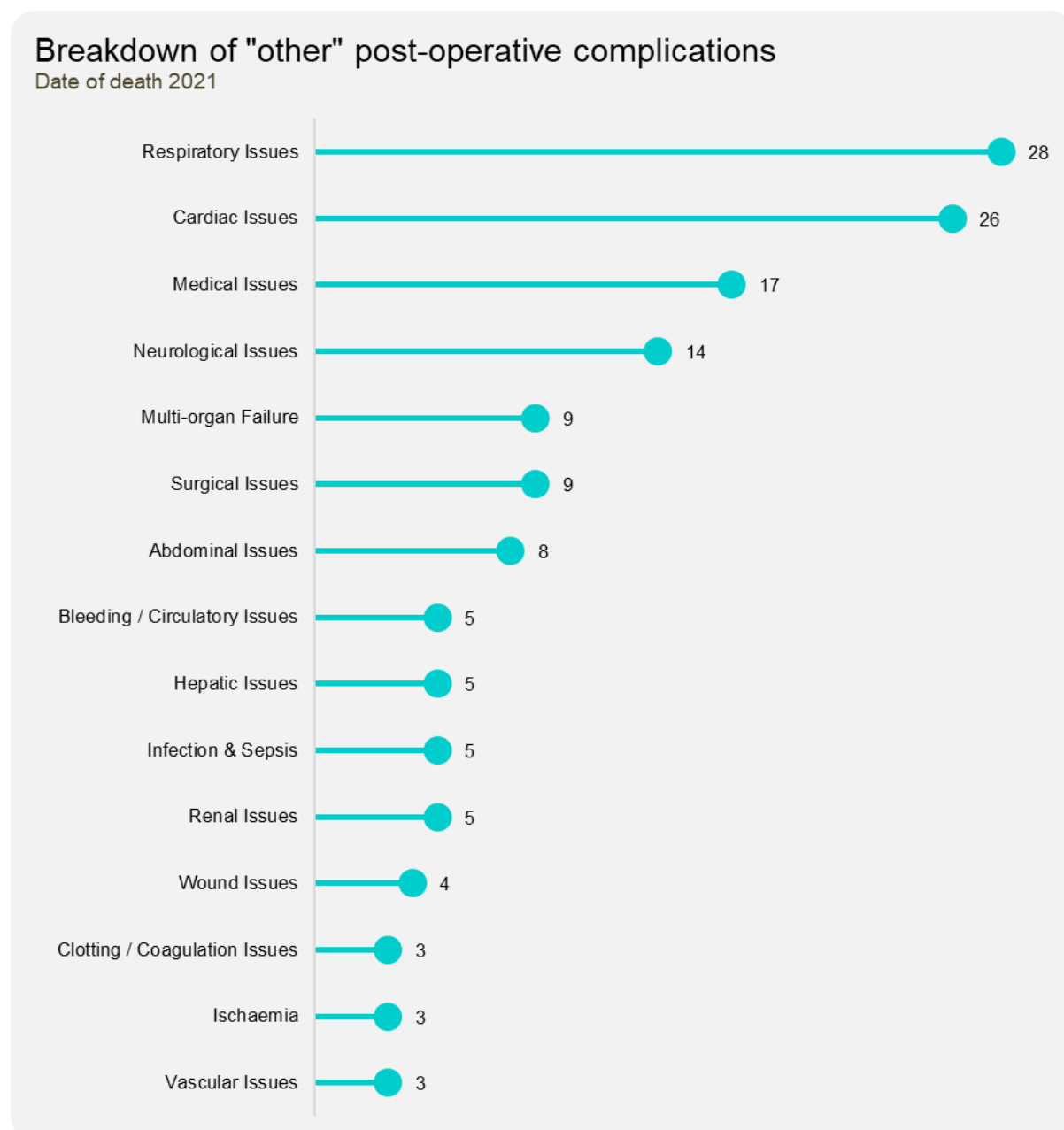


Figure 32: Other post-operative complications identified for 2021 deaths.

Responses to Question 4, in Figure 33 below, confirm that 86.34% of patients had at least one significant health issue increasing their risk of death.

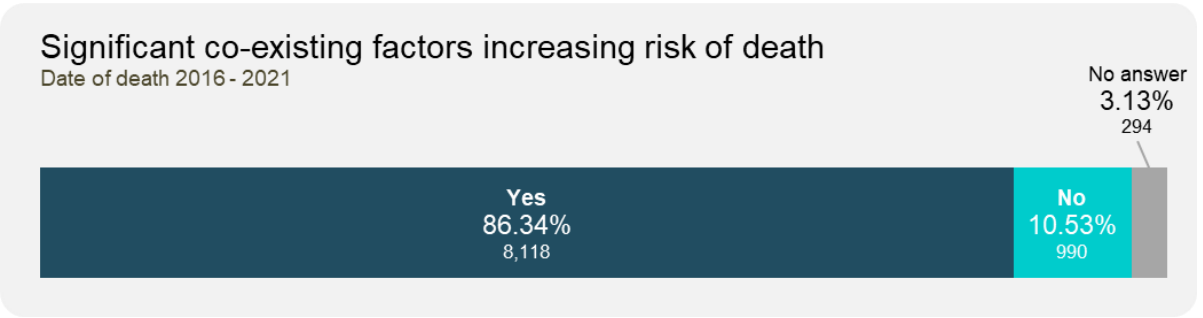


Figure 33: Responses for significant patient risk factors (2016-2021).

The distribution of selected responses to the 10 risk options listed on the form is shown in Figure 34 below. The highest response was for cardiovascular risk factors (21.5%).

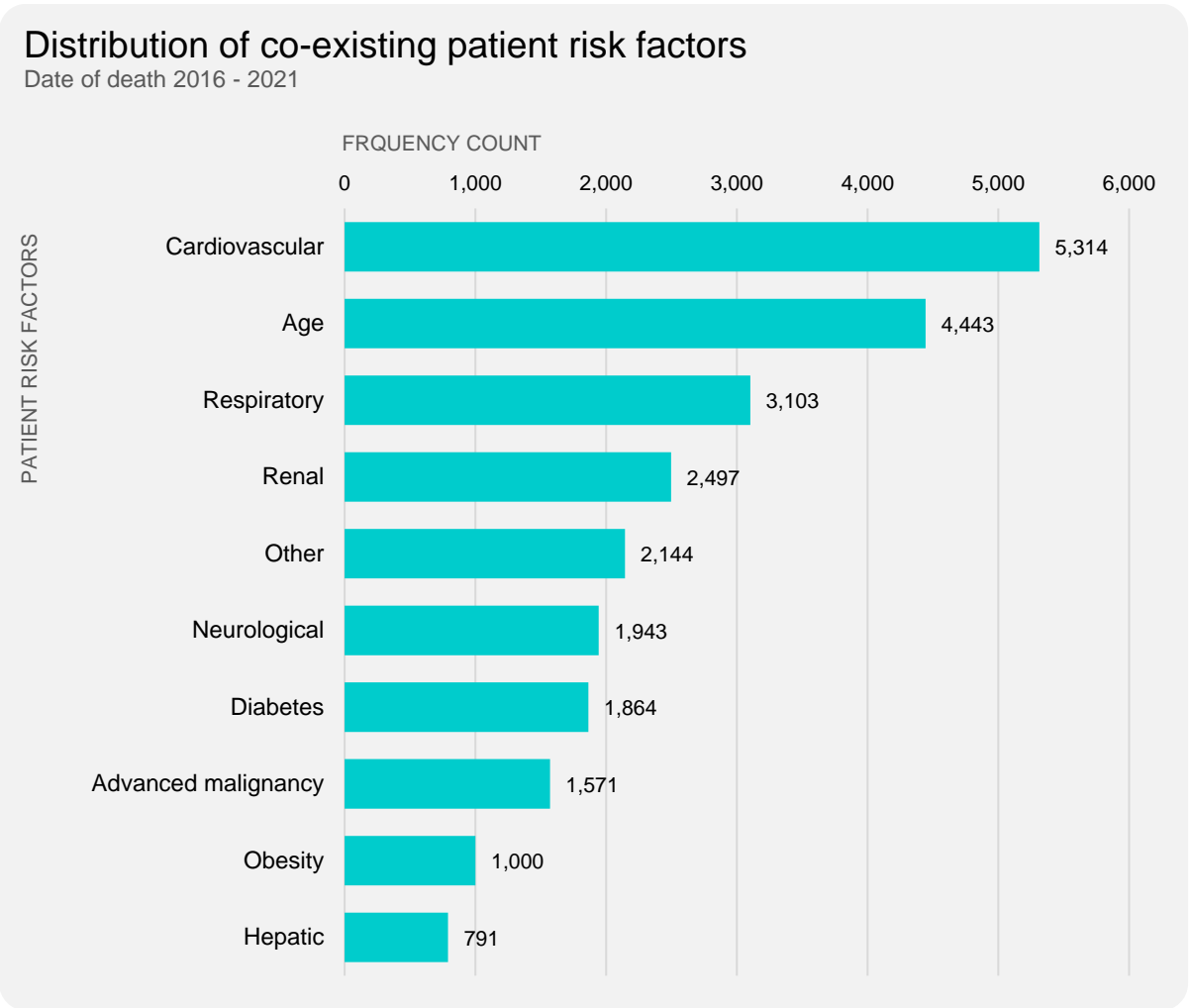


Figure 34: Distribution of responses for significant co-existing factors (2016-2021).

Question 5 responses relate to assessment of the patient's pre-anaesthesia medical co-morbidities using the ASA Physical Status Classification System. It is important to note that the classification system alone does not predict the perioperative risks, but used with other factors (e.g., type of surgery, frailty, level of deconditioning), it can be helpful in predicting perioperative risks⁴.

Responses for all ASA classifications are shown in Figure 35, below. The highest concentration of responses for the reporting period was for ASA IV (n=4,160), which defines this cohort as *a patient with severe systemic disease that is a constant threat to life*. Of these patients, 37% (n=1,541) were general surgery patients and 33.46% (n=1,392) required emergency surgery, i.e., where a delay to surgery would significantly increase the threat to life.

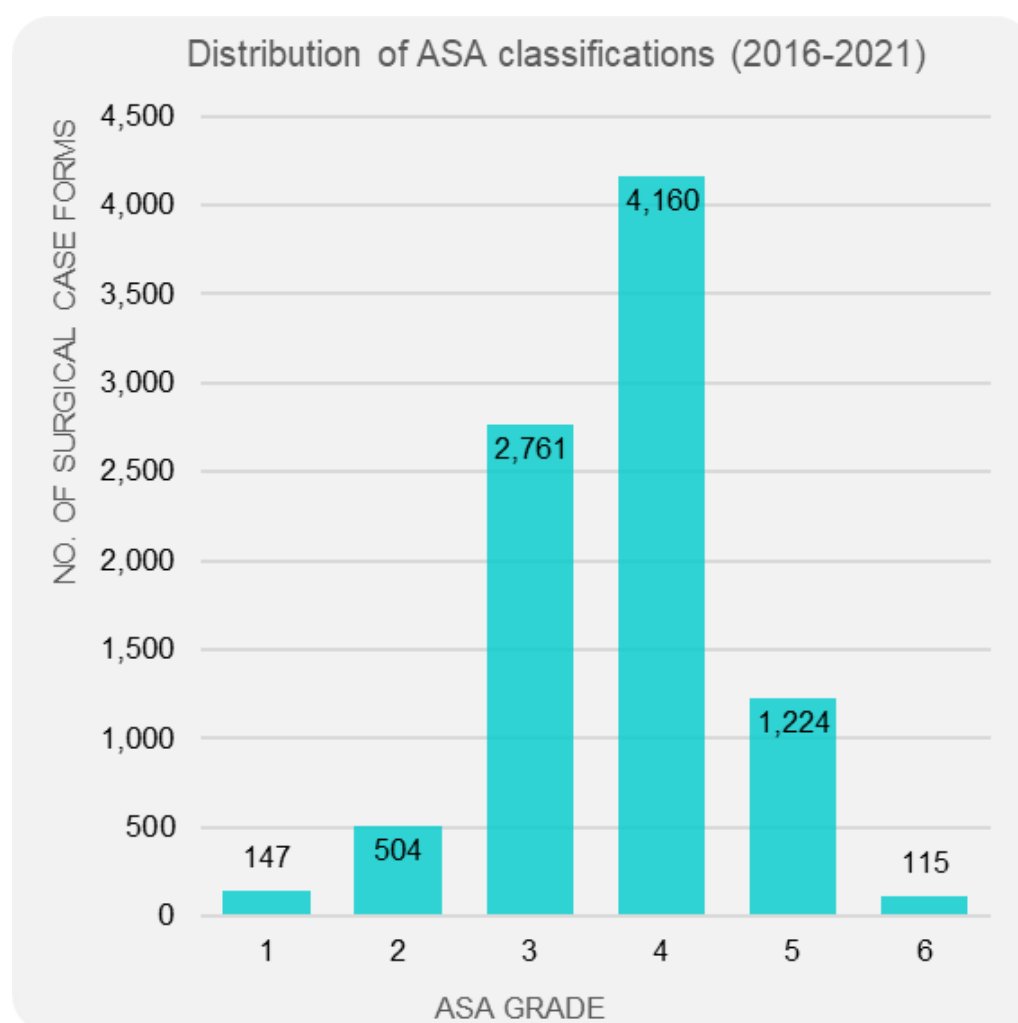


Figure 35: ASA classifications for patient medical co-morbidities (2016-2021).

⁴ <https://www.asahq.org/standards-and-practice-parameters/statement-on-asa-physical-status-classification-system>

Analysis on the cause of death identifies the Top 20 responses, as shown in Figure 36, below. The highest count for 2021 is “Multiple organ failure” (n=173), followed closely by “Septicaemia” (n=162). The Top 4 responses are the same causes identified for 2020 deaths. From the 1,145 surgical case forms submitted, 75% (n=860) were for three specialties, General Surgery, Orthopaedic Surgery and Neurosurgery.

Top 20 Final cause of death

Year of Death 2021

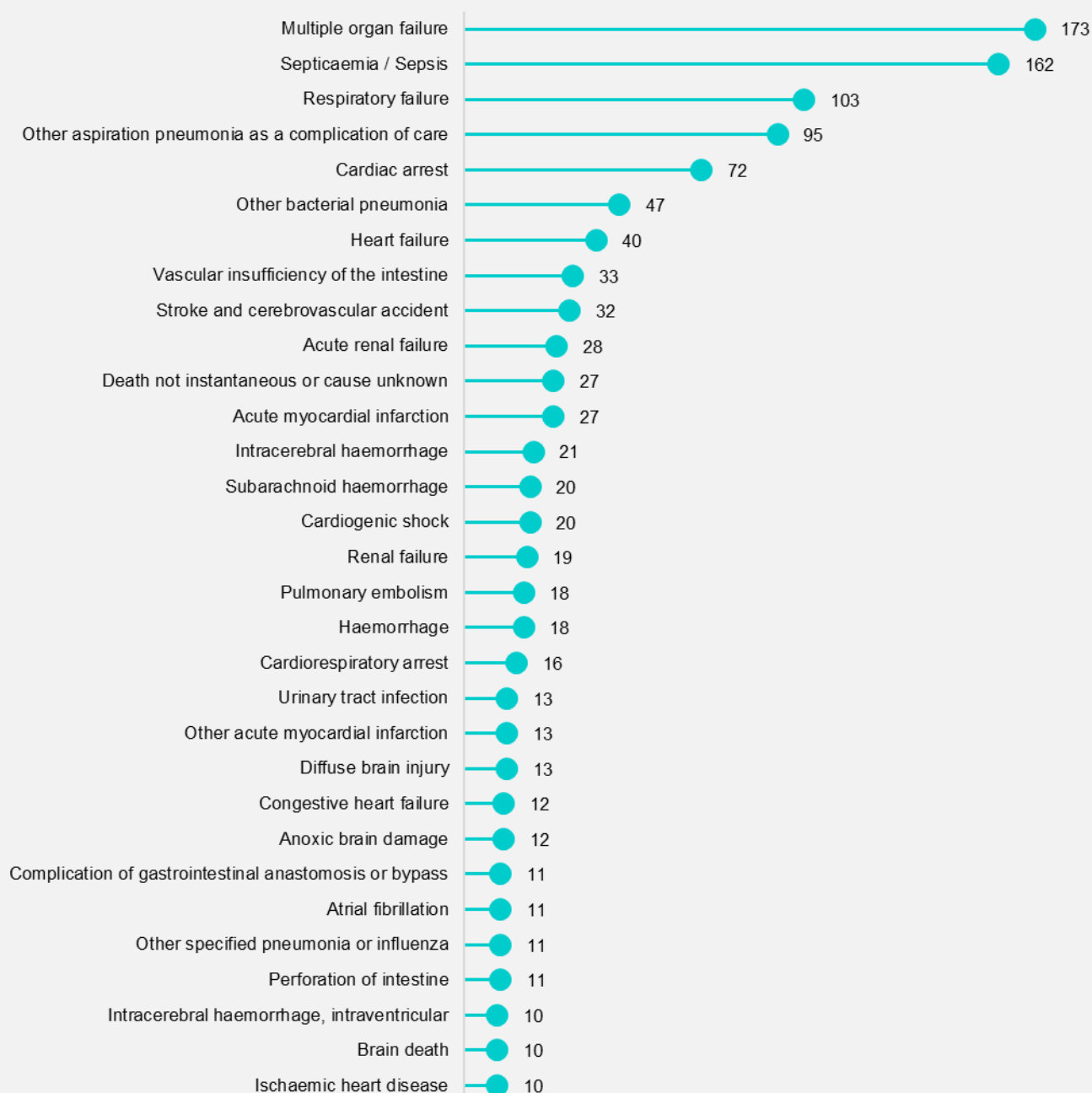


Figure 36: Cause of death responses for 2021 deaths.

Analysis on the pre-operative patient transfer responses to Question 6 for the reporting period is shown in Figure 37, below. Responses indicate 22.35% (n=2,101) of patients were transferred to another facility, of which, 10.95% (n=230) experienced a delay.

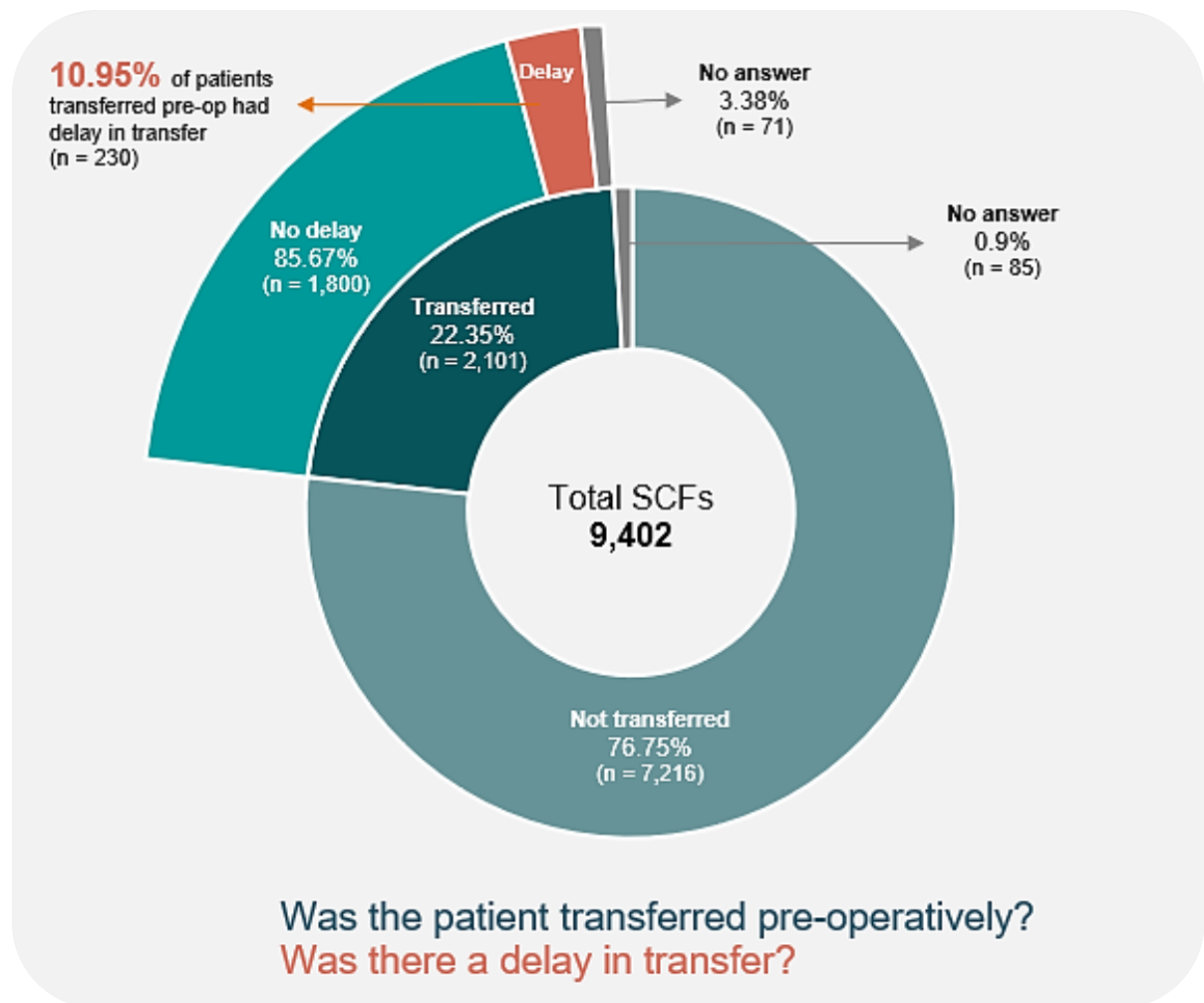


Figure 37: Pre-operative patient transfers and delays to transfer (2016-2021).

Part 3: Second Line Assessments

As part of the CHASM peer review process, all surgical case forms submitted undergo independent peer review (first line assessment) by a surgeon of the same specialty. This is to determine whether a conclusion can be made from the information provided, as to whether there are any clinical management issues (CMIs) which may require further investigation (second line assessment) by a case note review. These issues are categorised as Areas of Consideration, Concern or Adverse Events (ACONs).

In 2021, surgeons completed 1,505 first line assessments, of which no areas of consideration or concern were identified in 1,304 (86.64%) cases. This was the highest level of activity across the reporting period.

Activity for second line assessments is shown in Figure 38, below. 772 assessments were conducted by surgeons, with 549 ACONs identified.

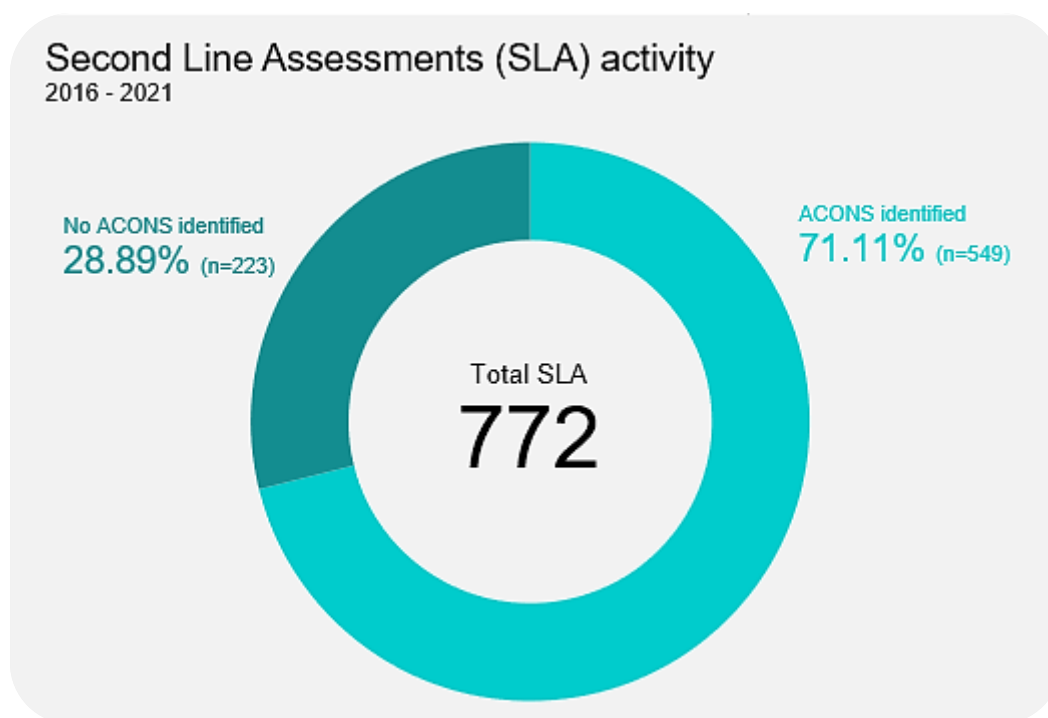


Figure 38: Breakdown of ACONs and no ACONs for total SLAs (2016-2021).

A further breakdown by year for ACONs / no ACON is provided in Figure 39, below.

Second Line Assessment ACONs

Areas of consideration, concern or adverse events identified

No areas of consideration, concern or adverse events identified

Case Assessment: 2016 - 2021

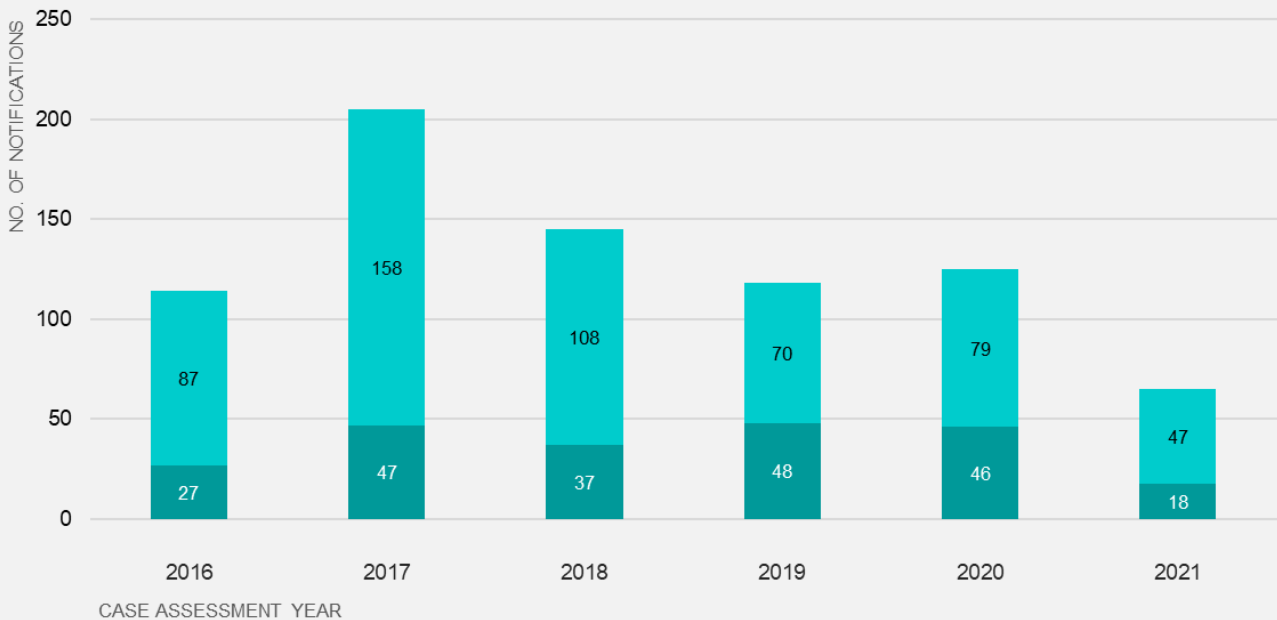


Figure 39: SLA activity of ACONs / no ACON by year (2016-2021).

In Figure 40, below, the trajectory of ACONs against number of SLAs, shows a steady occurrence across the reporting period. This indicates cases sent for further review are appropriately selected from First Line Assessor recommendations and feedback.

Second Line Assessment - ACONs v No ACON

Activity by assessment year 2016 - 2021

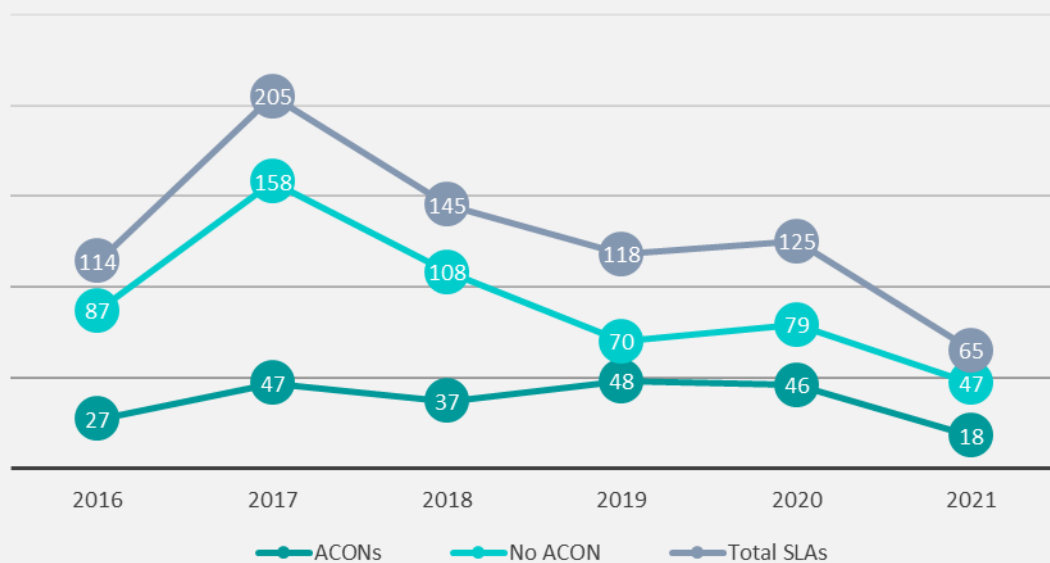


Figure 40: ACON and no ACON trajectory against number of SLAs (2016-2021).

Figure 41, below, depicts second line assessments conducted on 2021 deaths and provides a breakdown of the ACONs identified. The parent code Incorrect/Inappropriate therapy had the highest concentration of responses (n=13). Of these, the Top 3 child codes are Unsatisfactory medical management (n=3), Decision to operate (n=3) and Better to have performed more limited surgery (n=2).

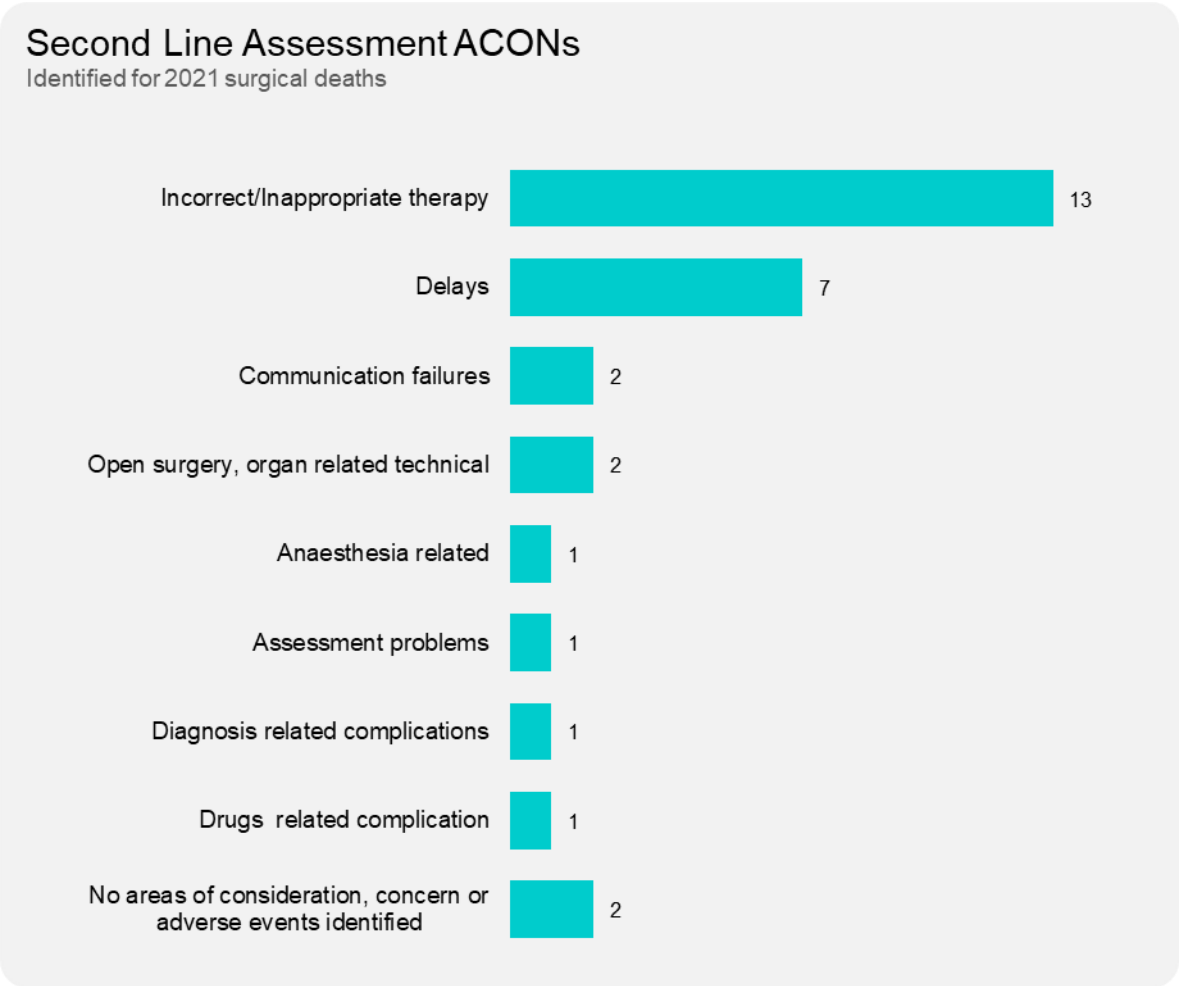


Figure 41: Date of Death ACONs

Further analysis on the Top 3 ACONs identified for 2021 deaths, as shown in Figure 42 below, identifies that across the reporting period the Top 2 ACONs have held the same rank, apart from a switch in



Figure 42: Top 3 ACONs for 2021 deaths and ranking across 6-years (2016-2021).

Part 4: Terminal Care

CHASM prefaces the completion of a surgical case form with an exclusion for terminal care patients by asking: *Was terminal care planned for this patient **prior to or on** admission?* If terminal care was planned and no significant operation was performed, the death is reviewed by the CHASM Office and may be excluded from the audit.

For the reporting period, a total of 2,083 patients were classified as terminal care. A breakdown of these patients by surgical specialty and by hospital group are provided in Figures 43 and 44, below.

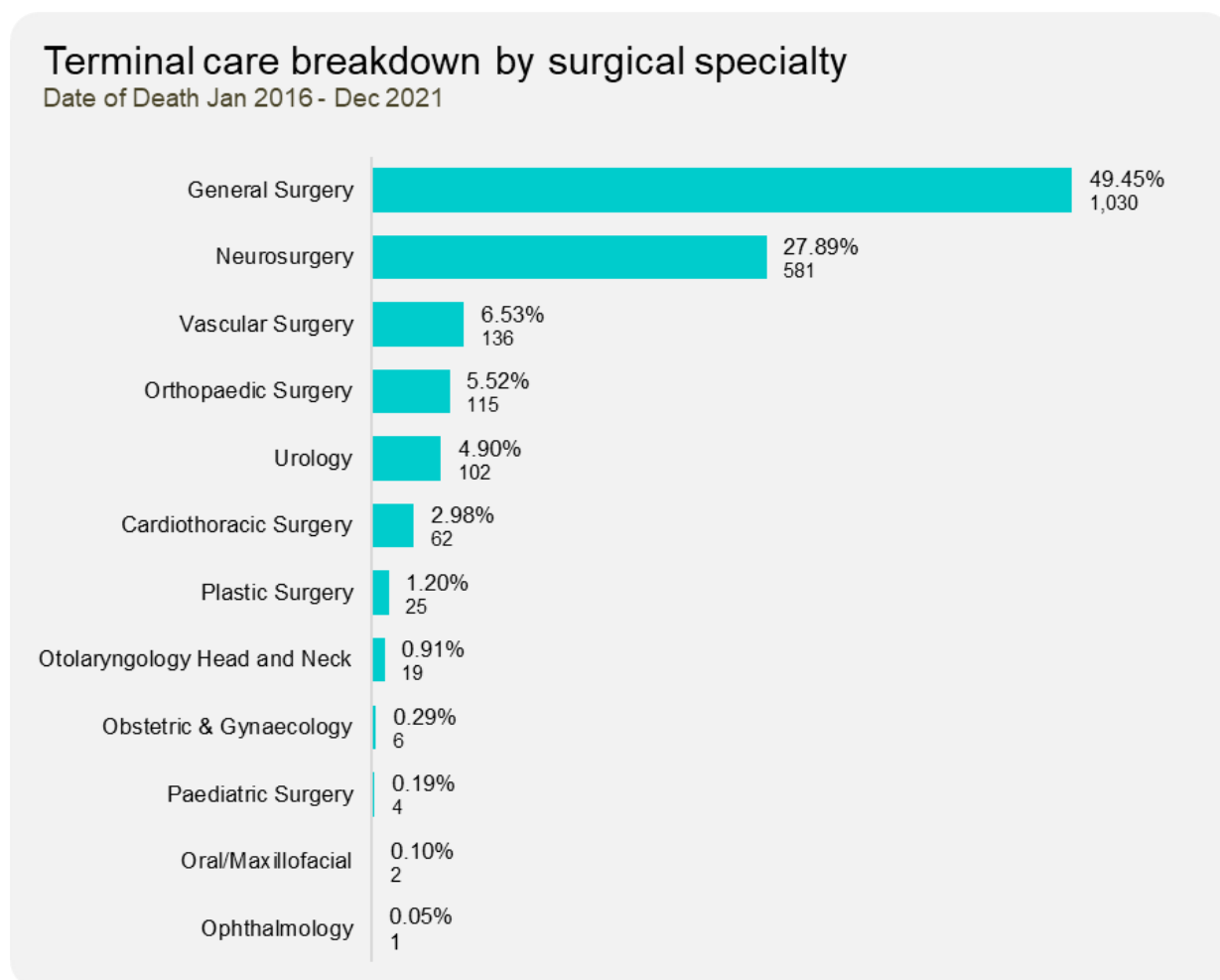


Figure 43: Terminal care patients by specialty (2016-2021).

Terminal care breakdown by hospital group

Date of Death Jan 2016 - Dec 2021

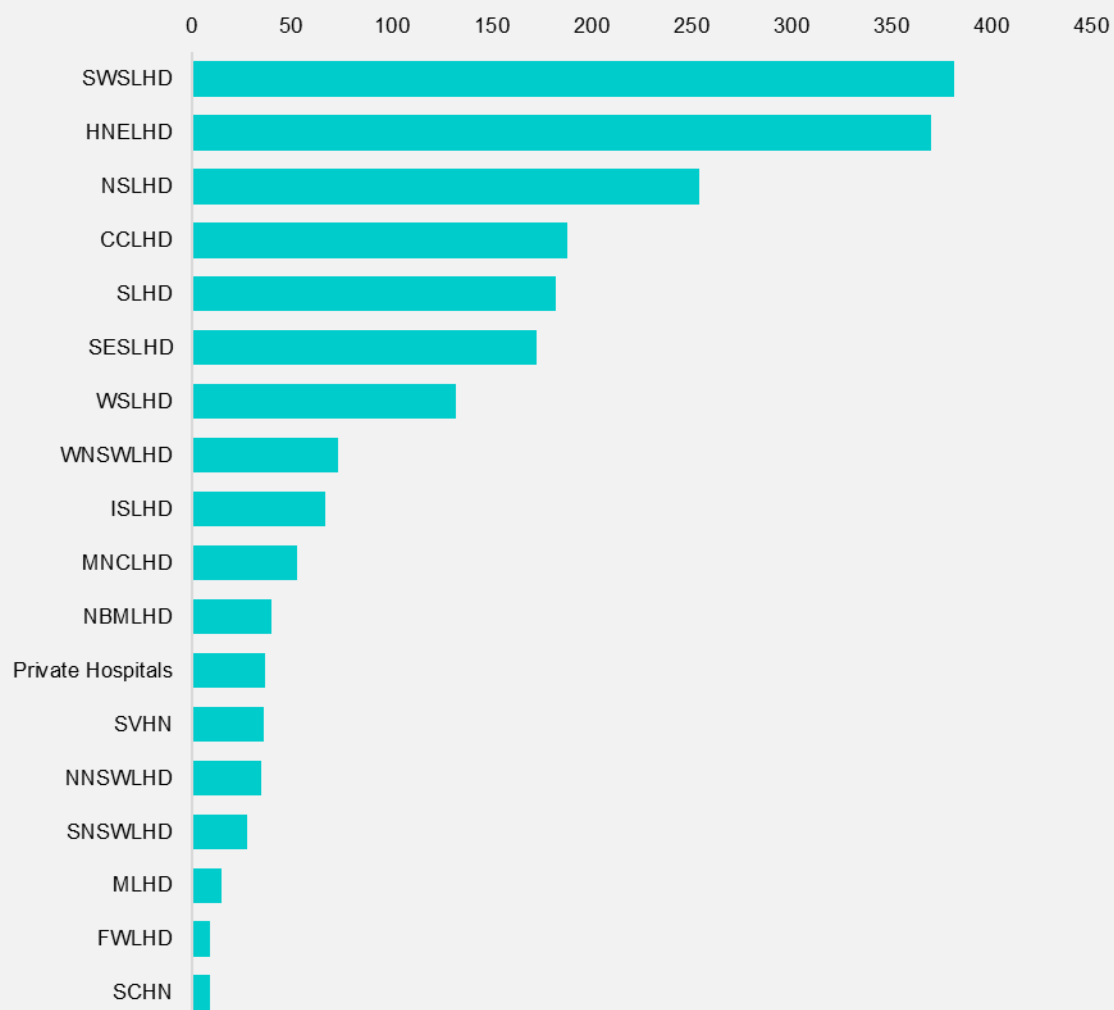
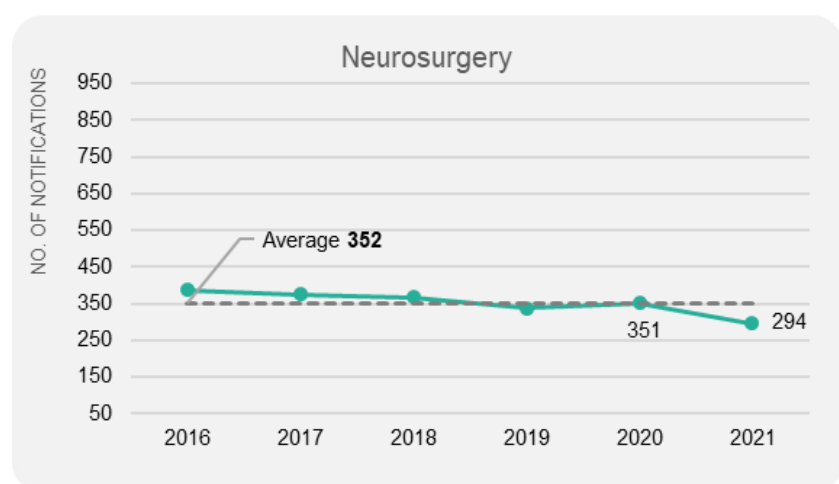
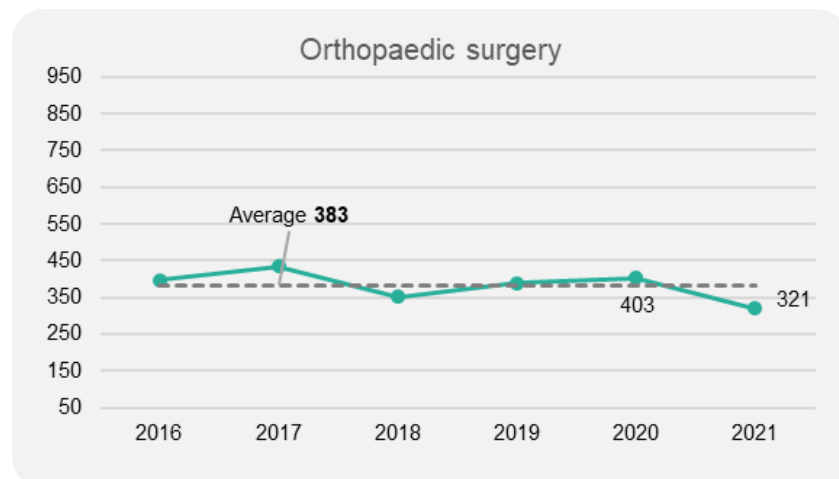
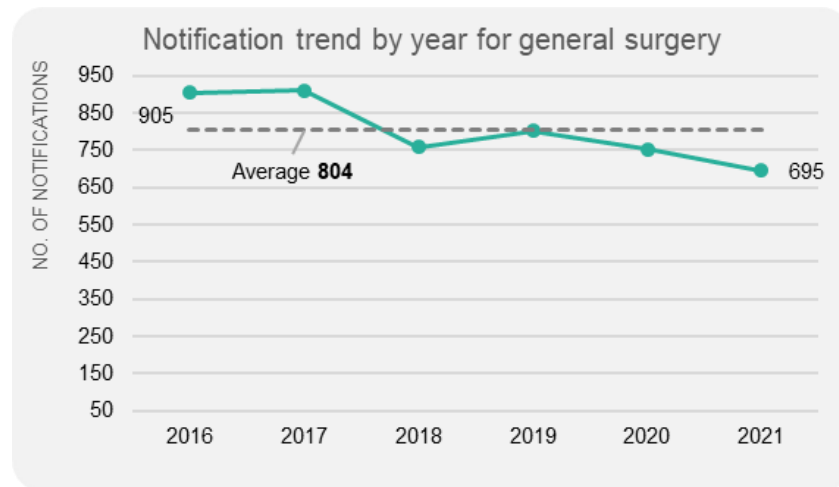
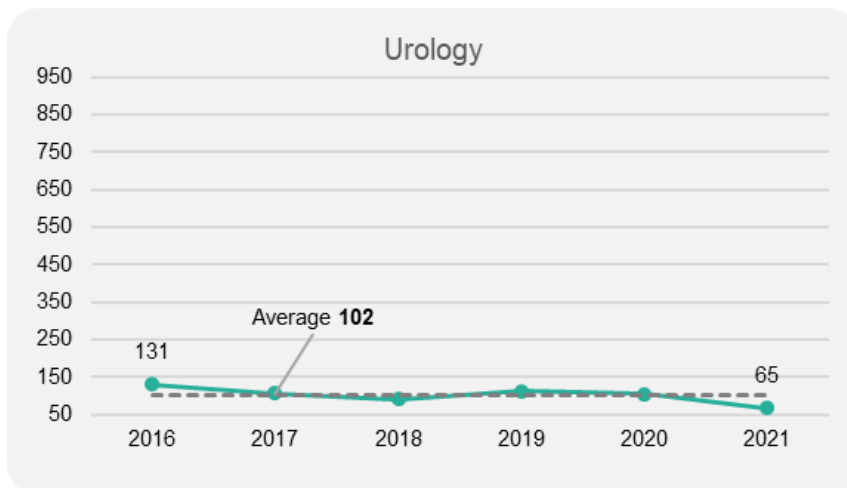
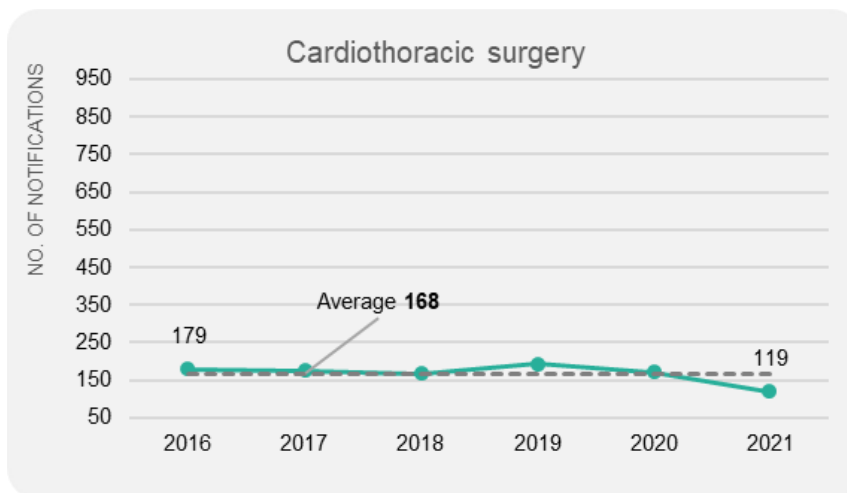
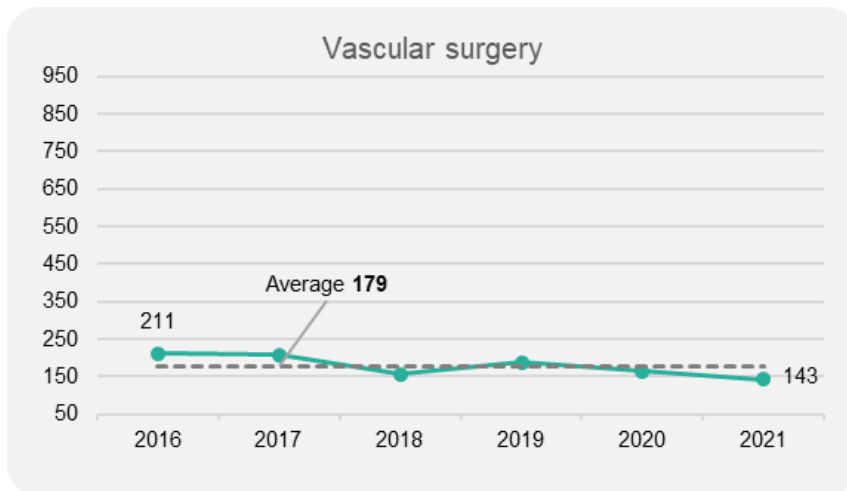


Figure 44: Terminal care patients by hospital group (2016-2021).

Appendices

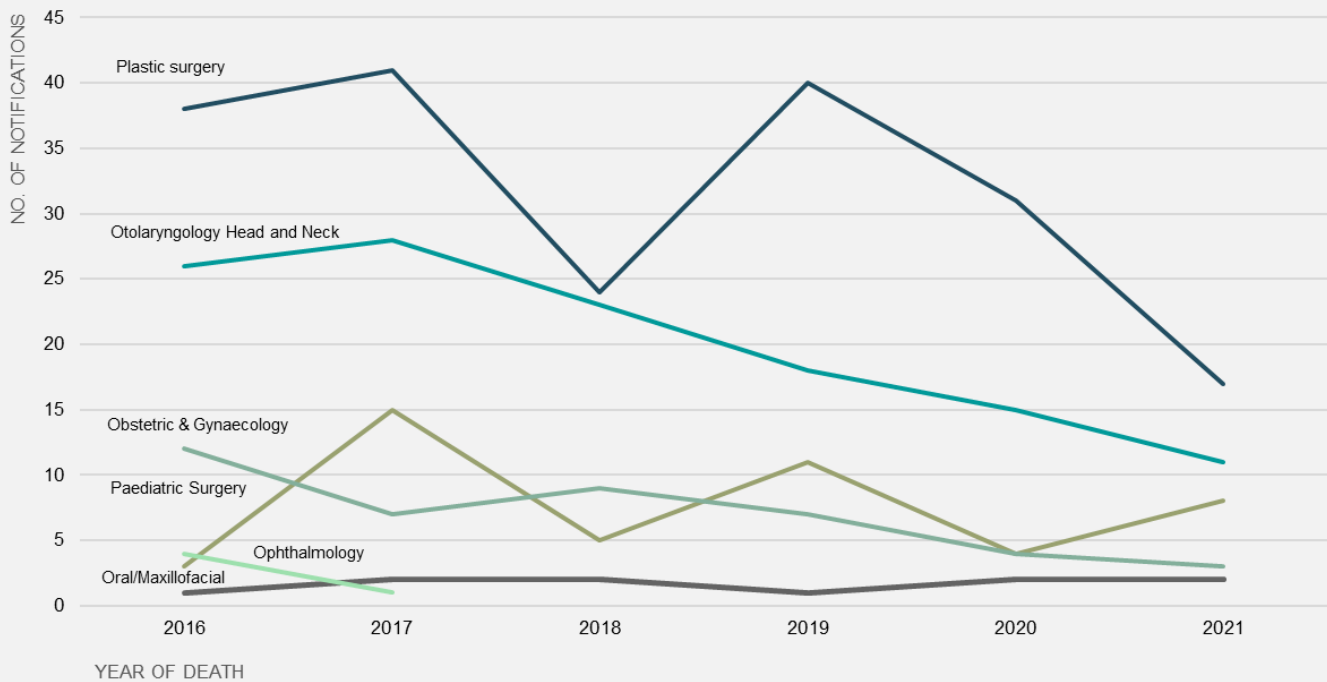
Appendix 1 – Notification trends by year and speciality (2016-2021)





Notification trends by year for other surgical specialties

Date of death 2016 - 2021

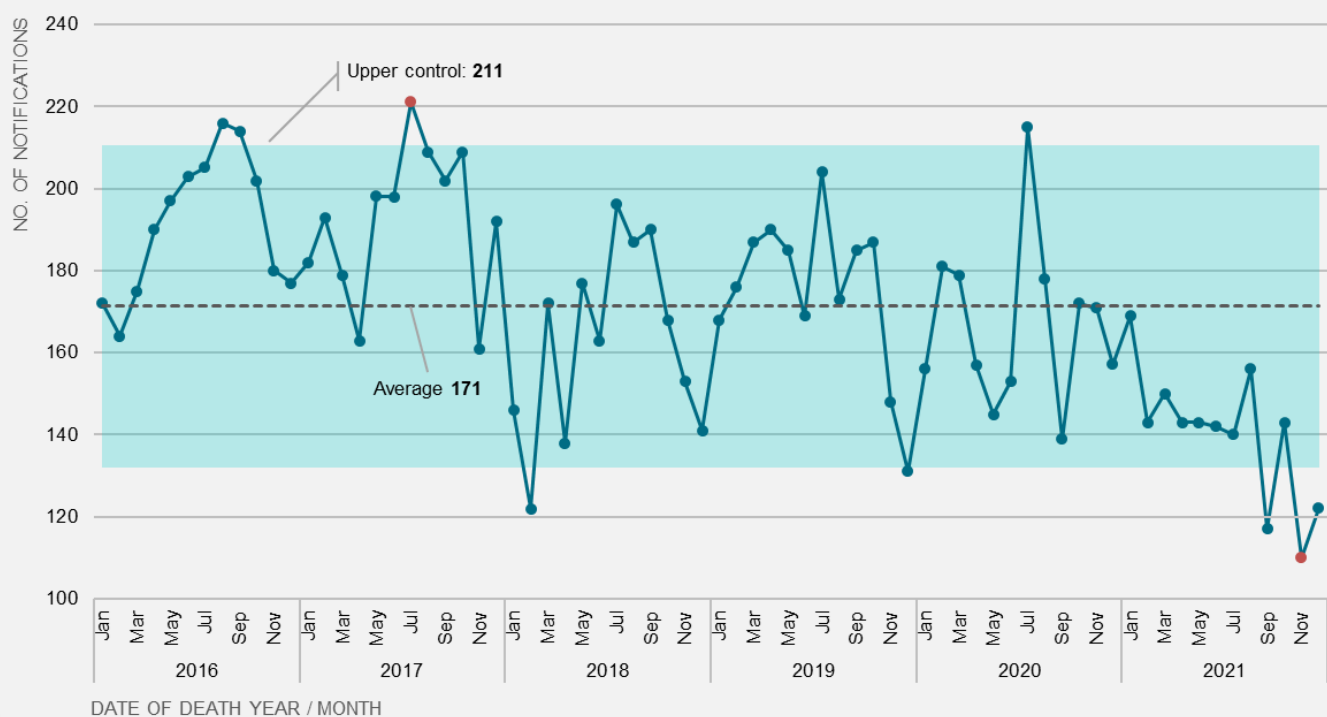


Note: From 2018, ophthalmology deaths are screened to ensure appropriate inclusion, as most deaths are coincidental to the procedure undertaken e.g., cataract surgery in elderly patients.

Appendix 2 – Notification trends by month and year (2016-2021)

Notifications 6 year trend

Date of death 2016 - 2021



Appendix 3 – Distribution of deaths for young persons (2016-2021)

