

Frailty and surgical outcomes

Introduction:

There is evidence that increasing frailty is associated with postoperative complications, length of stay (LOS), requirement for discharge to a skilled or assisted-living facility, and correlates with both mortality and morbidity across a range of surgical specialties (1-3). We aimed to assess the impact of frailty on surgical outcomes in our institution with a view to assessing additional needs for this group preoperatively.

Methods:

All adult patients undergoing elective and emergency surgery in our hospital during a two-week period were considered for inclusion. Those cases expected to be performed as day case surgery or only requiring an overnight stay were excluded. Patients were assessed on the morning of surgery by an anaesthetist and assigned a frailty score (FS), as described by the *Canadian Study of Health and Aging Clinical Frailty Scale* (4). Perioperative outcome data were collected including length of stay (LOS) (hospital and intensive care), haemoglobin (Hb) (g/L) and creatinine ($\mu\text{mol/L}$) (preoperatively and at 24 hours).

Results:

113 patients were included with a mean age of 66.3 yrs. Sex: 48% male, 52% female. In terms of surgical urgency 86.7% were elective (98/113) and 13.3% emergency (15/113). Surgical specialties involved were orthopaedics (31.9%), general (19.5%), urology (15.0%) and hepatopancreaticobiliary (14.2%) with the remainder consisting of ENT, gynae/gynae-onc, MaxFax, and UGI. We calculated the correlation coefficient (R) between FS and the following: LOS (hosp), LOS (ITU), Hb Pre-op, Hb at 24hrs, Creatinine Pre-op, Creatinine at 24hrs.

Table 1 (results of correlation analysis):

Correlation between FS and variable	R	n	p	Mean
LOS (hospital)	0.33	112	<0.05	6.6
LOS (ITU)	0.26	33	0.15	4.1

Hb (pre-op)	-0.34	112	<0.05	131
Hb (24 hours post-op)	-0.40	93	<0.05	-
Creatinine (pre-op)	0.03	112	0.73	70.5
Creatinine (24 hours post-op)	-0.01	94	0.92	-

Conclusion:

In our cohort, we identified a statistically significant, weakly positive correlation between FS and hospital LOS. Furthermore, patients with a FS > 4 had an almost double LOS (9.5 vs 5.8). There was also a statistically significant negative correlation between FS and haemoglobin concentration (pre & post-operatively).

Our findings support the introduction of a perioperative frailty service to ensure appropriate and timely optimisation of this vulnerable group. Such a service may form part of a holistic perioperative pathway with elderly medicine and a multidisciplinary team. The effectiveness of such a pathway could be assessed in terms of whether desired improvements in outcome can be achieved.

References:

1. Dasgupta M, Rolfson DB, Stolee P, Borrie MJ, Speechley M. Frailty is associated with postoperative complications in older adults with medical problems. Arch Gerontol Geriatr. 2009;48(1):78-83.
2. Makary MA, Segev DL, Pronovost PJ, Syin D, Bandeen-Roche K, Patel P, et al. Frailty as a predictor of surgical outcomes in older patients. J Am Coll Surg. 2010;210(6):901-8.
3. Velanovich V, Antoine H, Swartz A, Peters D, Rubinfeld I. Accumulating deficits model of frailty and postoperative mortality and morbidity: its application to a national database. Journal of Surgical Research. 2013;183(1):104-10.
4. Rockwood K, Song X, MacKnight C, Bergman H, Hogan DB, McDowell I, et al. A global clinical measure of fitness and frailty in elderly people. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne. 2005;173(5):489-95.

Title:

On the Day Cancellations of Elective Surgery in a District General Hospital

Introduction:

With hundreds of patients being cancelled on the day of their surgery every year in our hospital we decided to investigate whether any of these cancellations were due to medical reasons, and if so, whether they were appropriate. As a secondary objective we examined whether these medical cancellations were being appropriately documented and whether follow-up was being arranged.

Methods:

We examined the Electronic Patient Record (EPR) notes for all patients over a 4-month period cancelled on the day for:

- Hypertension
- Hyperglycaemia
- Inappropriate peri-operative management of anti-coagulants

These reasons were chosen as they all have robust AAGBI guidelines regarding cancellation. We audited each patient's notes, observation charts and laboratory results to examine whether the cancellation was appropriate and whether a follow-up plan had been documented at discharge.

We also examined the basic knowledge of the associated guidelines by circulating a questionnaire to the anaesthetic department.

Results:

22 cases during this period matched our inclusion criteria. Of these 12 (55%) were appropriate cancellations, the rest had insufficient documentation / data to elucidate whether the cancellation had been appropriate.

Only 9 cases (41%) had the reason for cancellation formally documented whilst 8 (36%) had follow-up plans documented.

Knowledge of guidelines was varied. However, only 38% knew the correct cut off for HbA1c and only 50% knew the limit for SBP on the day of surgery.

Conclusion:

Where documented cases were being cancelled appropriately. However, documentation was poor so a new cancellation proforma is being introduced (complete with guidelines) for elective surgery.

Furthermore, posters will go up in the day surgery unit highlighting these guidelines as well as encouraging anaesthetists and surgeons to complete the cancellation proforma.

References:

- *Peri-operative management of the surgical patient with diabetes, AAGBI, 2015*
- *The measurement of adult blood pressure and management of hypertension before elective surgery, AAGBI, 2016*
- *Regional anaesthesia and patients with abnormalities of coagulation, AAGBI, 2013*

Nutritional Prehabilitation at University Hospital Southampton

Introduction:

The National Institute of Clinical Excellence (NICE) acknowledge that malnourished patients have 3x risk of complications and 4x risk of death from surgery than well-nourished patients¹. It is estimated that 24-65% of patients undergoing surgery are malnourished². There are several randomised control trials and meta-analyses that demonstrate preoperative nutrition in malnourished patients can reduce postoperative morbidity by 20%³. With this in mind, University Hospital Southampton (UHS) have encompassed screening and treatment of malnutrition into Fit for Surgery School (F4SS). F4SS is an educational session which patients attend on average one month prior to surgery with the aim of improving modifiable risk factors and reducing surgical complications.

Methods:

Between August 2017 to 2018, patients who attended F4SS completed a modified Malnutrition Universal Screen Tool consisting of weight, BMI and percentage weight loss. All patients at high risk of malnutrition were assessed and treated by a dietitian. High risk was considered as >5% weight loss in the last 6-9 months, BMI <20 kg/m² or a reduced appetite.

Results:

27% of 266 patients screened were at high risk of malnutrition. 86% had lost significant weight and 61% had a reduced appetite. Figure 1 shows that Hepatopancreaticobiliary had the highest frequency of malnutrition. Only 15% of patients identified at high risk of malnutrition were already known to a Dietitian. Overall, 34% of patients received dietetic input. Of these, 26% received specialist dietetic advice, 31% required nutritional supplements and 40% were referred to the appropriate dietitian for ongoing nutritional support.

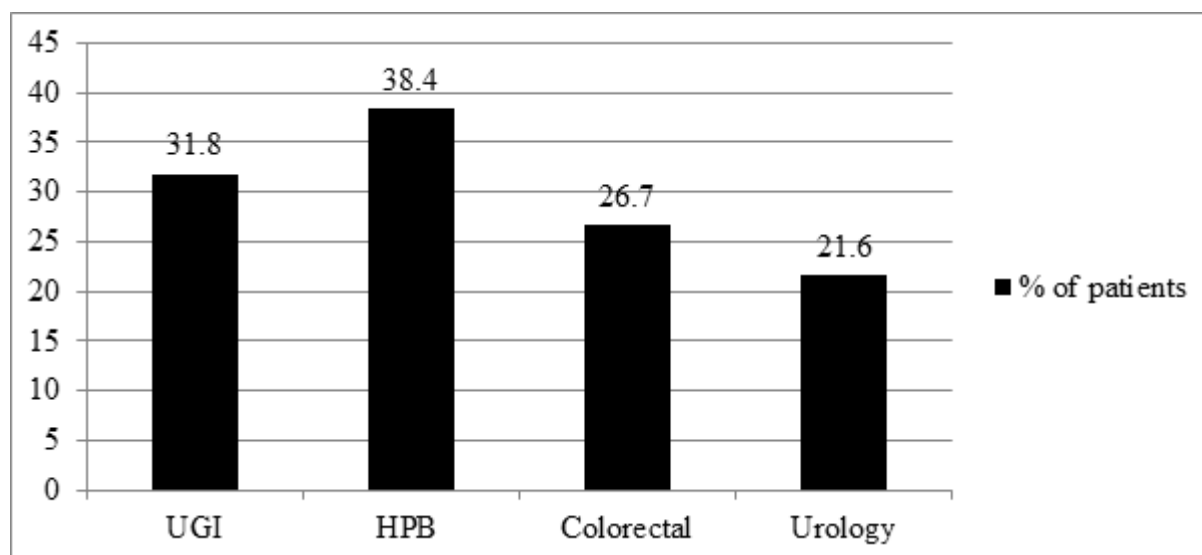


Figure 1: The percentage of patients identified at high risk of malnutrition according to surgical speciality.

Conclusion:

Preoperative malnutrition at UHS is significant and few patients would have received nutritional support if they had not been screened at F4SS. Preoperative treatment of

malnutrition is known to improve post-operative outcomes, however the exact affects in this study were not measured. It's currently not mandatory for patients to attend F4SS and cannot be relied on as the only nutritional screen prior to surgery. It is recommended that all patients due to undergo surgery are screened for malnutrition at the earliest opportunity in order to improve compliance with the NICE Clinical Guidance 32¹.

References:

1. National Institute of Clinical Excellence. Clinical Guidance 32. 2006
2. Bozzetti et al. Clinical Nutrition. 26: 698-709. 2007.
3. Benoist S, Brouquet A. Journal of Vascular Surgery. 152 (1): S3–S7. 2015.

A 3-year Retrospective Review of the Anaesthesiology Antepartum clinic for high-risk patients in a large, tertiary hospital in Singapore.

Introduction

With advancement in healthcare and technology, there is an increasing proportion of women with medically complicated pregnancies. These women are at increased risk of morbidity and mortality in the peripartum period. The CEMACH: Saving Mothers Lives 2003-2005 reported that a large proportion of these patients do not have a clear management plan. A dedicated clinic for the assessment of high-risk obstetric patients by the anaesthesiologists allows an informed and joint decision on delivery plans.

Methods

We conducted a retrospective evaluation of the electronic medical records of patients reviewed in the anaesthesiology antepartum clinic, in Singapore General Hospital, the largest tertiary hospital in Singapore. 111 patients attended the clinic over a period of 3 years, since the inception in 2015. The clinic, led by consultant works in collaboration with the Department of Obstetrics and Gynaecology and referrals made once a high-risk pregnancy has been identified.

Results

The 3 most common reasons for referral included high BMI (26.1%), cardiovascular disease (24.3%) and musculoskeletal conditions (21.6%). A small proportion of referrals were due to neurological/respiratory/rheumatological conditions, haematological disorders and prior complicated obstetric events. 50.4% of the patients were nulliparous. 22.2% of the referrals for cardiovascular disease were due to congenital heart disease (e.g. Fallot's tetralogy, coarctation of the aorta, transposition of the great vessels). 62.5% of the musculoskeletal referrals were due to underlying scoliosis. The average BMI among patients referred for high BMI was 41.5. Despite the high-risk profile due to various comorbidities, only 2.5% of the patients underwent emergency caesarean delivery. Maternal outcomes were favourable except for one mortality, secondary to out-of-hospital uterine rupture at 37 weeks gestation. Overall neonatal morbidity was low with 82.3% having Apgar scores of ≥ 8 at 1 minute, ≥ 9 at 5 minutes. We had 2 cases of neonatal mortality: 1 due to antenatally-diagnosed fetal anomalies and the other as a result of uterine rupture stated above.

Conclusion

Early assessment, a tailored management plan and a multidisciplinary team approach in high-risk pregnancies improves maternal and fetal outcomes. We will constantly review the clinical outcomes and also incorporate patient satisfaction score as part of our quality improvement program.

The Effect of Concomitant Hysterectomy on Complications Following Pelvic Organ Prolapse Surgery

Objective: To compare 30-day major complications following pelvic organ prolapse (POP) surgery with and without concomitant hysterectomy.

Methods: The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database was used to select all surgeries performed for POP from 2012 through 2016. CPT-4 procedure codes were then grouped based on surgical approach: vaginal (VAG), laparoscopic/robotic sacrocolpopexy (MISC), or open abdominal sacrocolpopexy (ASC). Major complications within 30 days were identified, including deep incisional surgical site infection (SSI), wound disruption, organ space SSI, pneumonia, unplanned intubation, pulmonary embolism, ventilator greater than 48 hours, progressive renal insufficiency, acute renal failure, CVA, cardiac arrest requiring CPR, myocardial infarction, blood transfusion, DVT, septic shock, and sepsis. Univariate chi-square, Fisher's Exact, and Kruskal Wallis tests as well as multivariable logistic regression were utilized to assess factors, including hysterectomy, associated with major complications within each surgical approach.

Results: Of the 60201 women who underwent surgery for POP, 51661 (85.8%) underwent VAG, 7072 (11.7%) MISC, and 1468 (2.4%) ASC. Concomitant hysterectomy was performed in 51.2% of those in the VAG group, 40.7% in the MISC group, and 28.7% in the ASC group. There were a total of 1722 major complications in 1432 patients (2.4%) within 30 days of surgery. The most common complications were blood transfusion (35.1%), organ space SSI (17.7%), and sepsis (10.9%). Multivariable analysis revealed the risk of complications following POP surgery was higher among women undergoing concomitant hysterectomy compared to those who did not have hysterectomy in the VAG (OR 1.5, $p<0.001$) and ASC (OR 2.7, $p<0.001$) groups. However, no increase in major complications was observed for the MISC group \pm concomitant hysterectomy (OR 0.99, $p=0.963$) (Table 1). Other independent risk factors for major complications during POP surgery included: non-white race ($p<0.001$), American Society of Anesthesiologists (ASA) classification system scores of 2 or 3-5 vs 1 ($p=0.025$ and <0.001 , respectively), and history of COPD ($p=0.001$).

Conclusions: Major complications following surgery for POP are uncommon. However, a higher risk of major complications was observed for women undergoing a vaginal or abdominal hysterectomy at the time of surgery for POP. Women undergoing hysterectomy at the time of POP surgery should be counseled regarding increased risks of major complications.

Table 1. Risk of 30-day major complication after undergoing hysterectomy at the time of POP surgery

Surgical Approach	Adjusted Odds Ratio (95% CI)	p-value
Vaginal (VAG)	1.53 (1.36-1.72)	<0.001
Laparoscopic/Robotic (MISC)	0.99 (0.67-1.46)	0.963
Abdominal (ASC)	2.77 (1.74-4.41)	<0.001

Title: Evaluation of the Establishment of a Geriatric Perioperative Service for Elective Lower Limb Joint Arthroplasty.

Objective: To investigate whether Comprehensive Geriatric Assessments (CGA) would improve the outcomes for older patients who had undergone elective hip and knee arthroplasties

Methods: Descriptive analyses were conducted on two cohorts of patients before and after the implementation of the Geriatric Perioperative Service (GPS) at Fremantle Hospital. CGA were performed at the preoperative clinic as per GPS protocol. The patients were categorised into the Pre-GPS and Post-GPS cohorts. Data collection was performed via review of patients' medical records and hospital electronic databases. The primary outcome was the postoperative morbidity as measured by the post-operative morbidity survey (POMS) tool.

Results: There were 101 patients in the Pre-GPS group and 99 in the Post-GPS group. Baseline characteristics were similar between the two cohorts with respect to age, gender distribution, weight, body mass index (BMI) and the operated joint. Patients in the post-GPS cohort were noted to have a lower proportion of ASA II (34.7% vs 57.4%, $p < 0.05$) and higher proportions of ASA III (61.2% vs 37.6%, $p < 0.05$) physical status. Using the POMS tool, There was a significant reduction in the mean total POMS score (0.64 ± 0.91 vs 0.96 ± 1.24 , $p < 0.05$) and pulmonary-specific morbidity (9.2% vs 25.8%, $p < 0.05$) in the post-GPS cohort. There was a trend towards a reduction in cardiovascular (5.1% vs 10.8%), renal (15.3% vs 34.8%), infectious (15.3% vs 17.8%) and pain (0% vs 1.0%) specific morbidity observed in the post-GPS cohort. In terms of length of hospital stay, most Post-GPS patients stayed for 5 days or less, compared to Pre-GPS patients who mostly stayed 6 days or more ($p=0.016$). Nine Post-GPS patients had delirium postoperatively, relative to five Pre-GPS patients.

Conclusion: The implementation of the GPS at Fremantle Hospital was successful and delivered a number of safety benefits for elderly patients undergoing elective joint arthroplasties. Although the patients seen at the GPS were of poorer physical and medical status, the service delivered a reduction in the total postoperative complications and pulmonary-specific complications, the most prevalent organ system complication prior to the introduction of the service. A trend towards a reduction in infectious, renal, cardiovascular and pain complications were also seen. GPS also delivered a shorter length of stay. Overall, the introduction of the GPS has delivered safer and more efficient care to elderly patients undergoing elective joint arthroplasty.

References

1. Naylor JM, Harmer AR, Heard RC, Harris IA. Patterns of recovery following knee and hip replacement in an Australian cohort. *Aust Health Rev.* 2009;33(1):124-35.
2. Johnson RL, Abdel MP, Frank RD, Chamberlain AM, Habermann EB, Mantilla CB. Impact of Frailty on Outcomes After Primary and Revision Total Hip Arthroplasty. *J Arthroplasty.* 2019;34(1):56-64 e5.
3. Eamer G, Taheri A, Chen SS, Daviduck Q, Chambers T, Shi X, et al. Comprehensive geriatric assessment for older people admitted to a surgical service. *Cochrane Database Syst Rev.* 2018;1:CD012485.
4. Australian and New Zealand Hip Fracture Registry (ANZHFR) Steering Group. Australian and New Zealand Guideline for Hip Fracture Care: Improving Outcomes in Hip Fracture Management of Adults. Sydney: ANZHFR Steering Group; 2014.
5. Gooneratne T, Bruce D, Chua C. Short term postoperative complications following elective hip and knee arthroplasty. Perth: Department of Geriatric Medicine, Fremantle Hospital; 2015.
6. Grocott MP, Browne JP, Van der Meulen J, Matejowsky C, Mutch M, Hamilton MA, et al. The Postoperative Morbidity Survey was validated and used to describe morbidity after major surgery. *J Clin Epidemiol.* 2007;60(9):919-28.
7. Hackett NJ, De Oliveira GS, Jain UK, Kim JY. ASA class is a reliable independent predictor of medical complications and mortality following surgery. *Int J Surg.* 2015;18:184-90.
8. Kahan BC, Koulenti D, Arvaniti K, Beavis V, Campbell D, Chan M, et al. Critical care admission following elective surgery was not associated with survival benefit: prospective analysis of data from 27 countries. *Intensive Care Med.* 2017;43(7):971-9.
9. De J, Wand AP. Delirium Screening: A Systematic Review of Delirium Screening Tools in Hospitalized Patients. *Gerontologist.* 2015;55(6):1079-99.
10. Styan L, Murphy S, Fleury A, McGowan B, Wullschleger M. Establishing a successful perioperative geriatric service in an Australian acute surgical unit. *ANZ J Surg.* 2018;88(6):607-11.

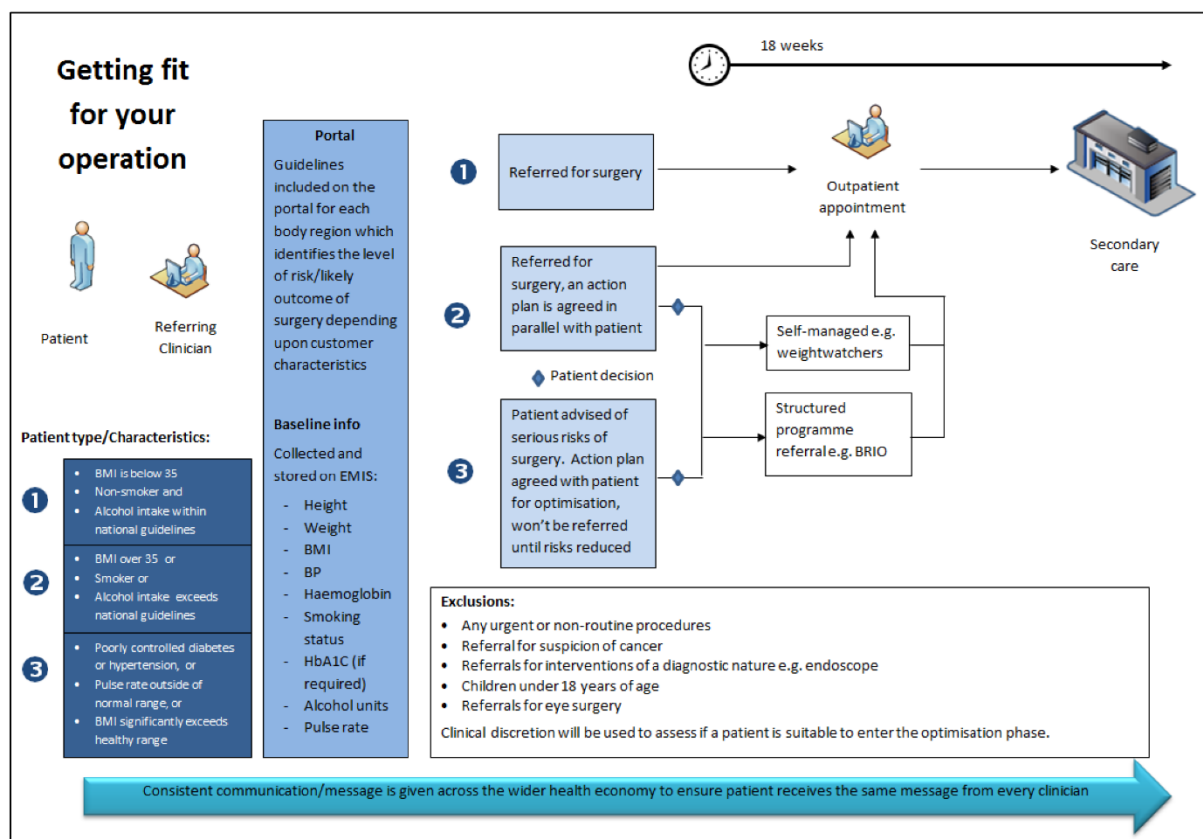
Introduction of a referral pathway for elective surgery and its impact on health optimisation - Has it made a difference?

Introduction

Many patients who are referred for elective surgery have risk factors for peri-operative morbidity including smoking, hypertension, obesity and diabetes. Peri-operative complications associated with smoking include impaired wound healing and increased risk of heart and lung complications.¹ Similarly, obesity is associated with a 5-fold increased risk of surgical site infection (SSI).²

In November 2017, West Cheshire CCG introduced a pathway designed to identify patients who would benefit from a period of health optimisation at the point of referral for surgery. These include:

- Patients with a BMI ≥ 35
- Current smokers
- Uncontrolled hypertension (BP above 160/100mmHg)
- Diabetic patients with HbA1c above 69mmol/L



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Methods

We carried out a retrospective audit of all adult patients undergoing elective surgery between 14/03/18 and 18/04/18. The BMI, smoking status, blood pressure and diabetes control at preoperative assessment were recorded. Results were compared with data from 2016 prior to implementation of the CCG referral pathway.

Results

	2016	2018
Number of patients in Audit	n = 470	n = 351
Percentage of current smokers	18.3%	16.2%
Mean BMI (z = -0.97 p = 0.16)	27.9	28.1
Median BMI	26.9	27.4
Percentage of patients with BMI ≥ 35	12.1%	11.5%
Number of diabetic patients	n = 54	n = 22
Percentage of diabetic patients with HBA1c > 69mmol/L	24%	0%
Mean HBA1c in diabetic patients (z = 1.53 p = 0.06)	55	47.7
Median HBA1c in diabetic patients	51	48
Percentage of patients requiring referral back to GP for blood pressure optimisation	1.1%	0.6%

Conclusion

Since introduction of the new referral pathway, there has been a marked reduction in the percentage of poorly controlled diabetic patients. There is also a reduction in percentage of current smokers in 2018 vs 2016 (16.2% vs 18.3%).

We are still seeing some patients with hypertension who could benefit from further optimisation prior to surgery. However, the referral pathway has helped us identify if hypertensive patients are genuinely hypertensive, or if the high blood pressure reading at preassessment clinic is due to “white coat syndrome”. Having the normal blood pressure readings on the referral pathway has prevented cancellations or referral back to the GP, and has therefore improved care significantly.

The BMI data between 2016 and 2018 are largely unchanged. There is a slight decrease in the number of patients with BMI ≥ 35 in 2018 though the mean and median BMI have both increased.

References

1. Theadom, A et al (2006) 'Effects of preoperative smoking cessation on the incidence and risk of intraoperative and postoperative complications in adult smokers: a systematic review', The Hillingdon Hospital, London, UK
2. Waisbren E et al (2010). Percent body fat and predication of surgical site infection. J am Coll Surg 2010;210(4): 381-9

Bridging the gap: A quality improvement project to improve the perioperative management of warfarinised patients for elective surgery

Introduction: Despite increased use of Novel Oral Anticoagulants, warfarin is still used in selected patients at risk of thromboembolic disease. Optimal perioperative management of warfarin is essential to prevent bleeding complications and risk of thrombosis in at risk patients, whilst avoiding costly surgical cancellations.

The aim of our quality improvement project was to assess compliance with the NHS Lothian Warfarin Bridging Guideline (2017) for patients undergoing elective surgery, and institute novel interventions to reduce inappropriate bridging, workload, and frequency of cancellations.

Methods: Perioperative management of all elective surgery patients on warfarin between August and December 2018 was assessed. Patients were identified through the surgical pre-assessment clinic (PAC), and data was collected prospectively. We audited 5 domains of anticoagulation management: selection of patients who require bridging, timing of warfarin cessation; appropriate INR reduction (≤ 1.5) on day of surgery (DoS); efficiency of communication in organisation of bridging; cancellation of surgery. A qualitative assessment of PAC Nurses and GPs' opinions was also conducted.

Results: 14 warfarinised patients were listed for elective surgery in the defined period. 6 patients (43%) received perioperative LMWH bridging, 8 (57%) did not. Of the 6 patients bridged, 66% were done so inappropriately, 83% stopped warfarin correctly, 66% had an appropriate INR for surgery, 33% had efficient communication between stakeholders, but no cases were cancelled. Of the 8 patients who were not bridged, all were done so appropriately; 88% stopped the warfarin on the correct day, 62% had an appropriately low INR, and 75% had efficient communication between stakeholders. 12% (1 patient) had surgery cancelled. In addition to the 5 domains, we found 66% of those patients needing bridging required inpatient admission prior to DoS, and 0% of patients followed the regime recommended by the guideline.

Qualitative data was obtained (10 PAC nurses and 2 GPs). Identified barriers to effective anticoagulation management include: lack of awareness/willingness of GPs to arrange bridging, difficulties contacting GPs, lack of patient understanding, and a lack of guideline use amongst surgeons.

Discussion: Peri-operative warfarin management represents a significant increase in workload for all staff involved. We found that the trust bridging guideline is rarely followed, patients are inappropriately admitted, and low risk patients are incorrectly bridged. Following

this audit, the management of perioperative bridging has moved from primary to secondary care. A warfarin perioperative pathway and warfarin package for both patients and PAC nurses has been established. Post intervention data collection is underway.

References:

NHS Lothian, 2017. *Warfarin, Direct Oral Anticoagulants and Anti-platelet Medication: Management at the time of elective surgery*. Edinburgh: NHS Lothian.

The Impact on Day of Surgery Cancellations of the First Anaesthetists-led Preoperative Assessment Clinic in Costa Rica.

Introduction: Pre-anaesthesia clinics have been developed to enhance patient centred care.¹ They allow timely identification and optimisation of clinical issues that may otherwise result in same day cancellations.² In Costa Rica, the preoperative assessment is done by different specialties but not by anaesthetists, and it occurs only minutes prior to surgery, where neither the risk, patient status, nor the comorbidities can be modified. Therefore, at our institution we decided to standardize the preoperative process and create the first anaesthetist-led preoperative consult service in Costa Rica. The aim of this project was to improve patient care through standardised preoperative assessment and to evaluate the impact of the pre-operative assessment on day of surgery cancellations.

Methods: An initial surgical service audit was conducted to measure the baseline rate of day of surgery cancellations (DSCs). A

quality improvement project was developed (Table 1), an evidence-based protocol was designed for preoperative assessment and an anaesthesia-led pre-anaesthetic consult for high risk surgical patients was introduced. T-test was used to compare DSCs over a six month period before and after the implementation of the consults.

Results: The monthly rate of

DSCs during the baseline audit in 2016 was 9.8%, with 73.5% of these related to clinical causes. Further analysis showed that 100% of these patients had an assessment by a general practitioner, but no patient had a preoperative assessment by an anaesthetist. 17% had a preoperative consult by an internal medicine specialist, of which 46% were considered unnecessary. After implementation of a standardised pre-assessment protocol, and an

anaesthesia-led clinic, DSCs relative risk reduction (RRR) was 28.6% (95% CI 18.6 to 37.3, $p<0.0001$). When analysed by causes, the RRR of DSCs due to patient related factors was 37.5% (95% CI 26.2 to 47.0, $p<0.0001$) and the RRR of DSCs due to non-clinical causes was 9.0% (95% CI -13.8 to 27.2, $p=0.41$) (Figure 1). **Conclusions:** The introduction of a protocolised, anaesthesia-led pre-assessment service significantly reduced DSCs. The reduction was primarily achieved by reducing cancellations resulting from clinical causes. This study demonstrates the clinical impact that anaesthesia as a specialty can have on patients' perioperative journey beyond the confines of the operating room and we hope will provide some evidence for patient benefit in order to encourage the implementation of a similar model of care across other hospitals in Costa Rica.

Keywords: anaesthesia, operating room, quality improvement, Costa Rica.

References:

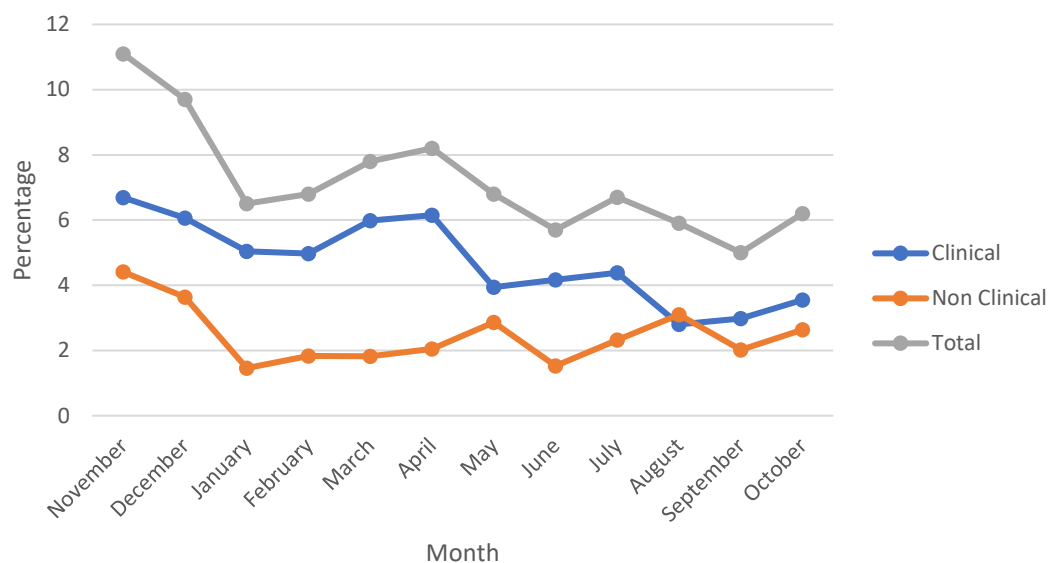
1. American Society of Anesthesiologists Task Force on Preanesthesia Evaluation. *Anesthesiology* 116: 522-38, 2012.
2. Vetter TR, Ivankova NV, Goeddel LA, McGwin GJr, Pittet JF et UAB Perioperative Surgical Home Group. *Anesthesiology* 119: 1261-74, 2013.

Table 1. PDSA cycles in the design and implementation of an intervention to reduce DSC

Cycle	Plan	Do	Study	Act	Time
1	Audit DSC causes	Review data from January to June 2016 DSC	9,8% of DSC, more than 70% due to clinical causes	Root cause analysis for inappropriate preoperative assessment	July 2016
2	Analysis of preoperative assessment done to patients that arrive to OR	Measure data during 4 weeks period	Analysis of 80% of scheduled patients, 9,36% DSC, 46% of specialist assessment were considered unnecessary, no patient was assessed by anaesthesia	Propose to standardize the preoperative assessment process	August to September 2016
3	Develop a MDT to create the protocols	Literature review to formulate the protocols and procedures for the preoperative assessment process	Feedback sessions with IM, GP and anaesthesia to identify corrections for the protocols	Dissemination of protocols, training sessions for the involved personnel in the process	December to April 2017
4	Pilot Month of standardized preoperative assessment	GPs assessment based on the new protocols Start of anaesthesia consult	Session with GP: 100% satisfaction with the assessment, no difference in time needed for consult Only 34 high risk patients requiring anaesthesia evaluation	Reduce the time for anaesthesia consult to one day per week and continue with the consults	May 2017
5	Six months of consults	Compare DSC between the pre and post-intervention periods	Analysis of the impact of the standardization of preoperative assessment on DSC	Continue with the clinic and the assessments. Focus on non-clinical causes for DSC	May-October 2017

PDSA: Plan-do-study-act, DSC: day of surgery cancellations, IM: internal medicine, GPs: general practitioners, OR: operating room, MDT: multidisciplinary team.

Figure 1. Percentage of DSC according to cause from November 2016 to October 2017



Surgical Risk Assessment: Good medicine, but rarely administered.

Introduction

In 2013, Dr. Ramani Moonesinghe and colleagues published an article comparing current perioperative risk assessment models [1] in which the authors questioned how often validated perioperative individualized risk assessment tools are actually used and documented.

We know from an English audit of 496 high-risk surgical patients that only 7% of these patients had documented risk-assessments. [2] This result is surprising given the abundance of *current* perioperative risk assessment literature. Considering that preoperative risk assessment is required by the ASA, ACS, CMS, and tJC, that it facilitates shared-decision making and informed consent, informs perioperative care, and allows for comparative audit, we undertook a 22 medical center, 5 State audit of *at-risk* surgical patients cared for between January 1, 2017 to December 31 2017, in an effort to determine the rate of documented individual risk assessments authored by surgeons and/or anesthesiologists within 24 hours of surgery.

Methods:

Following IRB approval, a population of at-risk surgical patients was retrospectively identified using ICD-10 codes. Then, a group of investigators were trained to identify whether quantitative risk assessment, qualitative risk assessment, and/or specific risk assessment tools were documented within preoperative surgical and anesthesiology charts. Chi square analysis was used to assess whether gender, ethnicity (Caucasian/ non-Caucasian), time of surgery (AM/PM), emergency or elective, cardiac or non-cardiac, alive or dead, and surgeon versus anesthesiologist impacted the rate of risk documentation.

Results: Table 1

- In total, 756 out of 140,000 surgical, non-obstetric, inpatients were identified.
- 4.8% of Anesthesiologists documented a qualitative risk assessment.
- 0.5% of Anesthesiologists documented a quantitative risk and named a tool.
- 11.51% of surgeons documented a qualitative risk.
- 2.38% of surgeons documented a quantitative risk assessment.
- 0.66% of surgeons included a tool name in their quantitative risk note.
- Out of 1512 preoperative notes, a RA tool was documented by name in only 10 patients (1.3%).

Table 1 Data and test of difference

	n	Any Risk Assessment	Any Risk Assessment %	chi sq p-value	95% confidence interval for the difference
Women	372	71	19.09%	0.4978	(-3.59% , 7.9%)
Men	384	65	16.93%		
Caucasian	669	114	17.04%	0.08264	(-18.46% , 1.97%)
Non Caucasian	87	22	25.29%		
AM Surgery	687	128	18.63%	0.1983	(-1.86% , 15.93%)
PM Surgery	69	8	11.59%		
Emergent	158	19	12.03%	0.0377	(1.15% , 13.93%)
Non-Emergent	598	117	19.57%		
ASA Classes 1/2	101	18	17.82%	1	
ASA Classes 3/4/5	654	117	17.89%		
Age < 65	308	45	14.61%	0.05623	(0.002% , 11.4%)
Age 65+	448	91	20.31%		
Non Cardiovascular Procedures	613	99	16.15%	0.009	(1.55% , 17.9%)
Cardiovascular Procedures	143	37	25.87%		

Mortality and Risk Assessment

	n	Any Risk Assessment	Any Risk Assessment %	chi sq p-value	95% confidence interval for the difference
No Mortality	543	92	16.94%	0.328	(-9.87% , 3.2%)
Mortality	217	44	20.28%		

Surgery vs. Anesthesia and Risk Assessment

	n	Any Risk Assessment	Any Risk Assessment %	chi sq p-value	95% confidence interval for the difference
Surgery	756	105	13.89%	< 0.0001	(5.81% , 11.91%)
Anesthesia	756	38	5.03%		

Conclusion:

The rate of documented individualized risk assessment within our multi-State sample was low. Surgeons were more likely than anesthesiologists to document organ specific risk and/or mortality risk. Cardiac surgical patients were more likely than non-cardiac surgery patients to have documented risk assessments as were non-emergent surgical patients. Though not statistically significant, non-Caucasian surgical patients tended to have their perioperative risk documented.

These results are similar to the NCEPOD audit and call for greater focus on preoperative individualized risk assessment. Failure to perform individual risk assessment prior to surgery denies patients the right to shared-decision making and informed consent. Small scale studies suggest that individual risk assessment may enhance care. [3] Large scale studies are required to determine whether preoperative risk assessment reduces morbidity and/or mortality.

References:

1. Moonesinghe, et al. Anesthesiology 119:959-81, 2013
2. Findley, et al. Knowing the Risk- NCEPOD. 6, 2011
3. Broughton, et al. ANZ J Surg 87: 893–897, 2017

Perioperative Smoking and Flap Survival

Abstract

Introduction: The aim of this study was to compare the complications of flap surgery in nonsmokers and smokers, and to determine how the incidence of complications was affected by the abstinence period from smoking before and after flap surgery.

Methods: In PubMed and Scopus, terms “smoking” AND “flap survival” were used, which resulted in 113 papers and 65 papers, respectively. After excluding 6 duplicate titles, 172 titles were reviewed. Among them, 45 abstracts were excluded, 20 full papers were reviewed, and finally, 15 papers were analyzed.

Results: Postoperative complications such as flap necrosis ($p<.001$), hematoma ($p<.001$), and fat necrosis ($p=.003$) occurred significantly more frequently in smokers than in nonsmokers. The flap loss rate was significantly higher in smokers who were abstinent for 24 hours postoperatively than in nonsmokers ($n=1464$, odds ratio [OR]=4.885, 95% confidence interval [CI]=2.071-11.524, $p<.001$). The flap loss rate was significantly lower in smokers who were abstinent for 1 week postoperatively than in those who were abstinent for 24 hours postoperatively ($n=131$, OR=0.252, 95% CI=0.074-0.851, $p=.027$). No significant difference in flap loss was found between nonsmokers and smokers who were abstinent for 1 week preoperatively ($n=1519$, OR=1.229, 95% CI=0.482-3.134, $p=.666$) or for 4 weeks preoperatively ($n=1576$, OR=1.902, 95% CI=0.383-2.119, $p=.812$).

Conclusion: Since smoking decreases the alveolar oxygen pressure and subcutaneous

wound-tissue oxygen, and nicotine causes vasoconstriction, smokers are more likely to experience flap loss, hematoma, or fat necrosis than non-smokers. Preoperative and postoperative abstinence period of at least 1 week is necessary for smokers who undergo flap operations.

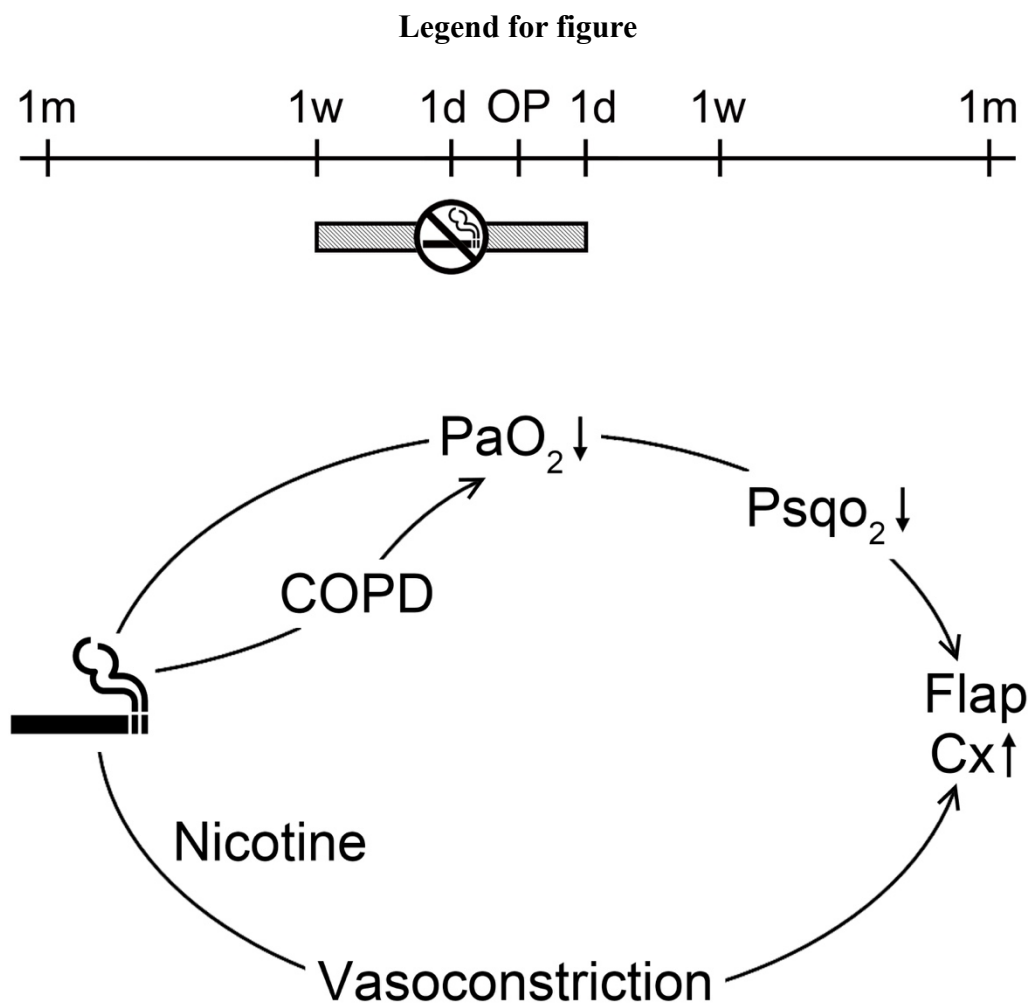


Figure 1. Mechanism of smoking and abstinence periods. Upper: Pre- and postoperative abstinence periods for smokers who undergo a flap operation. m: month, w: week, d: day. Lower: Mechanism of effect of smoking on flap loss. PaO₂: alveolar oxygen pressure, Psqo₂: subcutaneous wound-tissue oxygen, COPD: chronic obstructive pulmonary disease, Cx: complication

16 of the 18 anaesthetists surveyed knew guidelines existed. However, when asked about specific recommendations, the mean correct response rate was only 33%. In the first audit cycle (32 patients) BG was recorded hourly in 5 (16%) patients and not at all for 20 (68%). Mean time per recording was 182 minutes. BG was recorded as out of range on 10 occasions and only treated once. Repeat audit following implementation of the new tool (28 patients) showed at least hourly BG monitoring occurred in 14 (50%) patients, and at least once for 16 (57%). Mean time per

recording fell to 85 minutes and BG went out of range on only two occasions, both of which were treated.

Conclusion

Monitoring and management of patients with diabetes undergoing surgery in our trust previously fell well below guideline standards. Following an education programme and implementation of a novel perioperative management tool, we recorded an improvement in practice, including more regular monitoring and more proactive treatment of hyper- and hypoglycaemia. We expect practice will continue to improve as awareness increases, which we plan to achieve through ongoing education.

References

1. Association of Anaesthetists of Great Britain and Ireland, 2015, *Peri-operative management of the surgical patient with diabetes*, London: AAGBI
2. Frisch A, Chandra P, Smiley D, et al. Prevalence and clinical outcome of hyperglycemia in the perioperative period in noncardiac surgery. *Diabetes Care* 2010; 33: 1783–8
3. Joint British Diabetes Societies, 2016, *Management of adults with diabetes undergoing surgery and elective procedures: Improving standards*, (2nd Ed.) Solihull: Association of British Clinical Diabetologists

ABSTRACT**Non-Invasive Positive airway Pressure thErapy to Reduce Postoperative Lung complications following Upper abdominal Surgery (NIPPER-PLUS); a pilot RCT**

Title: Non-Invasive Positive airway Pressure thErapy to Reduce Postoperative Lung complications following Upper abdominal Surgery (NIPPER-PLUS); a pilot randomised controlled trial

Introduction: Postoperative pulmonary complications (PPC) are common following upper abdominal surgery [1-3] and are associated with significant clinical consequences [4-5]. The primary objective was to detect whether there is a signal towards PPC reduction with the addition of intermittent non-invasive ventilation (NIV) to continuous high-flow nasal cannula (HFNC) oxygen therapy alone following high-risk elective upper abdominal surgery. Secondary objectives are to measure feasibility and safety of HFNC and physiotherapy-led NIV protocols.

Methods: NIPPER-PLUS was a single-centre, parallel group, assessor-blinded, pilot randomised trial, with 130 high-risk upper abdominal surgery patients randomly assigned via concealed allocation to either: (1) HFNC for 48 hours following extubation or, (2) HFNC plus five 30-minute physiotherapy-led NIV sessions delivered within the first two postoperative days. Both groups received standardised preoperative physiotherapy and postoperative early ambulation. Primary outcome measure was PPC incidence within the first 14 postoperative days using the Melbourne Group Score [6]. Secondary outcome measures include; recruitment ability, protocol adherence, and safety.

Results: Incidence of PPC was similar between groups (HFNC alone; 18% ($n=12/65$) vs HFNC + NIV; 16% ($n = 10/63$), adjusted RR 1.16; 95% CI 0.54 to 2.52, $p = 0.70$). Participant consent rate was 96%. Two participants were withdrawn. Delivery of HFNC for 48 hours post-surgery was achieved in 82% ($n=105$) of participants. Average time to

commence HFNC was 59 minutes (SD 48) in the HFNC group and 73 minutes (SD 54) in the HFNC + NIV group. Delivery of physiotherapy-led NIV within four hours post extubation was achieved in 83% ($n = 52$) of participants and mean number of NIV sessions delivered was 4.3 (SD 1.2). Delivery of NIV as per protocol was achieved in only 54% ($n = 34$) of participants. Main barriers to NIV delivery were limited weekend physiotherapy-service and participant refusal. There was one major adverse event of severe hypotension resulting in a moderate inotrope increase for a 30 minute period.

Conclusion: A significant reduction in PPC was not detected in this pilot trial. Delivery of continuous HFNC was feasible. Whilst delivery of NIV within four hours of extubation was achieved; the protocol was not feasible in its current form and will require revision for future research. Postoperative NIV was safe with <1% adverse events.

References:

- [1] Neto AS, Hemmes, SN, Barbas CS, Beiderlinden M, Fernandez-Bustamante A, Futier E, et al. Incidence of mortality and morbidity related to postoperative lung injury in patients who have undergone abdominal or thoracic surgery: a systematic review and meta-analysis. *Lancet Respir Med*. 2014;12:1007-15.
- [2] Miskovic A, Lumb AB. Postoperative pulmonary complications. *Br J Anaesth*. 2017;118:317-34.
- [3] Fernandez-Bustamante A, Frendl G, Sprung J, Kor DJ, Subramaniam B, Martinez Ruiz R, et al. Postoperative Pulmonary Complications, Early Mortality, and Hospital Stay Following Noncardiothoracic Surgery: A Multicenter Study by the Perioperative Research Network Investigators. *JAMA Surg*. 2017;152:157-66.
- [4] Thompson DA, Makary MA, Dorman T, Pronovost PJ. Clinical and Economic Outcomes of Hospital Acquired Pneumonia in Intra-Abdominal Surgery Patients. *Annals of Surgery*. 2006;243:547-52.
- [5] Fleisher LA, Linde-Zwirble WT. Incidence, outcome, and attributable resource use associated with pulmonary and cardiac complications after major small and large bowel procedures. *Perioper Med (Lond)*. 2014;3:7.
- [6] Boden I, Skinner EH, Browning L, Reeve J, Anderson L, Hill C, et al. Preoperative physiotherapy for the prevention of respiratory complications after upper abdominal surgery: pragmatic, double blinded, multicentre randomised controlled trial. *BMJ*. 2018;360:j5916

Establishing a perioperative anaemic clinic: an innovative collaborative pathway

Background

Anaemia is associated with increased perioperative morbidity and mortality, including prolonged hospitalisation and higher blood transfusion rates. Although there are published guidelines globally on the management of anaemia pre-operatively, these are not widely adopted due to multiple factors. Our institution initiated a collaborative model for the pre-operative management of anaemia in patients presenting for elective surgery.

Methodology

We initiated a collaboration between anaesthesiologists and physicians at the Singapore General Hospital (SGH) in November 2017 to screen and manage all elective surgical patients with anaemia. The hurdles identified include:

1. lack of awareness among clinicians and hospital management team
2. oversight of anaemia and hence inadequate workup
3. lack of facilities for intravenous (iv) iron administration
4. increased financial burden for patients requiring iv iron

Baseline data for anaemia and perioperative outcomes were tabulated and presented to the hospital management team to heighten awareness and support the initiative. Collaboration between the haematologists, internal medicine (IM) physicians and anaesthesiologists facilitated the management of anaemia including the administration of iv iron therapy. To reduce the out-of-pocket payment for patients, the cost of iv iron was incorporated into the hospitalization bill. Clinical protocols were also developed to streamline work processes.

Results

The anaemia clinic in SGH has been operational for 15 months since November 2017, achieving a 97% capture rate for haemoglobin (Hb) screening for patients presenting for elective surgery. A total of 112 patients underwent iv iron therapy with no major complications encountered.

Discussion

Supportive hospital management, availability of resources, collaboration between various disciplines and implementation of evidence-based protocols are key to a successful preoperative anaemia clinic (PAC). In our hospital, the majority of elective surgical patients are assessed in the preoperative anaesthesia clinic 2 weeks prior to surgery, where a screening Hb is performed. Clinical protocols guide residents on the indications for referral to the PAC, led by IM physicians. In addition to postponement of surgery, patients with newly diagnosed anaemia with markedly low Hb/have any suggestive symptoms are given an early referral to the gastroenterologists for further evaluation.

Recommendations for a successful PAC:

1. Collate baseline data for anaemia prevalence and associated complications to gather support from various stakeholders involved

2. Develop a comprehensive service with an identified physician for holistic management, including post-operative follow-up.
3. Availability of clear, effective protocols and treatment algorithms
4. Promote team collaboration to facilitate inter-disciplinary referrals
5. Availability of resources and facilities for administration of iv iron therapy

References

1. Sim, Y. E. et al. Prevalence of preoperative anemia, abnormal mean corpuscular volume and red cell distribution width among surgical patients in Singapore, and their influence on one year mortality. *PLoS One* 12, e0182543 (2017).
2. Abdullah, H. R. et al. Association between preoperative anaemia with length of hospital stay among patients undergoing primary total knee arthroplasty in Singapore: a single-centre retrospective study. *BMJ Open* 7, e016403 (2017).
3. Guinn, N. R. et al. How do we develop and implement a preoperative anemia clinic designed to improve perioperative outcomes and reduce cost? *Transfusion* 56, 297–303 (2016).
4. Meybohm, P. et al. Feasibility and efficiency of a preoperative anaemia walk-in clinic: secondary data from a prospective observational trial. *Br. J. Anaesth.* 118, 625–626 (2017).
5. Deepti Radia, D. et al. Anemia management: development of a rapid-access anemia and intravenous iron service. *Risk Manag. Healthc. Policy* 6, 13 (2013).

Title – Qualitative assessment of electronic pre-operative assessment in a district general hospital

Introduction – Electronic methods of pre-operative assessment are a growing field and already in use by several NHS trusts. They have previously been shown to improve patient satisfaction and reduce consultation time (1). This study aimed to assess patient views and experiences of current clinic-based pre-operative assessment and gather perspectives on the potential introduction of electronic pre-operative assessment.

Methods – A paper-based survey was developed between pre-assessment medical and nursing staff. The survey was given to consecutive patients arriving for pre-operative assessment for day-case surgery over a six-week period from February – March 2019, at a large district general hospital. Surveys were transcribed to spreadsheet for analysis. No patient-identifiable information was gathered.

Results – 102 surveys were completed, covering a wide range of patient ages and all surgical specialities. When asked about the current pre-operative assessment service, 37 (36%) patients had made special arrangements to attend their appointment, 20 (20%) had had their appointment date changed. Regarding electronic pre-operative assessment, 64 (63%) patients responded that it would be a good idea, 26 (26%) stated it would be beneficial to not attend hospital for pre-operative assessment., and 95 (93%) patients had access to the internet.

Conclusion – Electronic pre-operative assessment represents an attractive prospect for NHS trusts by improving the efficiency of pre-operative assessment. Our study shows that most patients prefer the idea of electronic pre-operative assessment and have access to the internet to comply with newer developments. However, care must be taken to consider local patient preference when developing electronic pre-operative assessment models. Further work includes a pilot study of electronic pre-operative assessment for day case surgery in our trust, with qualitative information regarding patient satisfaction taken as outcomes alongside quantitative outcomes of efficiency.

References – (1). Howell, M. *Use of a patient completed iPad questionnaire to improve pre-operative assessment*. Journal of Clinical Monitoring and Computing. Volume 31. P221-225. 2017

Quantifying Risk - More Than Just Numbers.

Introduction

A case report regarding a patient whose perioperative journey provided difficult questions regarding risk.

Patient Background

An 85 Year old male presented to CPEX with gastro-oesophageal carcinoma for gastrectomy. For age, the patient was relatively fit with hypertension only. His exercise tolerance was 50 yards limited by joint pain and mild dyspnoea. He was a non-smoker and lived independently.

Results of Perioperative Investigations

A staging CT demonstrated T3N2M0 gastric carcinoma along with calcification of the coronary arteries, the latter prompting cardiology referral. The patient underwent cardiopulmonary exercise (CPEX) testing and anaesthetic pre-assessment. CPEX testing showed VO₂ 17.0ml/kg/min, VE/VCO₂ 28 and AT 11.8ml/kg/min which categorised him as low risk. The test demonstrated mild ST depression (1.9mm) at peak work. John Carlisle Risk Assessment provided a predicted mortality of 5.7%, prolonged recovery risk of 30% and chance of complication 26%. Examination found an ejection systolic murmur alongside borderline LVH and AF on ECG. Subsequent echocardiography showed normal systolic function, severe aortic stenosis with valve area of 0.7cm² and mean gradient of 27mmHg. The cardiologists completed an angiogram which showed no significant coronary artery disease.

Discussion

Four cardiologists were consulted, each had different opinions about how to proceed. The difficulty in assessing risk was that despite pathology being identified, he was relatively asymptomatic, with preserved mean gradients and adequate CPEX performance. The patient was fully informed of perioperative risk, in visual format, including: 8 year survival without gastric carcinoma or aortic stenosis (50%), perioperative mortality (5.7%), revised to 10% with aortic stenosis and mortality from gastric carcinoma without intervention certain over an undetermined timeframe. The patient opted for intervention and successfully underwent gastrectomy and oesophagectomy with a 48 hour HDU admission and a 7 day total hospital admission. As perioperative physicians we can only strive to accurately inform patients of risk. The balance of risk and ultimate decision lies with the patient.

Innovating perioperative anaemia in a district general hospital: challenges and solutions

Introduction

Anaemia is associated with increased perioperative morbidity and mortality (1) and pre-operative iron therapy is recommended for anaemic patients undergoing major surgery (2,3). We aimed to develop a single pathway for detecting and treating anaemia for patients undergoing major surgery in our trust.

Methods

We performed a literature and guideline review before developing a pathway that allowed identification and investigation/treatment of anaemia (figure one). The pathway is flexible and can be developed over time (e.g. integrating direct to specialty referrals).

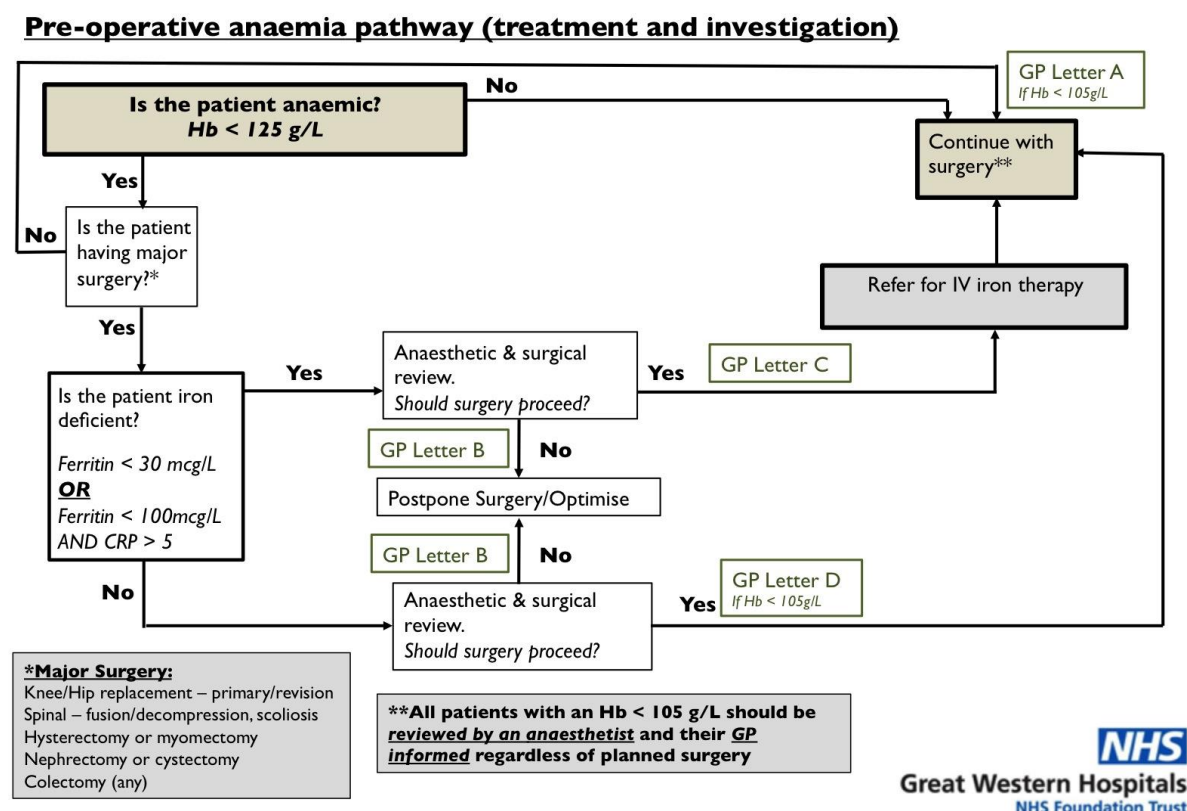


Figure One: Perioperative anaemia pathway

Alongside the pathway we developed a database for all patients treated with iron and secured funding from the trust to supply the intravenous iron.

Results

In the first six months using the pathway we referred 90 patients for intravenous iron. The mean time from iron therapy to surgery was 12.5 days, during which time the patients' mean haemoglobin rose from 105g/L to 110g/L.

Discussion

To improve perioperative outcomes in anaemic patients we created a single, simple, anaemia pathway. Barriers to implementation included finding staff/space to administer iron and the short

time between pre-operative assessment and surgery. To counter these we are submitting a business case to recruit another nurse and are implementing point of care haemoglobin testing (+/- further investigation if anaemic) when the decision to operate is made. We anticipate this will facilitate earlier and more efficacious iron therapy and allow us to offer oral iron to selected patients, which will reduce costs. We will also be implementing direct to specialty referrals for anaemic patients by developing an in-house anaemia triage service. We also plan to increase the haemoglobin cut off to 130g/L and introduce transferrin saturation as another marker of iron deficiency, which we will do once we have adequate staffing to manage the associated increase in workload.

We believe this project highlights many of the barriers to service improvement that are commonly encountered and identifies strategies to manage them. We feel our pathway is simple and effective and could be used in other clinical areas/trusts.

References

1. Mussallam, et al. Preoperative anaemia and post-operative outcomes in non-cardiac surgery: a retrospective cohort study, *Lancet*(378). 1396-1407. 2011.
2. Kotze et al. British Committee for Standards in Haematology Guidelines on the Identification and Management of Pre-Operative Anaemia. *BJH*(171), 322–331 2015.
3. Munoz e al. International consensus statement on the peri-operative management of anaemia and iron deficiency *Anaesthesia*(72) 233–247. 2017

Performance of machine learning models in predicting perioperative risks

Objective:

To compare established traditional risk stratification tools against machine learning (ML) models in prediction of perioperative risks.

Background:

With improved access to surgery, patients with postoperative complications will increase. Accurate preoperative assessment and prediction of surgical risk facilitates clinical decision-making and resource planning. A combination of ML techniques and advancements in electronic medical records (EMRs) may yield better predictive performance than traditional models. We hypothesize that a ML model for surgical risk prediction would outperform traditional risk calculators, such as the Combined assessment of Risk Encountered in surgery (CARES)¹ and American Society of Anesthesiologists-Physical Status.

Methods:

A retrospective analysis was conducted in Singapore General patients aged 18 years and above who underwent general or regional anaesthesia over 22 months. Patient data, preoperative investigation results and operative details were retrieved from EMRs. Prior to modeling, all variables were scaled, and missing values were imputed using median. 70% of observations were selected for training, with remaining 30% kept for model evaluation. To address class imbalance, training set patients without outcome were split into 10 roughly equal subsets, which was then paired with all training patients with outcome to create an ensemble of 10 datasets which were more balanced. Models were trained using random forest, adaptive boosting, gradient boosting and support vector machine. Outcomes measured were 30-day postoperative mortality and ICU admission > 24 hours. Model performance were evaluated using area under the receiver operating curve (AUROC) and area under the precision recall curve (AUPRC).

Results:

90785 patients were included. 30-day mortality rate was 0.6%. 1.4% of patients needed ICU admission of >24 hours post-operatively. All models were able to achieve high AUROCs of between 0.89 and 0.96, including the baseline CARES model despite its poor sensitivity of 0.00. It predicted all negatives in a predominantly negative dataset with its specificity of 1.00 and PPV of 0.00. With a F1 score of 0.28 and AUPRC of 0.2, gradient boosting was the best performing model, translating to an improvement of 50% in sensitivity with only 2% loss in specificity.

Discussion:

We have demonstrated that ML analytics can offer a superior performance compared to traditional statistical models. As ML enters mainstream perioperative literature, it is also important to re-evaluate the performance matrix used. AUROCs can be artificially maximized in

an imbalanced dataset that identifies rare events like perioperative mortality rate. We highlight more appropriate evaluation metrics such as F1 score and AUPRC.

Reference:

1. Chan DXH, Sim YE, Chan YH, Poopalalingam R, Abdullah HR. Development of the Combined Assessment of Risk Encountered in Surgery (CARES) surgical risk calculator for prediction of postsurgical mortality and need for intensive care unit admission risk: a single-center retrospective study. *BMJ Open*. 2018;8: e019427.

Perioperative anaemia, iron therapy and blood management in patients undergoing elective total laryngectomy.

Introduction

Patients with pre-operative anaemia have significantly higher rates of morbidity and mortality.¹ Perioperative anaemia has a negative effect upon functional recovery, length of hospital stay and quality of life.²

It is recommended that all patients presenting for elective and emergency surgery with an anticipated blood loss >500ml or >10% blood volume should have anaemia investigated and treated prior to surgery.³

Patients undergoing total laryngectomy are not expected to lose >500ml blood but are at high risk of anaemia and often have limited time for pre-operative optimisation. Concern existed locally that blood transfusion rates in this group were high. We wished to audit our laryngectomy population to investigate whether there was a place for offering perioperative IV iron therapy and so reduce allogeneic red cell transfusion, which is independently associated with poorer surgical outcomes.⁴

Method

Our audit was conducted retrospectively. The clinical notes and laboratory results were reviewed for each patient that underwent total laryngectomy in University Hospital Monklands between 01/12/2017 and 31/12/2018. Data collected included perioperative haemoglobin levels, intra-operative blood loss and receipt of red cells or iron therapy (Table 1). Anaemia was defined as < 13g/dl.⁵

Results

Twenty-six patients were included. Pre-operative haemoglobin ranged 8.7 - 15.4g/dl (average 12.4g/dl). 69.2% patients were anaemic pre-operatively and 96% in the immediate post-operative period. Average post-operative haemoglobin was 10.5g/dl. Lowest haemoglobin over day 0 to 5 ranged 7.2 - 11.4g/dl (average 9.2g/dl). 100% were anaemic at some point over this period and all remained anaemic at two months. Drop in haemoglobin ranged 0.5 - 5.3g/dl (average 3.3g/dl).

No patients received IV iron. Two patients (7.7%) were prescribed oral iron pre-operatively and 1 (3.8%) post-operatively. 42.3% received red cell transfusion in the perioperative period. Estimated blood loss ranged 200-1000ml (average 610.5ml). Estimated blood loss was >500ml in 75% of cases (Figure 1).

Conclusion

Anaemia is common in the perioperative laryngectomy population in our institution. Allogeneic red cell transfusion rates are high in a population already at risk of significant morbidity. The majority of patients lose >500ml or >10% of their blood volume during surgery. Iron therapy is rarely prescribed. Perioperative IV iron therapy may be of benefit in this population. We recommend pre-operative calculation and discussion of 10% blood volume for each patient.

References

- 1 Munting KE, Klein AA. Optimisation of pre-operative anaemia in patients before elective major surgery - why, who, when and how? *Anaesthesia*, 74 (Suppl. 1), 49-57, 2019.
- 2 Hans GA, Jones N. Preoperative anaemia, *Continuing Education in Anaesthesia, Critical Care & Pain*, 13 (3), 71-74, 2013.
- 3 Munoz. M, Acheson. A. G, et al. International consensus statement on the peri-operative management of anaemia and iron deficiency, *Anaesthesia*, 72 (2), 233-247, 2017.
- 4 Kotze A, Harris A, et al. British committee for standards in haematology guidelines on the identification and management of pre-operative anaemia, *British Journal of Haematology*, 171 (Issue 3), 322-331, 2015.
- 5 Munoz M, Acheson AG, et al. International consensus statement on the peri-operative management of anaemia and iron deficiency, *Anaesthesia*, 72 (2), 233-247, 2017.

	Question	
1	Gender	M/F
2	Date of surgery	—/—/—
3	Pre-operative haemoglobin	...g/dl
4	Immediate post-operative haemoglobin	...g/dl
5	Immediate drop in haemoglobin	...g/dl
6	Lowest haemoglobin in first 5 post-operative days	...g/dl
7	Maximum drop in haemoglobin (day 0 to 5)	...g/dl
8	Haemoglobin <13g/dl at 2 months or at last check	Y/N
9	Pre-operative iron therapy?	Y/N
10	If Y, IV or PO	IV/PO
11	Post-operative iron therapy?	Y/N
12	If Y, IV or PO	IV/PO
13	Perioperative red cell transfusion	Y/N
14	Estimated blood loss	...mls or not recorded

Table 1. Data collected for each patient

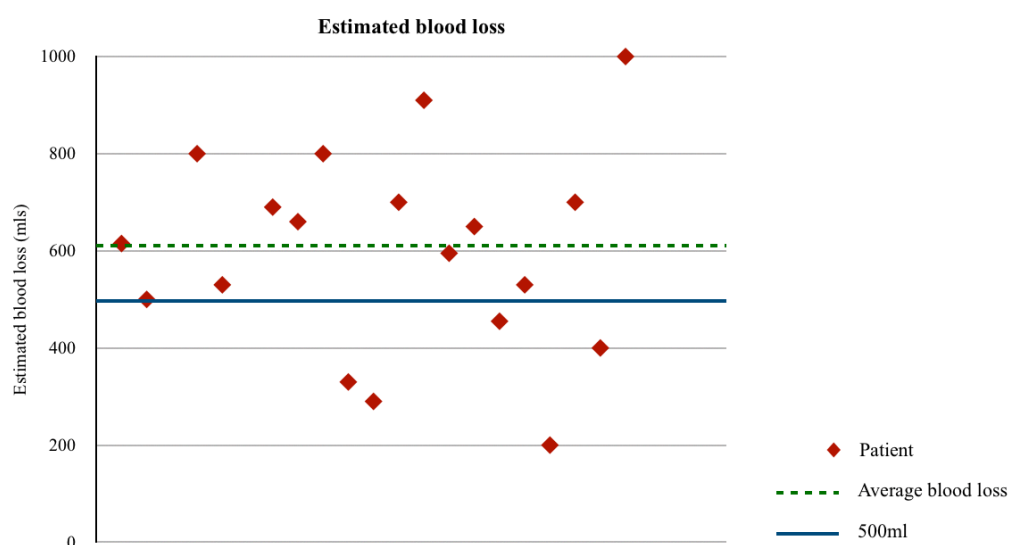


Figure 1. Estimated blood loss

A prospective randomised controlled study comparing C-MAC videolaryngoscope with macintosh laryngoscope for nasotracheal intubations by novices

Introduction

Use of C-MAC videolaryngoscope precludes the need for aligning the oropharyngeal and laryngeal axes, creating a more direct route from the nasopharynx to the trachea, which may lead to easier and quicker nasal intubation as compared to conventional laryngoscopy using Macintosh laryngoscope (MAC). Previous studies have demonstrated that videolaryngoscopes improve laryngeal view and ease intubation difficulty in novices when compared with MAC in the routine orotracheal intubations.^{1,2} There are no studies on intubation by novices for nasotracheal intubation (NTI) comparing MAC to videolaryngoscopes. Hence, we conducted this study to comparing C-MAC C-blade videolaryngoscope (CMAC-C) with the (MAC) for NTI by novices in patients undergoing head and neck cancer surgeries.

Methodology

The study was undertaken after obtaining approval from the hospital Institutional Review Board and registering with the Clinical Trials Registry – India

Study design - Parallel arm, randomised controlled trial, comparing C-MAC C-blade videolaryngoscope with Macintosh laryngoscope for NTI.

Inclusion Criteria

1. ASA grade I/II
2. Age group 18-60years
3. Patients needing NTI for elective surgery

Exclusion criteria

1. Refusal of consent
2. Risk factors for gastric aspiration
3. Previous head and neck surgery
4. Emergency surgery.
5. Anticipated or previously documented difficult airway

Patients were randomised on the morning of surgery to either (MAC) or (CMAC-C) group with a computer-generated block randomisation using opaque sealed envelopes.

The laryngoscopy and NTI was performed by novices (residents who had recently commenced training in anaesthesia) under the supervision of consultant anaesthetist.

Conduct of anaesthesia:

Monitoring, induction and maintenance of anaesthesia were standardised in both the groups. The patients were provided with supplemental oxygen using nasal cannula at 8L/min from the beginning of intubation till the endotracheal tube was confirmed in the trachea.

Outcome measures:

Primary outcome: Time to intubation.

Secondary outcomes:

1. Successful intubation: Within two attempts.
2. Number of attempts
3. Cormack–Lehane glottic grading

Results

Time to intubation was longer in CMAC-C group (112 ± 64.67 s) than Macintosh group (91.63 ± 43.27 s) ($P=0.378$). Successful intubations were more in CMAC-C group (18 (90%)) as compared to MAC group (16 (80%)) ($p=0.661$). CMAC-C group had higher first attempt intubations (18(90%)) compared to MAC group (15(75%)) ($p=0.487$). Without optimisation manoeuvre Cormack–Lehane Grade I view were more in CMAC-C (8(40%)) group than in the Macintosh group (4(20%)).

Conclusion

C-MAC C-blade videolaryngoscope was not found to be superior to conventional Macintosh laryngoscope for nasotracheal intubation performed by novices.

References

1. Ray DC, Billington C, Kearns PK, Kirkbride R, Mackintosh K, Reeve CS, et al. A comparison of McGrath and Macintosh laryngoscopes in novice users: a manikin study. *Anaesthesia*. 2009;64:1207-1210.
2. Maharaj CH, Costello JF, Higgins BD, Harte BH, Laffey JG. Learning and performance of tracheal intubation by novice personnel: a comparison of the Airtraq and Macintosh laryngoscope. *Anaesthesia*. 2006;61:671-677.

Post-operative troponin as a prediction tool for complications and patient stay in high-risk patients undergoing major colorectal surgery: A Harrogate Protocol

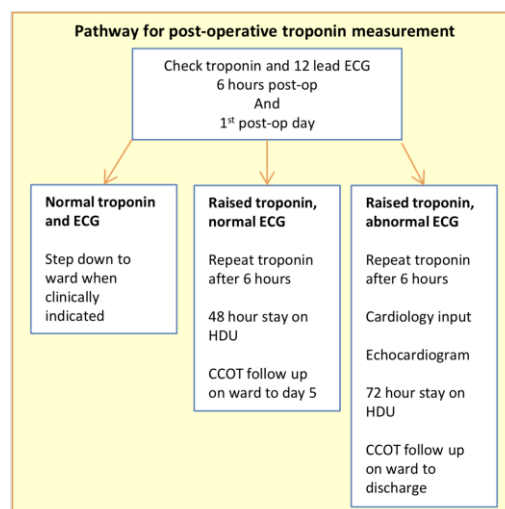
Introduction

Elevated post-operative troponin following major abdominal surgery is associated with increased risk of death and non-cardiac complications (1, 2). At Harrogate District Hospital (HDH) standard practice is for major colorectal patients triaged as high risk by cardiopulmonary exercise testing (CPET) to be admitted to the high dependency unit (HDU) post-operatively. Data collected at HDH between January 2014 and December 2016 indicated that a raised post-operative troponin was associated with increased average hospital length of stay and an increased rate of complications. Consequently, in July 2017 a post-operative troponin care pathway was introduced to inform management for those with raised troponin. The aim of this study was to determine whether the introduction of the post-operative troponin care pathway improved outcomes in this high-risk patient group.

Methods

Troponin measurements were taken from high-risk patients at two time points: 6 hours post-operatively and the morning following surgery. The management of the patients was informed by the troponin result as illustrated below:

Figure 1: The colorectal post-operative troponin care pathway



Patient outcomes recorded included: length of hospital stay, length of HDU stay, hospital readmission rate, HDU readmission rate and post-operative complication rate. Patient data gathered prior to July 2017 was used for comparison.

Results

Comparison was made between the pre-protocol group (N = 60) and the post-protocol group (N=37).

Table 1: Length of stay between patients with normal and raised troponins before and after the introduction of the troponin care pathway.

		Pre-protocol Troponin < 14 ng.L (N=38)	Post-protocol Troponin < 14 ng.L (N=21)	Pre-protocol Troponin > 14 ng.L (N=22)	Post-protocol Troponin > 14 ng.L (N=16)
Length of hospital stay (days)	Mean	11.2	7.55	15.9	11.7
	Median	7	5.5	10	8
	Range	2-34	4-28	3-64	5-38
HDU length of stay (days)	Mean	1.5	1.8	1.9	2.7
	Median	1	2	2	2
	Range	1-4	1-5	1-5	1-7

The introduction of the troponin-care pathway lead to a considerable decrease in the total length of hospital stay. Pre-protocol the average stay was 2.1 days on HDU and 10.2 days on the ward, associated with a total cost of £4740. Post-protocol the average HDU stay increased to 2.4 days and ward stay reduced to 7.3 days costing £4110. The number of HDU readmissions also decreased from 5% pre-protocol to 2.7% post protocol, despite no change in the number of patients admitted directly from the ward (5% pre-protocol verses 6% post-protocol). The overall complication rate remained similar between the pre (49%) and post-protocol (55%) groups. Finally, the number of hospital readmissions remained similar between the pre (13.5%) and post-protocol (13.8%) groups.

Conclusion

Although associated with a slight increase in the initial HDU length of stay, the introduction of a post-operative troponin care pathway resulted in an overall reduction in hospital length of stay, a reduction in the number of HDU readmissions and a £630 cost saving per patient.

References

- (1) Noordzij PG et al. High sensitive cardiac troponin T measurements in prediction of non-cardiac complications after major abdominal surgery. BJA. 2015 June;114(6):909-18]
- (2) VISION study investigators. Association between post-operative troponin levels and 30 day mortality among patients undergoing non-cardiac surgery. JAMA. 2012 June;307(21):2295-304

EBPOM Meeting: Abstract submission**Pre-Operative Wellness and Enhanced Rapid Recovery, POWERR**

A unique pre-surgical wellness and immunonutrition program, our ten year experience with quality improvement, harm reduction and direct reductions in cost of care.

Introduction/Objective

We have developed a unique per-surgical, pre-habilitation process that incorporates presurgical immunonutrition, POWERR. This program has been developed and deployed through Indian University Health in Indianapolis Indian, USA. We identified that 75% or perioperative patients had three or more risk factors for a major perioperative complication. Our program was developed to address these core issues with the goal of introducing pre-habilitation and optimization with immunonutrition pre-operatively.

Methods

This study includes patients across all surgical procedures setting a new standard. Higher risk patients are referred to the PAT (preintervention, preadmission testing) clinic for further assessment and medical optimization between one week to six weeks prior to surgery. The study compares those with preoperative wellness intervention against those with no intervention at a large academic center between 2014 and 2018. The preoperative bundles contained information on smoking cessation, incentive spirometry, chlorhexidine bath, topical mupirocin, and immunonutrition (Impact Advanced Recovery) shakes. Patient compliance was measured with standardized questionnaires. Clinical observations and standardized surveys were completed at intervals throughout the perioperative period. ACS NSQIP data was used as the metric for SSI rates.

Results

With continually expanding data collection, the study group now contains more than 86,000 surgical patients at a 1,100-licensed bed academic health center with an annual volume of 21,000 over the course of four years. Poisson regression model controlling for age, gender, race, ethnicity, and ASA classification show a 78% total harm reduction defined by summing SSI, CLABSI, CAUTI, CDI, VAE, and MRSA variables.

Conclusion

The interventional group had significantly lower length of stay, decreased total harm, and decreased surgical site infection rates. Immunonutrition impacts major risk events. Patients who undergo perioperative nutrition programs also have lower direct cost of care. Preoperative wellness program consisting of perioperative immunonutrition provides a standardized, safer method of approaching preoperative patients to provide decreased hospital stays, decreased patient cost, and increase overall health levels. This study serves as a foundation to direct better patient health and safety while also reducing costs in the care of the surgical patient.

A single centre review of malignant hyperthermia emergency resources. Are we prepared?**Introduction**

Malignant hyperthermia (MH) is a life threatening complication following exposure to Volatile anaesthetic agents or suxamethonium. Survival from MH is highly dependent on early recognition and prompt action (1). Centralising MH resources can improve patient outcomes by reducing the delays in receiving life saving drugs and equipment. The Association of Anaesthetists as well as UK and international MH societies recommend that a MH kit should be available in all anesthetizing locations (2). The aim was to institute a MH kit creating a consistent location for emergency drugs and equipment and improve staff knowledge.

Methods

Review of the current departmental MH resources identified difficulties in both locating and accessing the kit. This could result in significant delays to initiating treatment. In line with AAGBI guidance a MH box was created that contained all the listed drugs and equipment as well as 'VaporClean' charcoal filters. Creation of a laminated visual aid to be used in conjunction with the AAGBI crisis management plan. This also listed directions to nearest cooling machines and ice dispensers, additional web resources and MH referral follow up guidance. Staff were educated on the location of the MH box, kit contents and how to use the charcoal filters. To assess the impact of the kit, a survey was conducted within the anaesthetic department.

Results

The introduction of the kit resulted in greater awareness within the department about how to manage MH and where to find resources at our centre. Survey results showed that 100% of Anaesthetists felt the kit would reduce treatment delays. 100% felt that following the introduction of the kit they would all feel very confident in locating the necessary equipment, compared to 31% prior to the introduction of the kit. 95% felt that they would be more confident in managing MH when using the Kit.

Conclusions

Centralising MH resources is a simple and cost effective intervention, which can significantly reduce delays in time to access emergency drugs and equipment. The pre-prepared kit also gives Anaesthetist greater confidence in managing a rare complex emergency.

References

1. Pawan K Gupta, Philip M Hopkins, Diagnosis and management of malignant hyperthermia, BJA Education, Volume 17, Issue 7, July 2017, Pages 249–254, <https://doi.org/10.1093/bjaed/mkw079>
2. The Association of Anaesthetists of Great Britain and Ireland (AAGBI) (2011) Recommended Contents of Malignant Hyperthermia Management Kit. Available at: <http://dx.doi.org/10.1111/g.MHCRC.2011>

Long term outcomes of newly diagnosed Atrial Fibrillation in a Preoperative Setting.

Introduction

The preoperative assessment clinic (PAC) provides a unique screening opportunity for chronic disease. However, ensuring important diagnoses are communicated to primary care can be complex.

Atrial fibrillation (AF) is a common finding in PAC, with 425,000 people estimated to have undiagnosed AF in England (1). The objective of this study was to examine how patients diagnosed with AF in PAC were managed: whether GPs were aware of the new diagnosis, whether appropriate management was given and the duration between diagnosis and intervention.

Method

We retrospectively examined clinical notes of patients diagnosed with AF at PAC over a one-year period. Patients were contacted via telephone to obtain verbal consent. Caldicott approval was granted for this study. We specifically reviewed whether AF was coded on GP records, whether the patient was anticoagulated, the time taken to anticoagulate and the occurrence of any thromboembolic events.

Results

63 patients were identified as having new onset AF in PAC. 14 patients were excluded: two had incomplete data, four were deceased and we were unable to obtain further details, and eight had a documented diagnosis of AF prior to PAC.

49 patients (14F, 35M) were reviewed. There was no GP documented diagnoses of AF for 10 of the patients and none were anticoagulated. 39 had a documented diagnosis, seven were not anticoagulated. Of those who were anticoagulated, 28 were commenced on a NOAC.

The time taken to anticoagulate varied dramatically: 14 patients were anticoagulated soon after diagnosis (< 30 days), a further 10 patients were anticoagulated between 30-100 days after diagnosis, however nine patients took over 100 days to be anticoagulated, with one patient being anticoagulated 482 days after diagnosis.

Major thromboembolic events occurred in three patients: one had a TIA pre-operatively whilst anticoagulated, one had a stroke two days post-operatively following major head and neck surgery and one patient died from a stroke approximately six months following a circumcision. In the latter case, the GP was aware of the diagnosis and had seen the patient pre-operatively, however, the patient did not return post-operatively to discuss anticoagulation.

Summary

AF is the most common arrhythmia both in the perioperative and primary care setting (1). Failed communication and inadequate management of newly diagnosed AF at PAC can result in catastrophic outcomes. Further investigation is needed to assess whether a dedicated perioperative AF clinic is required.

1) Atrial fibrillation prevalence estimated in England. Public Health England
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/644869/atrial_fibrillation_AF_briefing.pdf

Title:

Perioperative Medicine Multidisciplinary management of the high-risk surgical patient: The NELA ward round.

Introduction:

Emergency laparotomy is a commonly performed high-risk surgical procedure (1). The National Emergency Laparotomy Audit (NELA) aims to enable high quality of care for patients undergoing emergency laparotomy (2) by addressing variation and deficits in patient care. This has led to a reduction in national 30-day mortality from 11.8% to 9.5% over the past five years (3). At UCLH, the adjusted mortality rate is 8.3%, however the median post operative length of stay of patients surviving to hospital discharge is 12.6 days (national average 10.4 days) with an unexpected critical care admission rate post operatively of 4.8% (national average 3.4%) (3).

A robust service pathway exists for patients up until discharge from critical care. Is there any scope for continuing this high quality of care to ward level?

Objective of the NELA ward round:

1. Introduce a multidisciplinary perioperative service providing clinical input on patients discharged from critical care following emergency laparotomy.
2. Daily standardised and individualised clinical assessment of a high-risk patient cohort recently discharged from critical care
3. Improve communication within the multi-disciplinary team caring for high risk patients
4. To use QI methods (PSDA cycles, process mapping etc) to continuously evaluate and improve the NELA ward round service.

Methods:

The NELA ward round service is provided by a Clinical Fellow in Perioperative Medicine (senior anaesthesia / intensive care trainee), pain nurse (acute pain team) and surgical registrar. The service was implemented on a full time basis at UCLH from September 2018. Patients discharged from critical care following emergency laparotomy are reviewed on a daily basis. A multi-disciplinary discussion regarding patient care allows a continuation of best practice in perioperative medicine to be extended from the critical care environment to the ward. The NELA ward round provides support and guidance for ward nursing staff and junior doctors caring for a high-risk patient population.

Impact & Effectiveness:

Qualitative and quantitative data is currently being collected to assess impact on this high-risk patient cohort. Repeated PSDA cycles are continuing to assess the effectiveness of the NELA ward round and highlight areas of patient care that may require improvement.

Conclusion:

Mortality rates in patients presenting for emergency laparotomy at UCLH is below the national average (3). Despite this, improvement can continuously be targeted.

Evaluation is ongoing of a perioperative medicine lead service that provides daily multi-disciplinary review of patients on the NELA pathway

References:

1. Clarke A, Murdoch H, Thomas MJ, Cook TM, Peden CJ. Mortality and postoperative care after emergency laparotomy. *Eur J Anaesthesiol.* 2011;28(1):16-19
2. Saunders DI, Murray D, Pichel AC, Varley S, Peden CJ. Variations in mortality after emergency laparotomy: the first report of the UK Emergency Laparotomy Network. *Br J Anaesth.* 2012;109(3):368-375
3. NELA project team. Fourth patient report of the National Emergency Laparotomy Audit. RCoA London, 2018.

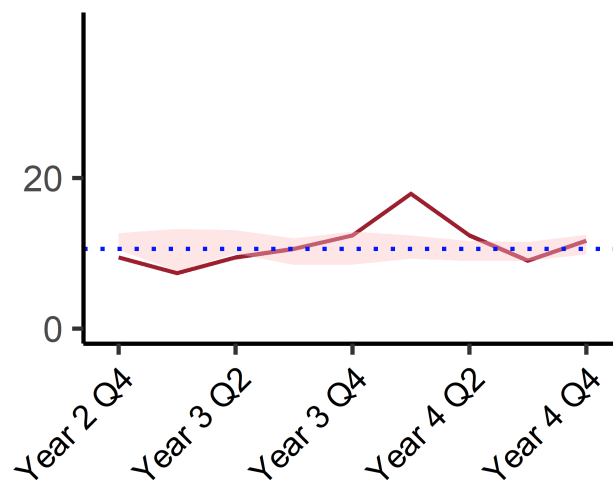


Figure 1. Postoperative length of stay after emergency laparotomy at UCLH

Ketamine and Dexmedetomidine Utilization at a Tertiary Pediatric Hospital

Introduction:

In 2016, the FDA put out an advisory warning to the public stating repeated or prolonged exposures to general anesthesia and sedation drugs for pediatric patient three years or younger and pregnant women could potentially be dangerous to brain health, including Ketamine which has been linked to neuroapoptosis through a different mechanism than inhaled anesthetics. Concurrently, dexmedetomidine has increasingly been used as an off-label agent for pediatric sedation and analgesia to reduce the risk neurotoxicity. The objective of this study is to quantify and compare the clinical utilization patterns of ketamine and dexmedetomidine at Texas Children's Hospital (TCH) during a period before and after the FDA warning (2016-2017).

Methods:

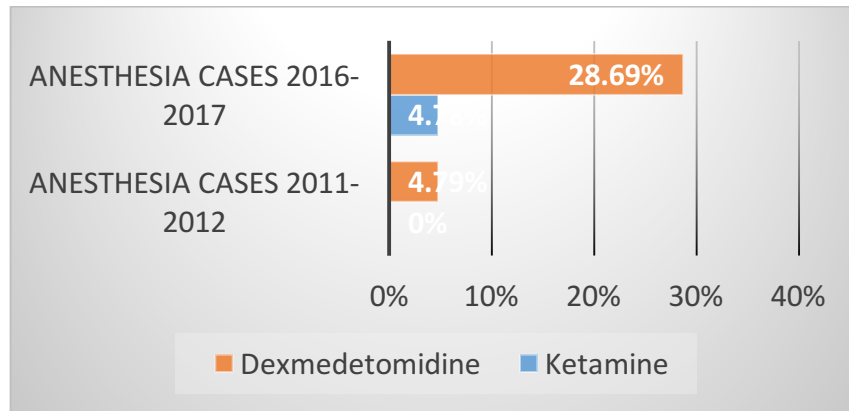
EMR data was used to conduct a retrospective analysis of anesthetic records for patients aged 0-36 months who underwent specific surgeries or procedures under general anesthesia or monitored anesthesia care from 2011-2012 and 2016-2017, before and after the FDA warning on inhaled anesthetics was published.

Results:

The use of ketamine was 0.00% from 2011-2012 and increased to 4.78% from 2016-2017. Statistical test for comparison of mean and distribution for 2011-2012 and 2016-2017 for single dose Ketamine was not completed due to insufficiently sample size. Overall, dexmedetomidine was used in 4.79% of pediatric surgeries in 2011-2012 and increased to 28.69% of pediatric surgeries from 2016-2017. Using the two-sample Wilcoxon rank-sum test to compare dexmedetomidine date from 2011-2012 and 2016-2017, there was no statistically significant difference in dexmedetomidine infusion or single dose dexmedetomidine ($p = 0.64$ and 0.31 respectively).

Conclusion:

The overall trend at TCH pediatric anesthesiology providers is increased use of the anesthetic adjunct dexmedetomidine, and to a lesser extent ketamine during the periods before and after the FDA warning. Despite the lack of statistical significance, there is strong observational evidence to support changes in the prescribing habits of clinical providers in recent years. The long-term effects of excessive ketamine early in life exposure have not been investigated clinically. Additionally, Dexmedetomidine has been reported to be neuro-protective in developmental mice studies, possibly related to this agent's sympatholytic activity in the context of an overwhelming stress response within the body during surgery. However, it has also been reported that dexmedetomidine increases the risk of bradycardia and adverse cardiac events in pediatric patients, particularly those with underlying cardiac abnormalities. Further research on the long-term effects of ketamine and dexmedetomidine use on pediatric patients continues to be an important area of further study.



Title:

An All-Wales perioperative pathway for the identification and management of excessive alcohol intake.

Introduction:

High alcohol consumption is prevalent in the surgical population with 1-in-5 patients having an alcohol use disorder,¹ increasing perioperative risks significantly of alcohol withdrawal seizures, postoperative infections and blood product requirements. This leads to increased length of hospital stay, ICU admissions and mortality.¹ Patients who drink excessively may also have other, often undiagnosed, alcohol related co-morbidities, such as liver impairment. These patients should be identified and optimised preoperatively to minimise these risks.

Previously, Cardiff and Vale UHB documented preoperative alcohol ‘units per week’. However, there was minimal assessment of alcohol dependence, or co-morbidities related to alcohol consumption, with no clear guidelines how to manage patients identified as at risk.

Methods:

We initially composed and distributed an All-Wales survey in order to establish how perioperative healthcare professionals currently identify patients at risk from alcohol abuse, and then plan their perioperative management. Following this we facilitated an interprofessional and multidisciplinary team (including Perioperative clinicians, Gastroenterologists, Psychiatrists specialising in addiction, Public Health Wales, and the Alcohol Liaison Team) to develop a perioperative pathway to be used for all patients undergoing elective, urgent or emergency surgery.

Results:

107 anaesthetists, surgeons and preassessment nurses responded from 7 health boards across Wales. The majority was not confident in screening patients for high alcohol consumption or managing them perioperatively; in particular, preventing and managing alcohol withdrawal, or knowing whom to contact for help.

The pathway developed uses the nationally recommended AUDIT-C and AUDIT screening tools² in a stepwise approach. This helps identify those at risk, how to manage potential perioperative alcohol disorders, and when to refer to specialist teams (including contact details,) for optimisation or further management.

We are also training clinicians to provide “alcohol brief interventions”; counselling patients of the increased risks from high alcohol consumption, and how to receive help to reduce their intake. This could be their first contact with healthcare professionals so it is paramount that we do not miss this opportunity.

Conclusion:

We have highlighted that perioperative healthcare professionals lack confidence in caring for the patient with excessive alcohol consumption. We aim to implement our pathway throughout Wales during 2019, and hope to record a significant improvement in clinicians' knowledge and confidence in identifying and managing these patients.

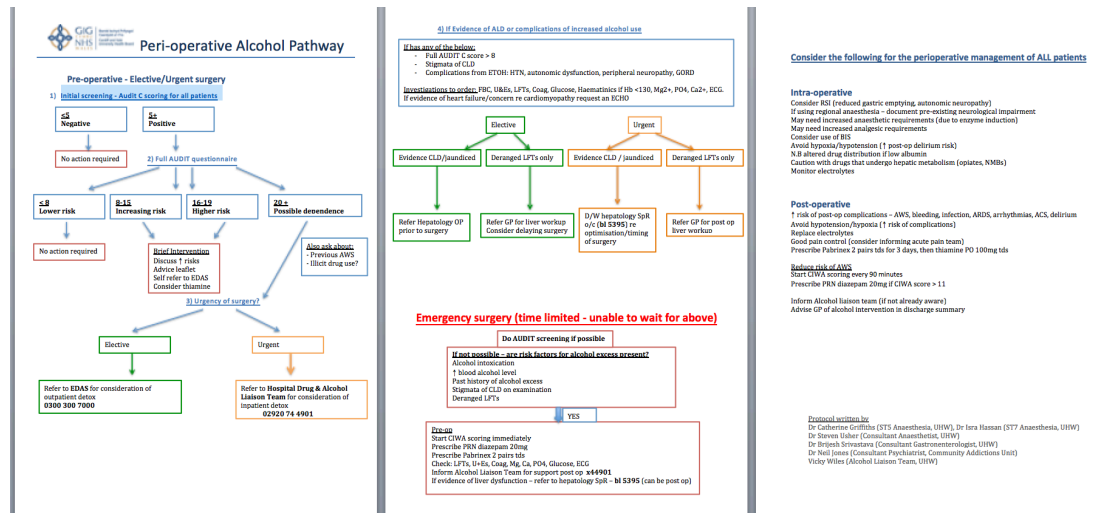


Figure 1: Perioperative alcohol pathway

References:

1. Gordon AJ. Identification and management of unhealthy alcohol use in the perioperative period. Up to date. November 22 2017. (<http://www.uptodate.com>)
2. Alcohol use disorders identification test consumption (AUDIT C). Alcohol use screening tests (www.gov.uk/government/publications/alcohol-use-screening-tests)

Title: Cardiopulmonary exercise testing predicts survival following radical cystectomy.

Introduction: Radical cystectomy (RC) is potentially curative treatment for muscle invasive bladder cancer. It is complex major surgery and has associated significant morbidity and mortality.¹ Unexpected perioperative morbidity is associated with reduced long term survival^{2,3} and recent guidelines advocate that patients undergoing major surgery should undergo risk assessment and stratification.^{4,5} Cardiopulmonary exercise testing (CPET) is an objective assessment of cardiopulmonary reserve.⁶ All patients considered for RC are referred for CPET. We hypothesise that CPET can be used to identify survival following RC.

Methods: A retrospective case cohort audit was undertaken for patients referred for CPET prior to RC and stratified into three cohorts: i)those undergoing RC; ii)those not undergoing surgery where poor cardiorespiratory reserve had contributed to the decision not to operate; iii)those not-undergoing surgery for other reasons (e.g. adverse cancer staging). We also examined relationships between co morbidities, complications and CPET and a univariate and multivariate analysis was undertaken comparing cohorts. This was used to generate a survival model in the operated cohort.

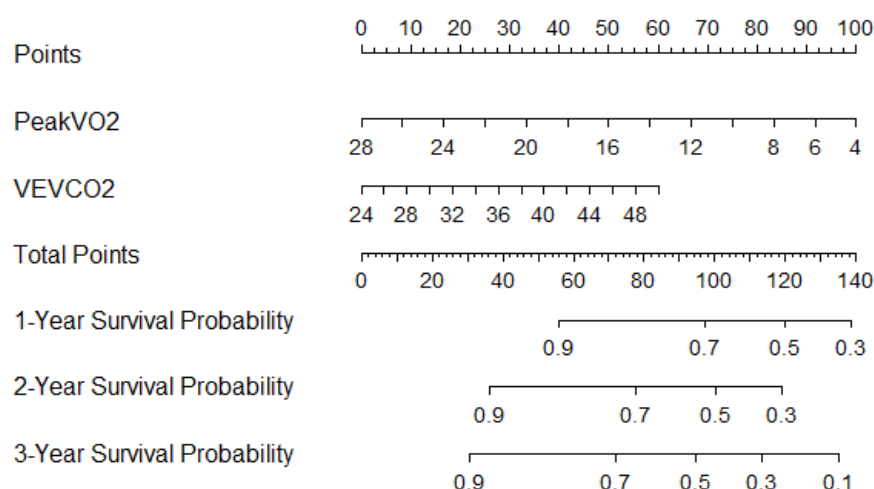
Results: Between March 2010 and May 2018, 141 patients were referred. Of those 103 underwent RC. There was a median value of 28 days between CPET and RC. The median survival for the not operated due to poor reserve group was 16 months (95% CI: 11-40) and for those not operated citing other reasons group was 23 months (95% CI: 5-49). At the time of the study a median value had not been achieved for survival time in the operated cohort. A univariate analysis highlighted that peak VO_2 , VE/VCO_2 , and an inability to identify AT are all significantly associated with survival (Table1). On multivariate analysis, peak VO_2 and VE/VCO_2 demonstrated a significant correlation with survival and have been used to generate a survival model (Figure1). This survival model also correlated to length of stay within hospital: p-value=0.008. Increasing severity of complications (using the Clavien-Dindo scoring system⁷) was associated with an increased length of stay.

Conclusion: Our study demonstrated, in the largest cohort to date, that cardiorespiratory reserve is associated with patient survival following radical cystectomy. We generated a survival model and associated nomogram which can be used to generate a survival probability in the years following radical cystectomy and is the first such example within this patient group. We hope in the future it will be a tool used to aid risk stratification, patient consent and prehabilitation.

Table 1: Univariate and multivariate survival analysis – Operated Group Only

	Univariate Analysis				Multivariate Analysis N = 103, E = 35; CPE = 0.70 (SE = 0.05)	
	N (E)	HR (95% CI)	p-value	CPE (SE)	HR (95% CI)	p-value
AT Missing (Y v N)	103 (35)	2.68 (1.21-5.89)	0.015	0.57 (0.03)	1.82 (0.80-4.14)	0.153
AT	91 (27)	0.97 (0.81-1.17)	0.780	0.55 (0.06)	NA	NA
Peak VO ₂	103 (35)	0.85 (0.76-0.96)	0.007	0.62 (0.05)	0.90 (0.80-1.00)	0.050
VE/VCO ₂	103 (35)	1.09 (1.03-1.16)	0.002	0.67 (0.05)	1.07 (1.01-1.13)	0.027
Haemoglobin	102 (35)	0.99 (0.97-1.01)	0.247	0.59 (0.05)	NA	NA
IHD Y v N	103 (35)	1.56 (0.76-3.19)	0.222	0.55 (0.04)	NA	NA
COPD Y v N	103 (35)	1.03 (0.45-2.36)	0.941	0.52 (0.04)	NA	NA
Creatinine	103 (35)	1.01 (1.00-1.03)	0.054	0.56 (0.05)	NA	NA
Statin Y v N	103 (35)	0.86 (0.44-1.68)	0.657	0.52 (0.05)	NA	NA
Hypertension Y v N	103 (35)	1.03 (0.53-2.00)	0.803	0.51 (0.04)	NA	NA

N – number of patients; E – number of events; HR – hazard ratio; CI – confidence interval; CPE – concordance probability estimate; SE – standard error; Y – yes; N – no; AT – anaerobic threshold; VE – ventilatory equivalents; IHD – ischaemic heart disease; COPD – chronic obstructive pulmonary disease.

Figure 1: Nomogram of the survival model.

Plot a perpendicular line up from both peak VO₂ and VE/VCO₂ to the top points line to generate a point score for each variable. Combine these 2 points to generate a total points score. On the lower half of the nomogram plot a perpendicular line down from the total points score to generate the survival probability at 1 year, 2 years and 3 years.

References:

1. Hounsoms, L.S., Verne, J., McGrath, J.S., Gillatt, D.A. Trends in operative caseload and mortality rates after radical cystectomy for bladder cancer in England for 1998-2010. *Eur Urol.* 2015;67: 1056–1062
2. Khuri SF *et al.* Determinants of Long-Term Survival After Major Surgery and the Adverse Effect of Postoperative Complications. *Ann Surg* 2005;242: 326–343
3. Moonesinghe *et al* Survival after postoperative morbidity: a longitudinal observational cohort study. *Br J Anaesth.* 2014;Dec; 113(6): 977–984.
4. De Hert S *et al* Preoperative evaluation of the adult patient undergoing non cardiac surgery: guidelines from the European Society of Anaesthesiology. *Eur J Anaesthesiol*, 2011 Oct;28(10): 684-722
5. The Royal College of Surgeons of England/Department of health. The higher risk general surgical patient: towards improved care for a forgotten group. Available <http://www.rcseng.ac.uk/publications/docs/higher-risk-surgicalpatient/> Accessed Jan 2019
6. Levett D, Grocott M. Cardiopulmonary Exercise Testing for risk prediction in major abdominal surgery. *Anesthesiology Clin.* 2015; 33(1): 1-16
7. Dindo D, Demartines N, Clavien PA. Classification of Surgical Complications. *Ann Surg* 2004;240: 205–213

LeakCheck: The first prospective study to identify perioperative modifiable risk factors for anastomotic leak in colorectal surgery

Introduction: Numerous risk factors for colorectal anastomotic leak (AL) have been identified using large retrospective datasets. Most of these are unmodifiable baseline patient factors. The international LeakCheck prospective study was initiated to identify perioperative modifiable risk factors for AL.

Methods: Patients from 13 hospitals in Europe and Australia, undergoing colorectal resections with the formation of a primary anastomosis were enrolled from June 2016 to December 2018. The LeakCheck procedure is a multifactorial checklist that was scored with the surgical team prior to the anastomosis. The checklist contains five main general topics; general condition, perfusion, contamination and visibility of the surgical field and surgery related factors. Univariate and multivariate logistic regression analyses were used to determine risk factors for AL.

Results: Out of 1120 patients, 107 developed an AL (9.6%). On univariate analysis: low preoperative haemoglobin (male < 8mmol/l, female < 7mmol/l), intraoperative blood loss > 100ml, use of inotropes, gross fecal contamination, and high perioperative glucose were significantly correlated with AL. On multivariate analysis: hemoglobin < 7mmol/l in women (OR:1.3, 95%CI 1.12-1.5), use of inotropes (OR:1.552, 95%CI 1.005-2.66), fecal contamination (OR:5.013, 95%CI 2.389-10.52), and conversion (OR:2.749 95%CI 1.08-6.961), were significant. There was a 5.1% AL rate in those without any of these risk factors. Patients with one or more risk factors had an increased AL rate: 13% in patients with one risk factor to 33% in patients with five.

Conclusion: This study has identified four potentially modifiable risk factors for AL in colorectal surgery: anemia, use of inotropes, fecal contamination and conversion. Successful optimization of those risk factors pre- and intraoperatively might lead to a reduction of the incidence of AL and could thus be a rational for multi-modal prehabilitation.

Title

Preoperative cardiopulmonary exercise testing and occurrence of acute kidney injury following oesophagectomy for oesophageal cancer.

Introduction

Acute kidney injury (AKI) has been reported to occur with a variable incidence of between 2.4% and 35% following oesophagectomy [1,2]. Postoperative AKI is associated with increased morbidity and both short and long term mortality [3,4]. There is currently limited evidence on the association between cardiovascular fitness, as assessed by cardiopulmonary exercise test (CPET), and the risk of postoperative AKI [5]. We aimed to study the incidence of AKI following elective surgery for oesophageal cancer and examine its association with preoperative CPET.

Methods

All patients that underwent oesophagectomy between January 2010 and December 2017 were identified. Serum creatinine was studied at three time points: preoperatively, at 48 hours and 7 days postoperatively. The KDIGO criteria were used for the definition of AKI.

Results

We identified 283 patients that underwent oesophagectomy. At 48 hours postoperatively 72 patients (25.7%) developed AKI. AKI stage 1,2 and 3 occurred with an incidence of 17.5%, 5% and 3% respectively. At 7 days postoperatively 25 patients (9%) had AKI. In keeping with recent data most of the patients that had AKI on day 2 recovered (83% had recovered by day 7) whereas over half (56%) of the patients that had AKI on day 7 had normal renal function on day 2 [6]. There was no difference in either the preoperative serum Creatinine or the age between the patients that developed AKI and those that did not, either on day 2 or day 7. [Fig1].

None of the CPET parameters examined (AT, VO₂ peak, VO₂ peak/m², V_e/VCO₂ slope) differed between the patients with AKI and those without either on day 2 or day 7 [Tbl1].

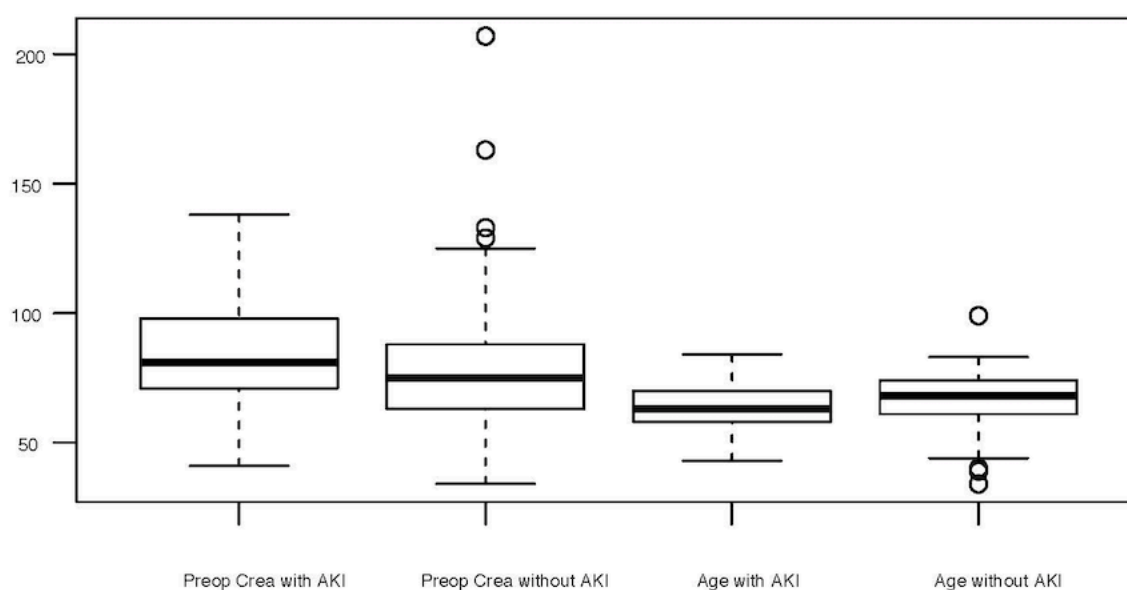


Fig 1. Boxplot of preoperative serum Creatinine and patient Age in patients with AKI and those without on day 7 postoperatively.

	AT		VO2 peak/m2		Ve/VCO2 slope	
	AKI	No AKI	AKI	No AKI	AKI	No AKI
Day 2	11.8 [10.7-13.3]	12 [10.7-13.4]	768 [648-854]	749 [639-868]	32 [28-36]	31 [27-36]
p	0.95		0.88		0.63	
Day 7	11.9 [10.8-12.9]	11.9 [10.6-13.4]	789 [686-868]	748 [640-869]	33 [29-36]	31 [27-36]
p	0.89		0.89		0.78	

Tbl 1. Table showing the median, [IQR] and p values (Wilcoxon test) of the CPET variables in patients with AKI and those without on days 2 and 7 postoperatively.

Conclusions

Our study did not show any association between preoperative CPET and the development of postoperative AKI. Both patient cohorts had very similar CPET values and it is possible that, even if fitness affected AKI, the association could not be shown, as it was other risk factors that differentiated the groups. Prospective studies are required to establish the presence or not of an association between CPET and AKI. If one exists, then physical fitness is likely to reduce the risk of AKI and therefore the focus should be placed on prehabilitation. If not, then better prediction of AKI risk preoperatively may require assessment of the functional renal reserve or use of specific scoring systems [7].

References

1. Wang W, Wang T, Feng X, Sun L. Incidence and risk factors of acute kidney injury after esophageal cancer surgery: A nested case-control study. *Int J Surg*. 2017;39:11-15.
2. Lee EH, Kim HR, Baek SH et al. Risk factors of postoperative acute kidney injury in patients undergoing esophageal cancer surgery. *J Cardiothorac Vasc Anesth*. 2014;28:936-42.
3. McKinlay J, Tyson E, Forni LG. Renal complications of anaesthesia. *Anaesthesia*. 2018;73 Suppl 1:85-94.
4. Hobson C, Ruchi R, Bihorac A. Perioperative Acute Kidney Injury: Risk Factors and Predictive Strategies. *Crit Care Clin*. 2017;33:379-396
5. Saratzis A, Shakespeare J, Jones O, Bown MJ, Mahmood A, Imray CHE. Pre-operative Functional Cardiovascular Reserve Is Associated with Acute Kidney Injury after Intervention. *Eur J Vasc Endovasc Surg*. 2017;53:717-724
6. Kellum JA, Sileanu FE, Bihorac A, Hoste EA, Chawla LS. Recovery after Acute Kidney Injury. *Am J Respir Crit Care Med*. 2017;195:784-791.
7. Kheterpal S, Tremper KK, Heung M et al. Development and validation of an acute kidney injury risk index for patients undergoing general surgery: results from a national data set. *Anesthesiology*. 2009;110:505-15.

Title: The usefulness of respiratory mechanic instability in evaluating the effect of continuous positive airway pressure for perioperative obstructive sleep apnea management

Abstract

Introduction: Respiratory mechanic instability (RMI) based on the paradoxical movement is correlated with respiratory disturbance such as apnea-hypopnea index (AHI) and reflect the severity of obstructive sleep apnea (OSA). The study was to identify RMI as a method for assessing the effectiveness of continuous positive airway pressure (CPAP) in the perioperative management for OSA.

Methods: A total 71 consecutive OSA patients with CPAP titration were included in this study. We compared sleep (sleep efficiency [SE], arousal index [Ari], and sleep stages), respiratory (AHI, oxygen desaturation index $\geq 3\%$ [ODI3], and lowest oxygen saturation), and RMI (events, index, duration, and % of stage duration) parameters between diagnostic polysomnography and CPAP titration data.

Results: All RMI parameters (events [157.5 ± 80.9 vs 80.0 ± 47.1 ; $p < 0.001$], index [25.3 ± 12.4 vs 12.7 ± 7.0 ; $p < 0.001$], duration [182.6 ± 96.2 vs 79.8 ± 88.9 ; $p < 0.001$], and % of stage duration [49.0 ± 24.4 vs 20.5 ± 21.3 ; $p < 0.001$]) were significantly improved with the alleviation of obstructive respiratory disturbance parameters (AHI [45.1 ± 23.0 vs 4.2 ± 4.3 ; $p < 0.001$], ODI3 [44.9 ± 22.6 vs 4.8 ± 4.6 ; $p < 0.001$], and lowest oxygen saturation [77.7 ± 7.3 vs 89.3 ± 3.8 ; $p < 0.001$]) in the comparison between diagnostic polysomnography and CPAP titration data.

Conclusion: RMI may be a useful method for evaluating the effect of CPAP in the perioperative management for OSA.

Reference(s): Author, Journal, Volume, Page, and Year

1. Choi JH, Lee B, Hwang SH., Otolaryngol Head Neck Surg., In press. 2019.

This study has not been published in a Peer Reviewed Journal.

I want this study to be presented as a poster.

Assessing smoking cessation support in the preoperative setting

Introduction

Smoking in the perioperative period leads to increased risks of cardiovascular and respiratory complications, increased rates of postoperative infections and impaired wound healing. Stopping smoking preoperatively, even for a short period of time, can improve surgical outcomes. We conducted this service evaluation project to assess smoking cessation support currently available in our hospital.

Methods

We carried out telephone survey in all smoker patients who attended nurse-led preassessment clinic in February 2019. Informed consent was obtained to contact these patients via telephone. We recorded patient demographics, any smoking-related advice or referrals performed and prescription of nicotine replacement therapy (NRT).

Results

In total, 38 smoker patients were contacted. 10 patients were unavailable leaving a cohort of 28 patients (17 males, 11 females, ages 21 – 66 years). 26 patients (93%) were advised to stop smoking at preassessment clinic, all of whom received verbal advice. 23 patients (82%) were offered a referral to the specialist smoking cessation service. Out of which, 14 patients (61%) were contacted by the service, mostly in the form of telephone calls and text messages. 3 out of these 14 patients (21%) were offered a clinic appointment, and only one patient attended.

No patients were offered NRT in clinic, although 13 patients (46%) stated that they would have accepted it. 27 patients (96%) found the preassessment nurses supportive and non-judgmental when giving advice, and 22 patients (79%) would recommend these approaches to other patients.

6 patients (21%) stopped smoking, all of whom either received verbal advice or formal referral. One patient was prescribed nicotine lozenges by the specialist service and reported it useful.

Conclusion

Several measures are required to help patients stop smoking preoperatively. These include healthcare professional advice, NRT and referral to a stop smoking service. We plan to introduce a patient group direction for NRT and organise a weekly hospital stop smoking clinic to reduce missed referrals. A leaflet regarding benefits and support for stopping smoking has also been created.

References

1. NICE Clinical Guidelines NG92: Stop smoking interventions and services (March 2018).
2. ASH Fact Sheet: Smoking statistics, illness and death, 2015.
3. Liu K, Creamer A. Improving smoking cessation policy by assessing user demand for an inpatient smoking cessation service in adult psychiatric wards. *BMJ Open Quality* 2015; 4 (1): u207323.w2933.

Title

Opioid prescription and ERAS – aligning the two

Introduction

The opioid epidemic is of growing concern with opioid use increasing for non-cancer pain.^{1,2} Non-standardised opioid prescription and variation in practice are contributing to the problem.² The analgesic benefits of opioids must be weighed against their multiple adverse effects.² Opioid sparing techniques in colorectal surgery are essential for enhanced recovery programs and reducing postoperative complications.³ The aim of data collection was to determine current practice, direct future practice and local guidelines on patients undergoing colorectal surgery in our unit.

Methods

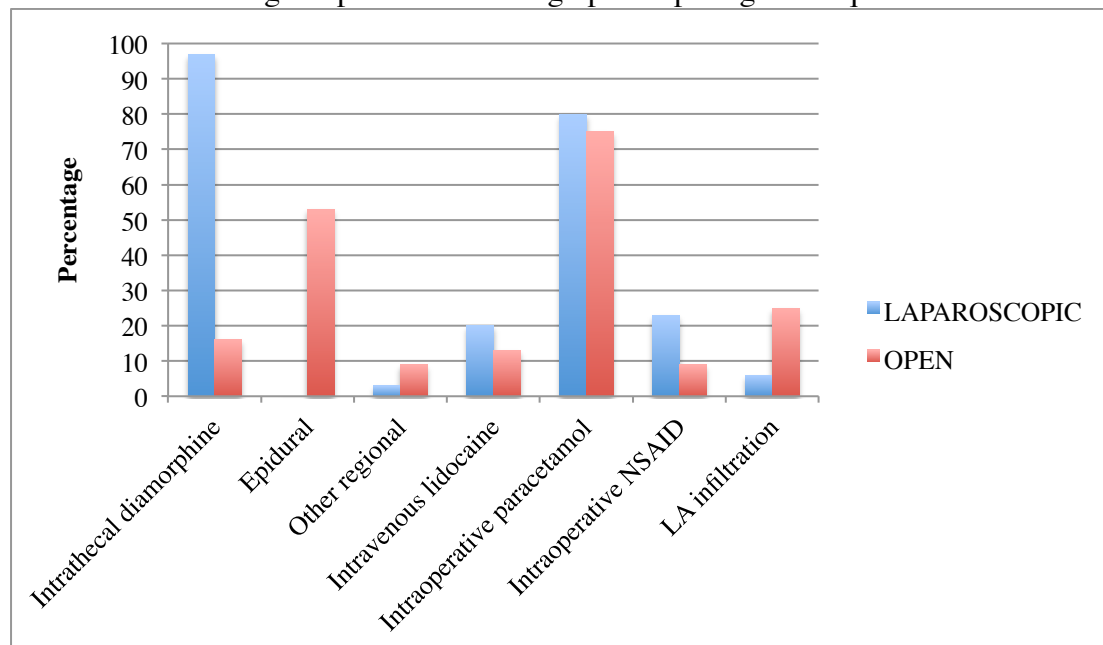
Over 5000 pieces of data were retrospectively collected on anaesthetic technique, perioperative analgesia, discharge opioids, complications and length of stay (LOS). Data was collected on 95 colorectal cases, 51 laparoscopic and 44 open.

Results

78% (40/51) laparoscopic cases and 89% (39/44) open cases received 5 different types of short acting (SA) opioids.

59% (30/51) laparoscopic cases and 73% (32/44) open cases received long acting (LA) opioids. SA opioids were not used in all cases receiving LA opioids. Use of opioid sparing techniques was variable in both laparoscopic and open cases (table one).

Table one. Percentage of patients receiving opioid sparing techniques.



19% (18/95) were discharged on different opioids of variable duration; 22% (4/18) for 3 days, 22% (4/18) for 5 days and 33% (6/18) for 7 days. 22% (4/18) of patients had no defined stop date. Alarming 17% (3/18) were discharged on SA opioids despite never having received them in hospital.

23% (10/44) open cases had a postoperative ileus, increasing median LOS from 10.5 to 14 days. 70% (7/10) had both LA and SA opioids compared to 65% (22/34) of open cases who did not have a postoperative ileus. 12% (6/51) laparoscopic cases had a postoperative ileus, increasing median LOS from 6 to 13 days. 83% (5/6) had both LA and SA opioids compared to 42% (19/45) of laparoscopic cases who did not have a postoperative ileus.

Conclusion

Local data has demonstrated significant variation in practice with failure to fully utilise opioid sparing techniques and comply with current enhanced recovery guidelines. The associated postoperative ileus and increased LOS have implications for both patients and the department. Opioid discharge prescriptions are non-standardised and on occasions inappropriate. This data has highlighted deficiencies in current practice. A standardised opioid sparing enhanced recovery guideline encompassing regional considerations has been created. We used the data to overcome local perceptions and perceived barriers when writing the guideline.

Reference

1. Alexander GC, Frattaroli S, Gielen AC. The Opioid Epidemic: From Evidence to Impact. Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland. October 2017. 59 pages
2. Els C, Jackson TD, Hagtvedt R, Kunyk D, Sonnenberg B, Lappi VG, Straube S. High-dose opioids for chronic non-cancer pain: an overview of Cochrane Reviews. *Cochrane Database of Systematic Reviews* 2017, Issue 10. Art. No.: CD012299.DOI: 10.1002/14651858.CD012299.pub2.
3. Gustafsson UO, Scott MJ, Hubner M, Nygen J, Demartines N, Fracis N et al. Guidelines for perioperative care in elective colorectal surgery: Enhanced recovery after surgery society recommendations: 2018. *World J Surg* 2018; 43(3):659-695 Avail from DOI: 10.1017/s00268-018-4844-y

Perioperative management of obstructive sleep apnoea: a regional survey of practice

Obstructive sleep apnoea (OSA) is an increasingly common co-morbidity presenting in elective surgical patients. It is associated with adverse perioperative outcomes but consensus is lacking on the optimum management of such patients[1]. Identification of patients with both confirmed sleep apnoea and those with risk factors or who may be as yet undiagnosed is essential to avoid complications associated with general anaesthesia and post-operative care. Guidelines on the perioperative management of OSA are available[2]; however variations in standards of care still exist across different hospitals and regions.

We aimed to investigate the perioperative management of OSA in all hospital Trusts across the Yorkshire and Humber region via a survey circulated to their pre-op assessment lead clinicians. We received 11 completed forms, a 79% response rate. Routine screening for OSA prior to elective surgery is undertaken in only 45% of hospitals, with all of those who do using a recognised screening tool (e.g. STOPBANG). 82% never request a venous bicarbonate, even in patients identified as high risk of OSA. For planned urgent surgery such as for cancer, only 36% had escalated post-operative care in response to a diagnosis of OSA. 73% of patients with OSA but without home CPAP are admitted to critical care post operatively, with the remaining 27% staying in a dedicated level 1 facility. However, if the patient already has their own CPAP machine then they are managed on a normal surgical ward 82% of the time, markedly reducing the critical care burden in this patient group. This is significant since 50% of responders reported that elective surgical cases were cancelled on either a weekly or monthly basis at their institution due to a lack of dedicated post-operative facilities for OSA patients.

Our data shows a significant variation in clinical practice between different hospitals for the management of OSA. The implications of this are potentially avoidable and costly critical care admissions and frequent cancellation of elective surgical cases.

References

- 1 Dawson D, Sing M, Chung F. The importance of obstructive sleep apnoea management in perioperative medicine. *Anaesthesia*. 2016;71(3):251-256.
- 2 Practice guidelines for the perioperative management of patients with obstructive sleep apnoea. <https://www.asahq.org/...guidelines/practice-guidelines-for-the-perioperative-manage>. Accessed 25/8/18.

A national survey regarding screening for peri-operative paediatric exposure to environmental tobacco smoke and availability of smoking cessation services

Introduction

Children exposed to environmental tobacco smoke are at increased risk of the complications of a general anaesthetic including laryngospasm, desaturation and bronchospasm, longer time in the post anaesthetic care unit ¹ and unplanned overnight admissions² as well as surgical complications such as delayed wound healing and delayed discharge³.

Guidelines on smoking management in the perioperative period include cessation of parental smoking or removal of the child from environmental tobacco smoke for as long as possible before surgery⁴.

The perioperative period presents a "teachable moment" that can motivate behavioural change¹; therefore as paediatric perioperative practitioners, we are ideally placed to ask parents or carers about their child's exposure to environmental tobacco smoke and signpost them to local smoking cessation services if applicable. We aimed to gauge the extent of this practice, stimulate discussion and identify areas of improvement.

Methods

We undertook a national survey, distributed electronically.

Results

We had 40 replies representing 34 hospitals throughout the UK, both tertiary paediatric units and district general hospitals. Most units do not routinely ask about exposure to environmental tobacco smoke; 23/34 units categorically do not, and respondents from five units were unaware of their Trust policy. Only six of the 34 hospitals (17.6%) do screen; only three of these offer smoking cessation support. Half of all respondents do not know if their unit offers this service at all. Providing literature and signposting to local smoking cessation clinics were the most common methods; funding had recently been lost for these services at one unit so GP referral remained their only option.

More commonly, 47% (16/34) of centres routinely document a child's body mass index and refer to weight reduction services if childhood obesity is identified.

Discussion and Conclusion

Despite evidence of the risks to children exposed to environmental tobacco smoke who undergo anaesthesia, very few units routinely screen or support smoking cessation, missing valuable opportunities to educate families and target a public health measure with huge potential benefits beyond the planned anaesthetic. Screening is most effectively done in a pre-operative clinic rather than on the day of surgery and encourages the development of

paediatric perioperative services. Barriers include the limited time available and the lack of awareness of smoking cessation services by perioperative practitioners. Routinely documenting environmental tobacco smoke exposure, like weight, could alert practitioners to a potential problem and motivate smoking cessation provision potentially collaborating with other services such as health visitor teams.

References

1. Parental smoking and children undergoing anesthesia: Is there a role for pediatric hospitals in smoking cessation? Niedermeier and Selleck, Journal for Specialists in Pediatric Nursing 21 (2016) 170–177
2. The Effect of Tobacco Smoke on Children Undergoing General Anesthesia and Surgery Setzer Pediatrics 1997; 100; 731
3. Impact of environmental tobacco smoke exposure on anaesthetic and surgical outcomes in children: a systematic review and meta-analysis Chiswell and Akram Arch Dis Child 2017; 102: 123–130.
4. Guidelines on smoking management during the perioperative period Anaesth Crit Care Pain Med 36 (2017) 195–200

Abstract Category: Clinical / Translational

Title: Smartphone App versus Physician Based Preoperative Assessment: A prospective observational pilot study

1.

Introduction and Objective: Assessment of fitness for surgery is conventionally performed by physicians in-person at pre-operative clinics. A recently developed smartphone application (MyOP) analyzes the patient reported health information and risk stratifies patients planned for elective surgery. Our study primarily aims to assess the feasibility of a planned observational study to determine the accuracy of the MyOp smartphone application in assessing a patient's fitness for surgery. Secondly, we aim to measure the incidence of incorrect assessment of patient fitness, and collect patient feedback about the application.

Methodology: In this pilot prospective observational study, 40 adult patients (21 to 60 years) scheduled to undergo elective minor and intermediate surgery at Singapore General Hospital (SGH) were recruited in the SGH preoperative assessment clinic. Study participants completed the assessment on the smartphone app, which would classify their fitness for surgery. They were then reviewed by a physician for routine preoperative assessment. Data were collected on the date and duration of assessment, app and physician classifications for fitness for surgery as well as patient feedback on the smartphone application. Feasibility outcomes included

1. Recruitment of 40 patients in 6 weeks.
2. Minimal loss to follow up, with 90% of enrolled subjects completing the study

Results:

Forty patients were recruited over 5 weeks. All enrolled subjects completed the study. Using the smartphone application, 19 patients were classified as fit for surgery and 21 patients were assessed to require further evaluation. This was compared to the gold standard of physician evaluation, in which 37 patients were classified as fit and 3 patients required further investigations/ review before surgery. There were no patients who were incorrectly assessed by the smartphone application to be fit.

Conclusion:

The observational study is feasible. Based on the pilot study, no patients were incorrectly assessed by the application to be fit for surgery.

TITLE:

Acute pain after prostatic high-intensity focused ultrasound

INTRODUCTION

High-intensity focused ultrasound (HIFU) has emerged over the recent years as a novel treatment alternative to radical treatment of prostate cancer with proven short- and medium-term cancer control and low complication rates compared with comparable treatment options. This technique uses focused ultrasound which causes hyperthermia and acoustic cavitation, in our organisation this is done as day-case procedure where patients will be able to be discharged home once certain parameters are met.

HIFU can be performed under General or Spinal/Epidural anaesthesia. At our institution it is performed under general anaesthesia. Reported complications from published case-series include urinary retention, urinary tract infection, urinary incontinence and erectile dysfunction. There has been no published material on the immediate post-operative complications and anecdotally there appears to be uncertainty over the degree of post-operative pain and discomfort from bladder spasms within our institution.

Methods

This was conducted as a prospective observational survey. Adults undergoing HIFU at our institution were recruited over a period of 6 months. A protocolled induction using propofol, remifentanyl and rocuronium was used with intraoperative 1g intravenous paracetamol, ondansetron and 100mcg of fentanyl. Post-operative analgesia of 100mcg of fentanyl was prescribed which was given as needed in increments. Data on procedure, demographics, acute pain scores, urinary urgency and analgesia requirement was collected using a pre-defined proforma. Pain was collected as a verbal score 0-3 anchored at no pain, mild, moderate and severe.

Results

22 patients were recruited. All recruited patients underwent a successful HIFU. Mean post-operative fentanyl requirement was 38mcg [IQR 0-100]. No patient required fentanyl above the 100mcg prescribed routinely post-operatively. 5 (22%) patients reported mild discomfort from urinary symptoms and 2 (10%) reported moderate discomfort. Oxybutynin was not needed for any patients.

Table 1: Pain scores and amount of analgesia required.

Pain	None-Mild	Moderate-Severe
Number of Patients (%)	18 (82%)	4 (18%)
Postoperative fentanyl given	24mcg IQR[0-50]	100mcg IQR[100-100]

Discussion

HIFU is a minimally invasive procedure for the treatment of prostatic cancer. 100mcg of fentanyl during induction appears to be effective in controlling post-operative pain in the majority of patients. There were no admissions due to uncontrollable pain. Urinary discomfort was common occurring in up to 30%. It is currently unsure if routine Oxybutynin would be of benefit.

References

Cordeiro, E. R., Cathelineau, X. , Thüroff, S. , Marberger, M. , Crouzet, S. and de la Rosette, J. J. (2012), High-intensity focused ultrasound (HIFU) for definitive treatment of prostate cancer. *BJU International*, 110: 1228-1242.

Post-operative destination of Colorectal surgery according to CPET results:

An Observational Study.

Introduction:

Correct identification of the post-operative destination for major colorectal surgery is a challenge. If we can correctly identify which patients can go to the ITU, HDU and ward, it will enhance the patient recovery process and maximum usage of hospital resources. But if we incorrectly put the moderate to high risk patients to the ward, complications will arise and an increase morbidity and mortality.

The final decision is taken by assessing patients' CPET results, frailty scores, patient comorbidities and surgical risk. We used anaerobic threshold, Peak VO_2 , Ventilatory equivalents of CO_2 and Peak Watts for CPET risk assessment.

Method:

Data collection and analysis of major colorectal surgeries performed from October 2017 to March 2018. Patients notes, CPET results, referral letters and MDT meeting notes were studied in detail. Then a questionnaire was filled in for each individual patient.

Results:

There were 49 patients.

61% were males and 39% were females.

Majority (53%) were over 70 years.

90% have a BMI between 18 and 30.

27% ASA1, 59% ASA2, 15% ASA 3 and only 2% ASA4.

67% Laparoscopic assisted, 14% robotic and 19% open laparotomies.

43% have high risk left sided procedures which will make them high risk for surgical complications. 39% had right sided colonic operation.

According to Anaerobic threshold, there were 35% high risk patients, 39% moderate risk patients and 26% low risk patients.

But according to Peak VO_2 and peak Watts, over 70% belonged to low risk category.

As mentioned previously, post-op care predictions were made considering all these risk factors.

8% were predicted for the ward, 69% to extended recovery, 23% to HDU and none to ITU.

Finally, we analysed the association between actual and predicted destinations and found that more than 90% of our predictions are accurate.

Conclusion:

Pre-op assessment for the prediction of the post-op destination using the current pathway works and no changes are needed to our current practice.

References:

- 1) Factors associated with survival after resection of colorectal adenocarcinoma in 314 patients.
J.Carlisle, British Journal Of Anaesthesia,, 108(3):403-5,2012
- 2) Using predicted 30-day mortality to plan postoperative colorectal surgery care
M.Swart,J.B.Carlisle and J.Goddard
British Journal of Anaesthesia,118(1):100-4(2017)
- 3) Cardiopulmonary exercise testing for the prediction of morbidity risk after rectal cancer Surgery.
M.A.West,BJS,101,1166-1172,2014

Title: External validation and recalibration of the Revised Frailty Index (rFI) for prediction of complications of liver resection surgery in a high volume UK centre

Background: Liver resection offers curative potential but 1 in 5 patients develop a serious complication, with implications for patient quality of life and healthcare resource utilisation (1). A nomogram designed to predict complications in patients undergoing liver resection, the Revised Frailty Index (rFI), comprises six variables (pathology type, extent of surgical resection, ASA, BMI, haematocrit and serum albumin) and demonstrates good discrimination in a US cohort (AUROC 0.68) (2). However, the rFI was both developed and validated using the American College of Surgeons' National Surgical Quality Improvement Programme (NSQIP) database, and has not been validated outside this cohort. We attempted to validate the rFI as a predictor of severe 90-day complications at a high volume UK centre, to our knowledge the first attempt to externally validate the rFI.

Method: We conducted a retrospective analysis of 300 consecutive patients undergoing liver resection at our institution. Coefficients for each rFI variable were derived from the nomogram in the original paper and used to calculate the rFI score for each patient. Our primary outcome of interest was any complication Clavien-Dindo grade 3 or above, during or within 90 days after surgery.

Results: 274 patients comprised the final dataset (57% male, median age 64 years), and 47 patients (17%) experienced severe complications. The rFI was a poor discriminator of complications in our cohort (AUROC 0.52; see Figure 1). In a post hoc analysis we used binary logistic regression to derive a best-fit model incorporating rFI variables and thresholds. This yielded a final model with AUROC 0.69 comprising extent of surgical resection, ASA, serum albumin and haematocrit.

Conclusions: The rFI was a poor discriminator of postoperative complications in patients undergoing liver resection surgery at a high-volume UK centre. Discrimination was improved in our best-fit model which used the rFI variables and thresholds, but empirically derived coefficients. Two of the original rFI variables, BMI and pathology type, were not included in the best-fit model, indicating that they are less influential in determining complications among patients at our centre. This new model awaits external validation.

References:

1. Mavros MN, de Jong M, Dogeas E, Hyder O, Pawlik TM. Impact of complications of long-term survival after resection of colorectal metastases. *Br J Surg*. 2013 Apr;100(5):711-8
2. Gani F, Cerullo M, Amini N, Buettner S, Margonis GA, Sasaki K, et al. Frailty as a risk predictor of morbidity and mortality following liver surgery. *J Gastrointest Surg*. 2017 May;21(5):822–30

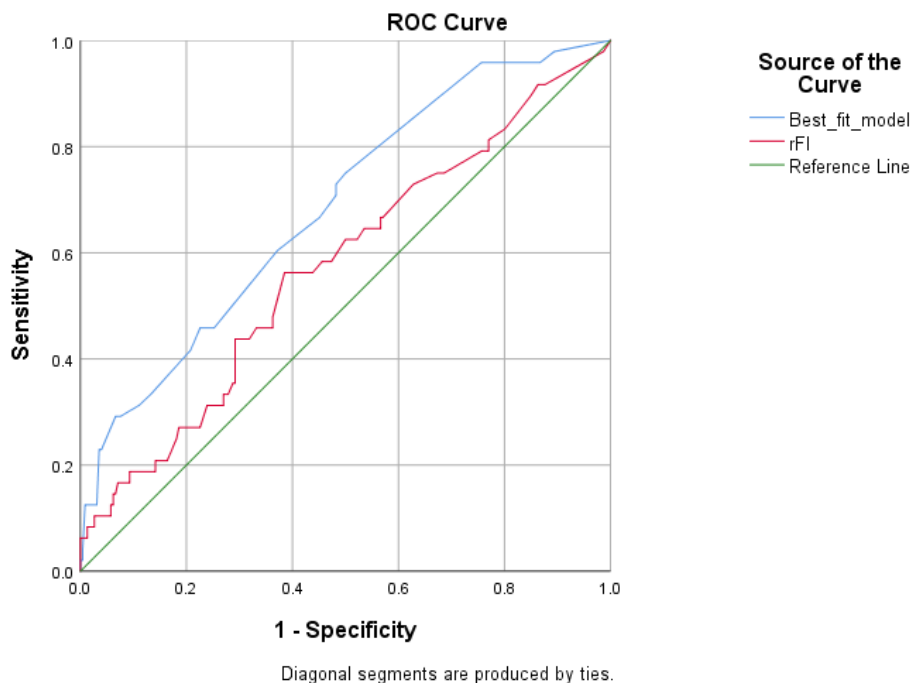


Figure 1. Discrimination of severe 90-day complications in patients undergoing liver resection surgery by the revised Frailty Index and an rFI-derived, best-fit model.

Title:

Development of a risk model to predict complications of liver resection surgery at a high volume UK centre

Introduction:

Centralisation of services, advances in surgical techniques, and improved perioperative care have reduced mortality rates for liver resection surgery to <3% (1,2). Despite these improvements in care, patients remain at high risk of perioperative complications, with rates of 30-45% in published series (2,3).

While long term outcomes for patients undergoing liver resection for cancer are improving, postoperative complications remain important determinants of postoperative quality of life. Predicting which patients will experience complications is difficult. A simple, clinically useful risk model that predicts complications could contribute to preoperative shared decision making and perioperative resource allocation, leading to improved patient-centred outcomes.

We have recently demonstrated that a model developed in the US (2) to predict complications of liver resection performs poorly in our cohort. We aimed to develop a simple, clinically useful risk model to accurately predict postoperative complications in patients undergoing liver resection.

Methods:

We conducted a retrospective analysis of 300 consecutive liver resections performed at a single, high volume centre. Candidate predictors including a variety of patient and surgical factors were assessed using binomial logistic regression to yield a model predictive of severe complications (Clavien-Dindo grade III or higher) during or within 90 days after surgery.

Results:

The overall rate of Clavien-Dindo grade III or higher complications was 17%. A final model comprising extent of surgical resection, ASA-PS score, sex, serum haemoglobin and serum albumin demonstrated good discrimination with area under the receiver operating characteristic curve of 0.70 (95% CI 0.61-0.78).

Conclusion:

Using just five preoperative variables we can predict the risk of serious complications for patients undergoing liver resection at a high volume UK centre. Following appropriate validation there is potential for this model to improve perioperative shared decision making and resource allocation, leading to improved outcomes.

References:

1. Ciriá R, Cherqui D, Geller DA, Briceno J, Wakabayashi G. Comparative Short-term Benefits of Laparoscopic Liver Resection: 9000 Cases and Climbing. *Ann Surg*. 2016

Apr;263(4):761–77.

2. Gani F, Cerullo M, Amini N, Buettner S, Margonis GA, Sasaki K, et al. Frailty as a risk predictor of morbidity and mortality following liver surgery. *J Gastrointest Surg*. 2017 May;21(5):822–30.
3. McKay A, You I, Bigam D, Lafreniere R, Sutherland F, Ghali W, et al. Impact of surgeon training on outcomes after resective hepatic surgery. *Ann Surg Oncol*. 2008 May;15(5):1348–55.

Addressing variation as the enemy of quality: a PQIP project.

Introduction

12 months ago at EBPOM we presented our work on identifying inconsistencies in data entry onto the PQIP web-tool which resulted in difficulty interpreting our data. Following this, we have sought to build on our work by instituting a protocolised pathway for patients undergoing elective colorectal resection at our hospital. The pathway is intended to cover the entire perioperative period.

Methods

Following interrogation of our data, we wrote to PQIP to identify hospitals who were performing well in the PQIP process and outcome measures we were interested in. This included pain in recovery, pain on day 1 and DrEaMing on day 1. We wrote to these units to enquire about their enhanced recovery pathways, their use of multimodal analgesia, anaesthetic techniques and use of regional anaesthesia. Using our own data, we identified common themes, and where protocols differed from our own, discussed at a departmental meeting whether we should trial it. We worked with our preoperative assessment and acute pain services to agree analgesic approaches and ways to identify patients at risk of postoperative pain which may be difficult to manage, in addition to opioid de-prescribing advice.

Results

We produced a pragmatic protocol (extract in figure 1) designed to guide preoperative assessment, anaesthetists, recovery staff and ward staff, which incorporates the principles of enhanced recovery that we have adopted as an institution. This was circulated to a core group of anaesthetists who have regular colorectal lists, and then to the department and other staff for agreement. After editing and updates adoption and evaluation of impact using PQIP, we introduced the protocol in February 2019.

Conclusions

Deming referred to uncontrolled variation as the 'enemy of quality'. We aim to control our variation in a department where anaesthetists of all grades may be providing anaesthesia for colorectal resections. We believe it is important to use a defined set of techniques and capture these accurately in order to evaluate what may be effective. We will run this protocol for six months, track its impact using PQIP data and formally re-evaluate at six months. This project also illustrates the power of PQIP to share learning and experience across units with the aim of improving outcomes.

References

1. PQIP Annual report 2018. Available from: <https://pqip.org.uk/pages/ar2018> Accessed 28/4/19

Figure 1

ENHANCED RECOVERY PERIOPERATIVE PROTOCOL FOR ELECTIVE COLORECTAL SURGERY

INTRAOPERATIVE CARE

Anaesthetic technique			
Open		Laparoscopic	
GA: Volatile/TIVA	GA: Volatile/TIVA	GA: Volatile/TIVA	GA: Volatile/TIVA
Rectus sheath catheters (prime >20 mins before arrival in recovery)	Epidural PCEA	Targeted regional block at end to cover incision for specimen removal (QL/Rectus Sheath/TAP)	Spinal with diamorphine* (volume of LA used discretionary)
+ PCA	Rescue/step down analgesia		+/- PCA (with caution)

Intrathecal diamorphine dosing

Balance dose against risk of delayed respiratory depression
(combination with oral morphine postop)

- Recommend up to 300mcg
- Consider patient's age, perioperative risk category and postoperative destination when deciding dose
- Label clearly on drug chart that intrathecal opioid given
- Hand over to PACU and ward that intrathecal opioid given

Intraoperative care bundle

- Goal: Normothermia: proactive warming with temperature measurement, fluid warmer and forced air warmer.
- Goal: Normovolaemia: consider goal directed fluid therapy. Catheterise.
- Goal: Reduce PONV risk: Ondansetron 4mg and Dexamethasone 6.6mg unless contraindicated
- Goal: Reduce DVT risk: mechanical thromboprophylaxis, prescribe chemical
- Goal: Reduce risk of surgical site infection: antibiotics within 60 mins induction
- Goal: Wake up comfortable: Load with intravenous paracetamol if not already

Chronic pain patients/long term opioids/high risk of pain

Consider Ketamine bolus 0.25mg/kg after induction of anaesthesia

- Maximum 20mg in patients over 75 years
- Further dose reduction in patients with early dementia or pre-existing cognitive impairment

Outcomes in Major Colorectal Surgery at Mid-Essex Hospitals

Introduction

Major colorectal resection comprises a group of procedures carried out for a variety of indications, both cancer and non-cancer (Inflammatory, Diverticular disease, etc). Operations are performed in teaching hospital and district general hospital settings, with varying reported outcomes. Quoted mortality rates range from 1.5% to 6%⁽¹⁻³⁾.

In our hospital there have been recent alterations in the elective colorectal surgery pathway. These include: MDT meetings for cancer treatment, anaesthetist-led pre-assessment, Cardio-pulmonary Exercise testing (CPET), anaemia treatment pathways, Shared-decision making clinics, post-op destination MDT meetings, increased use of minimally invasive surgery (including robotically-assisted). We wanted to monitor these changes and compare with national data.

Methods

This project was registered with our hospital audit department. A list of patients assessed for elective colorectal surgery was obtained from the database of our CPET laboratory, then sent to the hospital coding department, which generated an Excel spreadsheet report. This included colorectal procedures carried out from January 2017 to January 2019, surgery date, operative approach, diagnoses, and discharge date. These data were confirmed against hospital electronic patient records. Patients were excluded if they underwent emergency surgery instead, or if they did not have major resections. Results were filtered for major resection for cancer, to compare with other centres using the National Bowel Cancer Audit (NBOCA)⁽³⁾.

Results

232 individual cases were identified. 47 were excluded as they were non-elective or not major resections.

Of 185 patients included, there were 4 deaths, correct to April 2019, none within 30 days of surgery. They died at 80, 185, 265, and 293 days post-surgery.

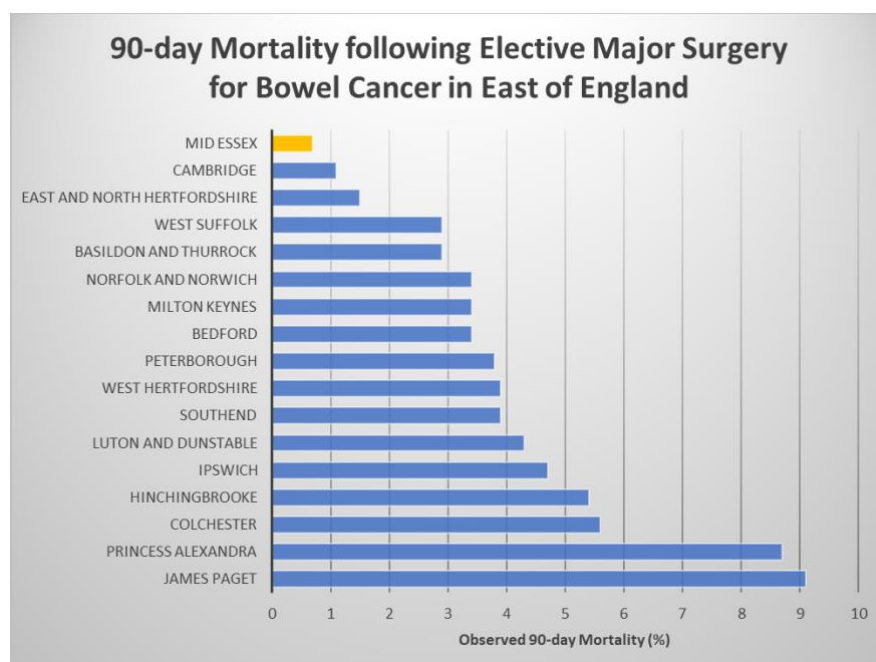
Table 1. Table of mortality results

	Number of patients	%
30-day	0	0
90-day	1	0.54
1-year	4	2.16

171 (92%) were attempted minimally-invasive, with 29 (16%) converted to open surgery. 142 (77%) patients underwent primary anastomosis, the remainder being defunctioned. Median length of stay was 4 days.

To compare with other hospitals, we reviewed data from the NBOCA 2018 report. Our 90-day mortality for cancer surgery was 0.7% (1 of 144 patients), which was tabulated with NBOCA observed 90-day mortality from 2016-2017.

Figure 1. Graph of observed 90-day mortality across the East of England region.



Conclusion

Our mortality over this 2-year period seems below the national average, comparing favourably with national audit data when using cancer patients as a surrogate of our surgical population. The data compared with NBOCA is only for cancer, so excludes a number of our patients, and is over 2 years, compared with the 1-year NBOCA cohort. However, our overall 0.54% 90-day mortality remains lower than most other published data. We recognise the need for subsequent study of those patients that chose a non-operative treatment.

References

- 1) Cone MM, Herzig DO, Diggs BS, *et al.* Dramatic Decreases in Mortality from Laparoscopic Colon Resections Based on Data from the Nationwide Inpatient Sample. *Arch Surg.* 2011;146(5):594–599.
- 2) Billeter, Adrian T. *et al.* Mortality after Elective Colon Resection: The Search for Outcomes that Define Quality in Surgical Practice. Dec 2012. *Journal of the American College of Surgeons*, Volume 214, Issue 4, 436 - 443
- 3) National Bowel Cancer Audit. Annual Report 2018. Healthcare Quality Improvement Partnership (HQIP). Available online at: <https://www.nboca.org.uk/content/uploads/2018/12/NBOCA-annual-report2018.pdf> (Accessed on 27/04/2019).

Outcomes in Elective Nephrectomy at Mid-Essex Hospitals

Introduction

Nephrectomy is a major operation carried out across the UK in both district general and teaching hospitals, with over 7000 estimated cases per year¹. National Audit of these cases reports an overall mortality rate from surgery of 0.5%¹. They are usually elective, and routinely undergo detailed pre-operative assessment. In our hospital this includes the use of Cardiopulmonary Exercise Testing (CPET). We wanted to assess the utility of CPET in predicting outcome in Mid-Essex.

Methods

This project was registered with the hospital audit department. A list of patients assessed in Anaesthetic Clinic was produced from our CPET laboratory database. This list was sent to the hospital coding department, producing a report detailing all operations within the specified time, their date of surgery, approach, diagnoses, and hospital discharge dates. These data were checked against hospital electronic patient records. Data was analysed in Excel. This allowed comparison of length of stay (LOS) data against measured pre-operative CPET variables. Unpaired 2-tailed students t-tests were used to assess significance of differences found.

Results

51 cases between October 2017 and January 2019 were identified, 40 Nephrectomy (78%) and 11 Nephroureterectomy (22%). Median age of patients was 69 years, and median LOS 4 days. While it was not possible to use CPET to predict mortality, there was some link between test results and subsequent LOS. When split into 2 groups; those who stayed in hospital for 5 days or more, and those who were discharged sooner, there was a significant difference in several of the observed CPET measurements.

Length of Hospital Stay (LOS)			
	Mean (SD) of values for LOS less than 5 days	Mean (SD) of values for LOS 5 days or over	p-value
AT	11.9 (3.54)	9.4 (2.53)	0.018
Peak VO2	18.7 (6.41)	14 (4.58)	0.014
Peak Work	128.9 (50.85)	86.9 (46.7)	0.009

Table 1. Difference in pre-operative CPET measurements for those patients who went on to stay in hospital for less than 5 days, or 5 days plus.

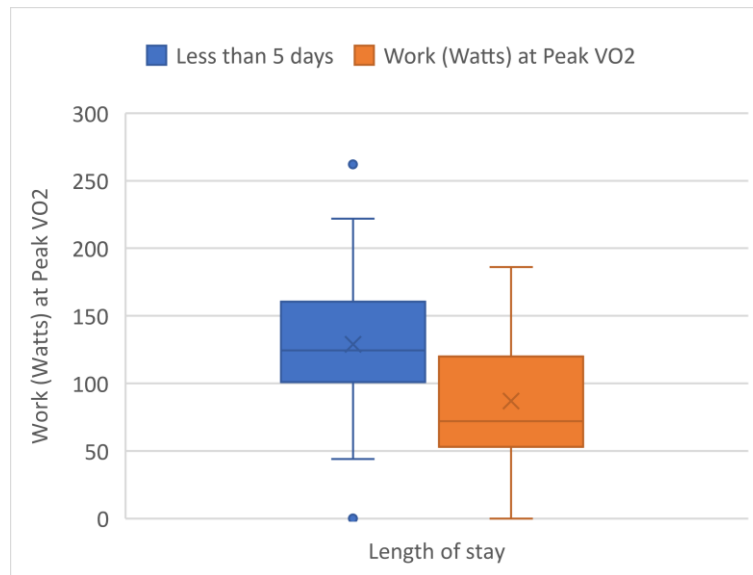


Figure 1. Box-and-whisker plots for 2 groups of patients, one with a post-op length of stay of less than 5 days, and one of 5 days or more, showing the difference in peak work achieved at pre-operative CPET.

Conclusion

There appears to be no correlation with findings at anaesthetic pre-operative assessment, or with pre-operative CPET with mortality following elective nephrectomy. We therefore suggest that CPET is not a useful investigation for predicting surgical mortality in nephrectomy. However, CPET remains relevant in planning post-operative destination, and predicting the likelihood of prolonged length of hospital stay.

References

- 1) Fernando A, Fowler S, Van Hemelrijck M, O'Brien T. (2017) Who is at risk of death from nephrectomy? An analysis of thirty-day mortality after 21 380 nephrectomies in 3 years of the British Association of Urological Surgeons (BAUS) National Nephrectomy Audit. *BJU Int*, 120: 358-364.

Postoperative delirium and anaesthetic management- systematic review

Background

Postoperative delirium is a common neurocognitive complication in the older surgical population and is associated with significantly increased risk of mortality and morbidity (1, 2). There are numerous studies on the association between anaesthetic practices and postoperative delirium. However, there is no published guideline on what is the anaesthetic best practice to minimize the risk of postoperative delirium (3). We systematically reviewed the literature on the impact of anaesthetic practice on postoperative delirium.

Methods

We systematically reviewed literatures from PubMed for studies related to postoperative delirium and various aspects of anaesthetic practice. We also systematically searched the literatures for studies on the risk factors of postoperative delirium. Evidence for each aspect of anaesthetic care was summarised, and the quality of evidence was assessed according to grading system published by the American society of Anesthesiologists.

Results

Despite numerous published studies and several meta-analyses on the risk factors of delirium, there are currently no validated risk prediction systems for postoperative delirium, therefore preoperative risk stratification remains a clinical decision. We identified several aspects of anaesthetic practice which reduces the risk of postoperative delirium, including depth of anaesthesia monitoring, opioid sparing strategies including regional anaesthesia. Interestingly, the choice of anaesthetic agent does not appear to influence the risk of postoperative delirium, while the association between intraoperative hypotension and delirium is conflicting.

Conclusion

Preoperative assessment could identify patients at risk of perioperative delirium. However a risk scoring system should be developed to further aid clinical decision making. In high risk patients, measures should be taken to minimise the anaesthetic related risk factors.

1 Maniar HS, Lindman BR, Escallier K, et al. Delirium after surgical and transcatheter aortic valve replacement is associated with increased mortality. *J Thorac Cardiovasc Surg* 2016; 151: 815-23.e1-2.

2 Inouye SK, Marcantonio ER, Kosar CM, et al. The short-term and long-term relationship between delirium and cognitive trajectory in older surgical patients. *Alzheimers Dement* 2016; 12: 766-75.

3 Weinstein SM, Poultides L, Baaklini LR, et al. Postoperative delirium in total knee and hip arthroplasty patients: a study of perioperative modifiable risk factors. *Br J Anaesth* 2018; 120: 999-1008.

EBPOM Abstract

Too much of a good thing? Prevalence of Perioperative Hyperoxia in a Major Teaching Hospital

Introduction

While critical to organ function, supranormal oxygen levels (defined as peripheral saturations >98%) can be detrimental¹. Cardiovascular effects include increased systemic vascular resistance & decreased cardiac contractility². Pulmonary complications include endothelial damage secondary to reactive oxygen species. Increased mortality in the intensive care unit (ICU) has also been demonstrated with over oxygenation.

Major surgery induces a cascade of systemic inflammatory responses. Peri-operative management in critical care aims to reduce the impact of this cascade, reducing incidence of morbidity & mortality. We aimed to evaluate prevalence of potentially harmful but easily modifiable hyperoxia in critical care for patients undergoing a full range of major surgery.

Methods

Retrospective data was collected for a three-week period for patients admitted to critical care following elective and acute surgery. Patients underwent upper-gastrointestinal, hepato-biliary, vascular and neurosurgical procedures. Demographics, recorded co-morbidities, key operative information and blood gas results with observations were acquired and collated through electronic patient records.

Results

33 males and 27 females were identified, mean age 53.6 years and 62.9 years respectively. 28 patients (46.7%) underwent elective surgery, 32 patients underwent emergency surgery. Open surgical approaches were used in the majority (88%) of patients while laparoscopic and percutaneous techniques were used in the remainder.

Hyperoxia was prevalent both intra- and post-operatively, particularly in theatre (mean PaO₂ 23.9KPa). On the ICU, mean FiO₂ was 0.31, with various modes of oxygen delivery from mechanical ventilation to nasal cannulae. Where supplemental oxygen was delivered, 47% of data points collected showed peripheral saturations of >98%. Those undergoing mechanical ventilation were at particular risk of hyperoxia (mean PaO₂ 14.41KPa, mean O₂ saturation 98.14%).

Conclusion

Hyperoxia was seen in theatre, recovery and for prolonged periods in intensive care. Supplementary oxygen was often delivered without any clear indication. Mechanically ventilated patients, already at higher risk of pulmonary complications, were more prone to hyperoxia.

Prevalent hyperoxia represents an easily modifiable risk factor to prevent further physiological deficit and reduce potential ICU mortality. Our future aims include development of a targeted education programme for both nursing and medical teams & institution of a decision tree to guide management of FiO₂ & supplemental oxygen delivery. Additional work is required to understand the cause of high rates of hyperoxia in theatre and understanding individual practices in gas delivery during anaesthesia.

[1] Chu D. **Mortality and morbidity in acutely ill adults treated with liberal versus conservative oxygen therapy (IOTA): a systematic review and meta-analysis.** *Lancet* 2018; **391**: 1693–705

[2] Smit B. **Hemodynamic effects of acute hyperoxia: systematic review and meta-analysis.** *Critical Care* 2018; **22**: 45

Title

ERAS+ programme associated with reduced postoperative pulmonary complications (PPCs) after colorectal resection

Introduction

The ERAS+ bundle of perioperative care, which includes incentive spirometry (IS), was associated with a 50% reduction in PPCs in a mixed surgical specialty cohort¹ when it was introduced at Central Manchester Foundation Trust.

In 2018 we joined Greater Manchester ERAS+ (GM ERAS+), a group of centres committed to upscaling the ERAS+ programme as part of a quality improvement initiative. We measured compliance with IS use and the incidence of PPCs before and during its introduction in the elective colorectal resection population at our centre.

Methods

Elective colorectal surgery patients were included. PPC was defined using pragmatic clinical consensus agreed by the GM ERAS+ group: prescribed antibiotics for suspected chest source, or requirement for ventilatory support. Compliance with IS usage within 24 hours of surgery and incidence of PPCs at day 7 were recorded prospectively by a trained data collector from July 2018-February 2019.

Results:

56 patients were included. 4/56 patients developed a PPC (7.1%). 3/35 (8.5%) occurred before IS introduction and 1/21 (4.7%) occurred afterwards.

Incentive spirometers were introduced in December 2018. Subsequent compliance with post-operative IS usage was 12/21 (57.1%).

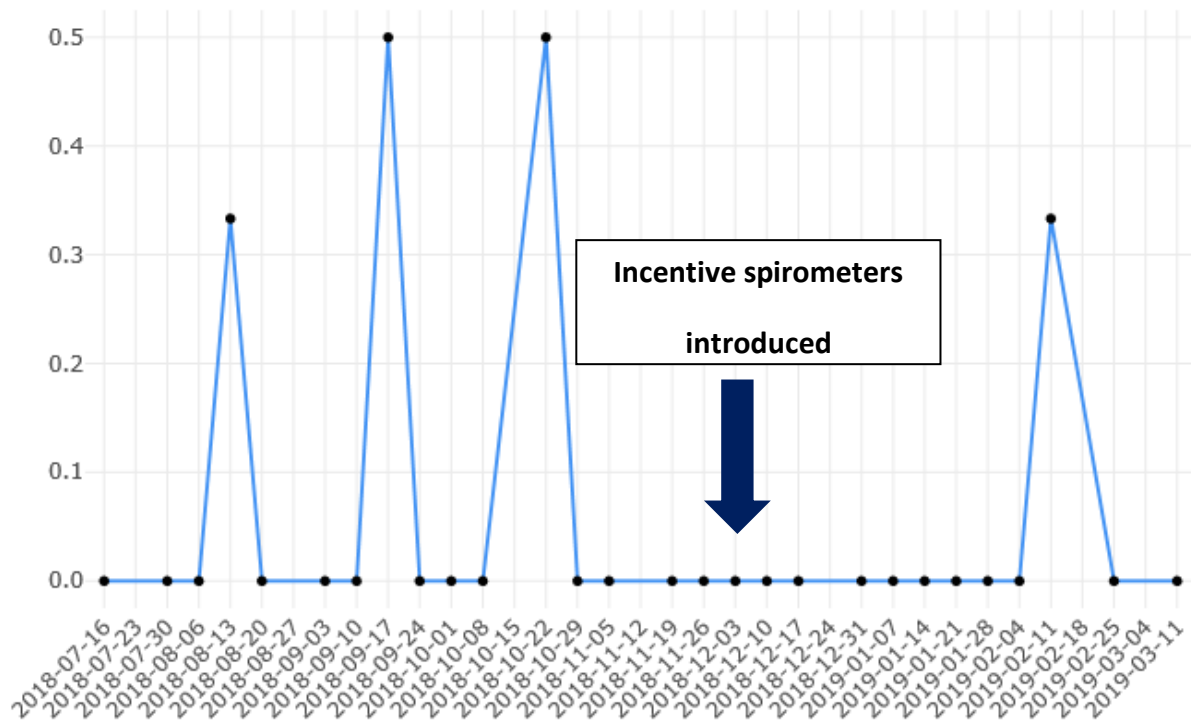


Figure 1. Incidence of postoperative pulmonary complications (PPCs) in elective colorectal surgery patients

Conclusions:

We formally adopted the ERAS+ programme from August 2018. During pre-operative consultations we placed greater emphasis on prehabilitation aspects such as physical activity and mouthcare.

57% of patients were compliant with use of the IS device post-operatively following their introduction in December 2018, and the incidence of PPCs reduced from 8.5% to 4.7%.

We aim to achieve higher IS compliance rate by taking the PDSA (Plan, Do, Study, Act) approach. We will issue patient belonging bags to assist the flow of IS devices with patients through their inpatient journey. We will launch a classroom format Surgery School from May 2019 to provide patients with education, peer support and empowerment in their peri-operative journey. From May 2019 most colorectal surgical patients will also have access to the Prehab4Cancer programme which will facilitate cancer patients across GM to engage in exercise, have nutritional screening and improved emotional well-being before and after surgery².

References:

1. Moore, J. A., Conway, D. H., Thomas, N. , Cummings, D. and Atkinson, D. (2017), Impact of a peri-operative quality improvement programme on postoperative pulmonary complications. *Anaesthesia*, 72: 317-327. doi:[10.1111/anae.13763](https://doi.org/10.1111/anae.13763)
2. <https://gmcancer.org.uk/our-areas-of-work/prehab4cancer/>

Assessing the Relationship of Body Composition and Physical Fitness in Oesophago-gastric Cancer patients undergoing Multi-modal Therapies and Surgery

Introduction: Oesophago-gastric (OG) cancer affects 13,000 individuals in the United Kingdom each year. Multi-modal therapies for locally advanced OG cancers, including neoadjuvant cancer therapies (NAC) and surgery offer improved survival. However, this increases perioperative toxicity and mortality. Sarcopenia and poor physical fitness have independently been associated with worse post-operative outcomes in numerous cancer types. The association between body composition and fitness has not been investigated in this cohort. This study aims to assess the impact of NAC on skeletal muscle and cardiopulmonary fitness and their shared association with each other and 1-year overall survival (OS).

Methods: Patients with locally advanced OG cancer undergoing curative multi-modal treatment and cardiopulmonary exercise test (CPET) were recruited. All CPET variables were investigated with particular interest in peak oxygen uptake (VO_2 at Peak) and oxygen uptake at anaerobic threshold (VO_2 at AT) before and after NAC. Body composition was calculated from single Computerised Tomography slices taken before and after NAC using Sliceomatic™ software. Selected measurements at L3 included: skeletal muscle area (SM), its' radiation attenuation (SM-RA) and visceral and subcutaneous adipose tissue (VAT and SAT). Pectoralis muscle area (PMA) and anterior chest wall adipose tissue (ACF) measurements were also recorded at the suprasternal notch. Sarcopenia was defined as low skeletal muscle index at L3 from sex-specific cut-offs.

Results: A total of 136 patients from four UK hospitals were included, with 94 of these patients undergoing an additional CPET post-NAC. Significant changes in VO_2 at Peak, VO_2 at AT, chest wall and abdominal body composition were seen (Table 1). In univariate analyses, VO_2 at AT and VO_2 at Peak were respectively associated with SM, as well as SM-RA, SAT, VAT, PMA and ACF. In multivariate analysis, PMA was associated with VO_2 at Peak (95%CI 0.50 to 0.19; $p=0.001$), while ACF was associated with both VO_2 at AT and Peak (95%CI -0.09 to -0.05; $p<0.001$ and 95%CI -0.15 to -0.08; $p<0.001$). In univariate and multivariate survival analysis, pre-NAC VO_2 at AT was associated with 1-year OS (95%CI -0.78 to -0.1; $p=0.01$), in addition to nodal staging and surgical resection margin.

Conclusion:

NAC has deleterious effects on chest and abdominal body composition and physical fitness in OG cancer patients. A novel positive association between body composition (both chest wall and abdominal) and fitness was found, suggesting an additive perioperative risk stratification value. Prehabilitation during NAC might rescue these negative effects on fitness and body composition and improve outcome.

*joint authorship

Fit-4-Surgery Collaborative authors – Mr Saq Rahman, Ms Alicia Munro, Mr Ben Grace, Prof Gerry Danjoux, Dr Tom Owen

Table 1

	All patients (n=136)	Pre-NAT CT (n=107)	Post-NAT CT (n=107)	Mean Difference (95% CI)	p-value
<u>Lumbar vertebrae Three</u>					
Skeletal Muscle Area (cm ²)	140.49 (32.44)	142.15 (32.75)	132.13 (30.13)	- 10.02 (-7.43 – -12.62)	< 0.001
Skeletal Muscle Index (cm ² /m ²)	48.32 (11.02)	48.386 (10.64)	44.97 (9.76)	- 3.41 (-2.50 – -4.33)	< 0.001
Mean Muscle Attenuation (HU)	38.17 (8.18)	38.21 (8.09)	35.56 (8.26)	- 2.65 (-1.22 – -4.08)	< 0.001
Subcutaneous adipose tissue (cm ²)	186.19 (103.91) ^a	183.28 (106.48) ^b	165.73 (93.89) ^b	- 17.55 (-9.62 – -25.48)	< 0.001
Visceral adipose tissue (cm ²)	182.15 (102.51)	184.87 (106.39)	167.06 (99.93)	- 17.816 (-9.80 – -25.84)	< 0.001
Intra-muscular adipose tissue (cm ²)	11.27 (8.33)	11.22 (8.51)	10.93 (7.72)	- 0.297 (-1.08 – 0.48)	0.452
Fat-free Mass (kg)	48.21 (9.73)	48.71 (9.83)	45.70 (9.04)	- 3.01 (-2.23 – -3.78)	< 0.001
Fat Mass (kg)	26.91 (7.38) ^a	26.94 (7.70) ^b	25.41 (7.10) ^b	- 1.49 (-0.84 – -2.15)	< 0.001
Sarcopenia (n,%)	75 (55%)	58 (54.2%)	74 (69.2%)	+ 16	<0.001
<u>Suprasternal</u>					
	A(n=132)				
Anterior Chest Fat (cm ²)	44.43 (26.57)	45.21 (25.40) ^c	40.50 (24.15) ^c	-4.71 (-1.04 – -2.65)	< 0.001
Pectoralis Muscle Area (cm ²)	40.13 (11.62)	40.776 (12.11) ^d	35.88 (10.57) ^d	-4.89 (-2.65 – -6.77)	< 0.001
Pectoralis Muscle RA (HU)	38.82 (8.25)	38.236 (8.51) ^d	35.24 (9.36) ^d	-2.99 (-0.73 – -1.54)	<0.001
<u>Selected CPET variables</u>					
	All patients (n=136)	Pre-CPET (n=94)	Post-CPET (n=94)	Mean Difference (95% CI)	p-value
VO ₂ at AT (ml/min)	0.90 (0.27) ^e	0.92 (0.27)	0.79 (0.26)	- 0.1 (-0.08 – -0.17)	< 0.001
VO ₂ at AT (ml/kg/min)	11.49 (3.05) ^e	11.84 (0.26)	10.41 (3.19)	- 1.43 (-0.83 – -2.02)	< 0.001
VO ₂ at Peak (ml/min)	1.58 (0.53)	1.64 (0.52)	1.36 (0.47)	- 0.28 (-0.22 – -0.35)	< 0.001
VO ₂ at Peak (ml/kg/min)	20.14 (5.89)	21.16 (6.0)	17.74 (5.53)	- 3.41 (-2.59 – -4.24)	< 0.001

A table showing the effects of neoadjuvant cancer therapies on body composition and physical fitness.

Missing data:

Comparative body composition analysis involved 107 patients as 29 did not have post-NAC CT slice because: inappropriate quality of post-CT scan (n=3), Palliative therapy following NAT with no post CT scan (n= 2), Unobtainable post-CT scan (n=6), Death during NAC (n=3), Post-NAC CT was post-operative CT (n=15)

L3:

^a = 123 – 13 patients had cropped CT scans which would invalidate SAT and FM variables.

^b = 91 – another 3 scans from post-NAC were cropped and so 16 patients were excluded for comparative SAT and FM analysis

Suprasternal:

There were 4 poor quality pre-NAC chest CT scans, which significantly distorted pectoralis muscles and anterior chest fat hence total number of patients n=132

^c = 99 – From the 107, 8 patients had artefacts distorting the anterior chest fat

^d = 96 – From the 107, 11 patients had artefacts distorting pectoralis muscles

Title: Patient regret following oesophagectomy: The importance of post-operative quality of life

Introduction: Oesophagectomy is a highly morbid procedure with post-operative complication rates of 59%. Recovery from oesophagectomy may be protracted, particularly in the presence of significant complications and prolonged hospital stays, resulting in a long-term impact on quality of life. Furthermore, less than 50% of operated patients are alive at 5 years, with cancer recurrence rates of 20% at one year. As a result, even patients with an apparently successful surgical outcome may subsequently regret their treatment choices. We aimed to identify the prevalence of post-surgical regret amongst oesophageal cancer patients and to identify factors associated with regret.

Methods: Telephone questionnaires were administered to all patients. Regret was assessed using the validated Decisional Regret Scale. Shared decision-making was assessed using the Control Preferences Scale and Patients Perceived Involvement in Care Scale. Quality of life was assessed using the generalised QLQ-C30 and oesophageal specific OES-18 measures. The association of factors with the development of regret was determined using Mann-Whitney U and Independent Samples t-tests.

Characteristic:	Overall Cohort, (n=76)	2017, (n=39)	2018, (n=37)
Age (years)	67.3± 9.8	67.6±9.5	67.1±10.2
Sex:			
Male	59 (78%)	27 (69%)	32 (86%)
Female	17 (22%)	12 (31%)	5 (14%)
BMI	28.9±5.1	29.2±5.5	28.6±4.7
Length of Stay (days)	Med= 10 (IQR=6)	Med=10 (IQR=6)	Med=10 (IQR=7)
Post op complications:			
Yes			
No	50 (66%) 26 (34%)	28 (72%) 11 (28%)	22 (59%) 15 (41%)
Clavien Dindo >3b			
Yes	11 (14%)	8 (21%)	3 (8%)
No	65 (86%)	31 (79%)	34 (92%)

Table 1: Patient Demographics- Mean and Standard Deviation are shown for and BMI. Median (Med) and Interquartile range (IQR) for length of stay is shown. All remaining variables are frequencies with proportional percentages.

Results: 76 patients underwent oesophagectomy between January 2017 to October 2018, with 49 patients (65%) responding to the questionnaire. Most patients were male (78%) with a mean age of 67.3 years and 90-day mortality of 4.4%. Regret prevalence was high, with 61% (n=30) of patients experiencing some degree of regret. 14% of patients (n=7) described moderate or severe regret. Most patients desired to have a passive role in decision-making (74%, n=36) whereas only 45% (n=22) adopted this passive role. Post-operative regret was associated with: hospital length of stay, emotional and social functioning, insomnia, difficulty eating and reduced summary QLQ-C30 quality of life scores. Regret was not associated with

the presence or severity of post-operative complications, neoadjuvant treatment toxicity, cancer reoccurrence or participation in shared decision-making.

Conclusions: Regret is a salient experience for many patients recovering from intentionally curative treatment for oesophageal cancer. Regret was significantly associated with quality of life measures but not the presence or severity of post-operative complications. This highlights the importance of the psychological and functional impact of surgery on patient reported outcomes, which should be measured in addition to traditional morbidity and cancer specific outcomes. Although a pilot, this is the first study to show associations between quality of life and regret following major cancer resection surgery. Future work is required to further explore changes in regret and quality of life over time and to identify interventions that can reduce regret and improve quality of life after oesophagectomy.

References:

1. Brehaut J, O'Connor A, Wood T, Hack T, Siminoff L, Gordon E et al. Validation of a decision regret scale. *Medical Decision Making*. 2003; 23(4): 281-292.
2. Wilson A, Winner M, Yahanda A, Andreatos N, Ronnekleiv-Kelly S, Pawlik T. Factors associated with decisional regret among patients undergoing major thoracic and abdominal operations. *Surgery*. 2017; 161(4): 1058-1066.

Preventing Post-operative Delirium in Elective Lower Limb Arthroplasty

Introduction:

Delirium is a post-operative risk and it carries significant morbidity and mortality. Patients who develop delirium tend to have longer lengths of stay and poorer outcomes. This can have serious impacts for patients and their loved ones. This risk is increased by the use of opiate based and neuropathic medications.

The post-operative pain regime we utilise for elective lower limb arthroplasty patients consists of Paracetamol, Gabapentin, OxyContin which is then stepped down to Dihydrocodeine and OxyNorm for breakthrough.

We have developed a system of adapting patients' analgesia if they are deemed to be at high risk of delirium.

Methods:

Patients who are 65 years or older are screened prior to admission by liaising with the local psychiatry liaison team regarding whether they have any previous issues or contact with mental health services.

Patients are stratified into low, medium or high risk groups based on the following criteria:

GREEN	<ul style="list-style-type: none"> • Aged below 65 years old. • No Significant Sensory Impairment • No history of cognitive decline. • Independent with mobility • No polypharmacy
AMBER	<ul style="list-style-type: none"> • Over 65 years of age. • Polypharmacy – 4 medications or more • 1 Sensory Impairment • Restricted mobility
RED	<ul style="list-style-type: none"> • Over 65 years of age. • Physical co morbidities • Polypharmacy • 1+ Sensory Impairments • Psychiatric Co morbidities

For high risk patients, the pain regimen is adapted by:

- Avoiding Gabapentin, OxyContin and OxyNorm
- Extending intravenous Paracetamol duration from 24 to 72 hours
- Using oral NSAIDs such as Ibuprofen or rectal NSAIDs such as Diclofenac
- If required, using mild opiates such as Codeine 15mg or Dihydrocodeine 30mg
- If necessary, using low dose Oramorph (2.5mg-5mg) for breakthrough

Results:

Some patients have been managed successfully with solely intravenous Paracetamol and NSAIDs. If we have felt this to be insufficient, we have utilised low dose Codeine either as required or regularly if deemed necessary.

Oramorph has been avoided in most instances.

3 patients suffered from delirium over a 12 month period; 2 of these had pre-existing cognitive impairment.

Conclusion:

Avoiding opiates and neuropathic analgesia in high risk patients can reduce the incidence of delirium. Having an awareness of delirium risk and a thorough patient background enables clinicians to tailor post-operative analgesic regimens in an attempt to reduce the chance of this occurring.

Use of Oramorph on Discharge in Elective Lower Limb Arthroplasty

Introduction:

As the inpatient length of stay for elective lower limb arthroplasty patients has reduced to an average of 24-72 hours, it has become apparent that some patients experience significant issues with pain control post-discharge.

Patients may still require stronger opiates that they would usually receive if they were still inpatients. Once at home, they may experience difficulties being reviewed in primary care due to mobility and also service pressures; and in the worst case scenarios this can lead to preventable readmissions.

Our usual discharge analgesia consists of Paracetamol and Dihydrocodeine. As a response to the above, we have developed a service whereby patients are assessed pre-admission with regards to whether they may be prescribed Oramorph as breakthrough analgesia on discharge from hospital.

Methods:

All patients attend a validation appointment with a specialist joint replacement nurse within 2 weeks of surgery. This is to ensure that there are no outstanding issues.

If a patient is deemed to be at low risk of post-operative delirium, they are offered Oramorph. Some patients decline this based on previous experiences with Morphine or if they feel that mild opiates are sufficient.

Oramorph (100ml of 10mg/5ml) prescriptions are prepared the week before admission to prevent delays in discharge.

Patients who are 80 years or older are assessed on a case by case basis once they are admitted. The reason for this is that in our initial trial period, we found a lot of declines. Additionally, they tend to remain inpatients for longer at which point their pain is better controlled.

Results:

1 patient readmitted within 30 days of discharge over a 12 month period due to pain control issues.

We experienced a significant reduction in telephone calls from patients regarding sub-optimal pain control.

Up to 5% of patients issued with Oramorph returned an unused bottle.

Conclusion:

As we strive to reduce the length of stay of elective lower limb arthroplasty patients, they will inevitably experience issues post-discharge that in the past would have been addressed prior to discharge.

With regards to pain control, we have responded to this by including Oramorph as a discharge medication after assessing them.

Consequently, there have been less readmissions due to poor pain control and increased patient satisfaction.

Taking Perioperative Medicine onto the wards: addressing the gaps in postoperative perioperative care.

Introduction

XXX Hospital has been at the forefront of UK developments in perioperative medicine for over 15 years. We recognised there were deficiencies in provision of perioperative medicine on our surgical wards:

- Failure to rescue
- PQIP reported complications
- Concerns about unsupported junior doctors on surgical wards
- Increased elective surgery length of stay

We were interested in following our patients receiving ward based care postoperatively and established a pilot project to evaluate the patient journey and ward processes, and consider how a perioperative medicine service may be able to improve outcomes for our patients.

Methods

The project ran from July 2018 until March 2019. We commenced with observational work to understand the team dynamics on two wards: an elective orthopaedic ward and a general surgical ward. This identified the following:

- Pressure on the 'on-take' surgical teams to prioritise preoperative cases.
- Limited medical cover after 1pm when results of investigations are available
- Lack of timely medical support for the F1 covering the wards
- Prioritisation of sicker patients (appropriately), but less focus on adherence to enhanced recovery of elective surgical patients.

We instituted the following:

- 5 Consultant or Advanced Trainee sessions per week
- A daily board round of all surgical patients with the multidisciplinary team
- Review of all elective surgical patients, all patients discharged from critical care and unselected patients of concern to the ward team.
- Teaching of principles of perioperative care: fluid and electrolyte management, pain management, represcribing and deprescribing and acute kidney injury.

Results

Thematic analysis of our interventions found the following:

- Identification of patients who would benefit from geriatric input
- Direct admission to critical care, access to imaging and specialist opinions.
- Better prompting of ERAS interventions: removing cannulae, stopping fluids
- Better communication with senior surgeons
- Proactive correction of electrolyte disturbances
- Positive feedback from families about communication

We have also had impact in terms of bed day saving with a saving of 28 bed days over the first 4 months of the pilot project.

Conclusion

The pilot project has demonstrated an unmet need in postoperative surgical care on the wards, which could benefit from targeted interventions, senior support and flattened hierarchy. We have submitted a detailed business case to fund a perioperative team for the surgical directorate 0800-1800 5 days per week. We believe this will demonstrate improved patient-centred outcomes and herald a new era in perioperative medicine in our hospital.

References

1. Ghaferi AA, Dimick JB. Understanding failure to rescue and improving safety culture. *Ann Surg* 2015; 261(5): 839-40
2. Perioperative Quality Improvement Programme Annual Report 2018. Available from: <https://pqip.org.uk/pages/ar2018>
3. Dhesi JK, Swart M. Specialist preoperative assessment clinics. *Anaesthesia* 2015; 71 (S1):3-8
4. Berian JR, Ban KA, Liu JB, Ko CY, Feldman LS, Thacker JK. Adherence to enhanced recovery protocols in NSQIP and association with colectomy outcomes. *Ann Surg* 2019; 269: 486-93.

Post-operative Ferinject Usage in Elective Lower Limb Arthroplasty

Introduction:

Patients undergoing lower limb arthroplasty will experience a degree of blood loss and a significant number of them may receive red cell transfusions in the post-operative period.

Red cell transfusions carry potential risks including transmission of blood-borne infections and increased incidence of prosthetic infection.

Additionally, blood product supplies are finite and therefore, using alternatives helps preserve stock for patients with significant clinical need.

Over the last 12 months, we have utilised Ferinject as an alternative in patients with significant post-operative anaemia in an effort to reduce red cell transfusion. This drug can be administered quickly and replenishes the body's iron stores and this assists in the formation of new red cells.

Methods:

Ferinject infusion is considered in patients with a post-operative haemoglobin < 100g/L. This is usually administered in the first 48 hours post-operatively.

A follow up full blood count is arranged 28 days post-Ferinject infusion to assess the response. At this point, a decision can be taken whether any further anaemia management is required.

Results:

Two thirds of patients have a haemoglobin rise of 30-50g/L within 28 days of receiving Ferinject.

Red cell transfusions have been reduced by a third.

One patient did not respond and was referred to haematology for investigation. The remainder of patients responded and did not require any further intervention i.e. further Ferinject or oral iron replacement.

Conclusion:

This work suggests that the use of Ferinject post-operatively in lower limb arthroplasty patients is associated with reduced red cell transfusions.

The majority of patients have had a haemoglobin rise of at least 20g/L within a month of infusion and none of them required further anaemia management such as oral iron replacement.

Transfusion inevitably results in patients in hospital till at least the next morning for a check haemoglobin. This is not the case if Ferinject is used instead resulting in reduced length of stay.

Authors

Title

Perioperative Medicine in Action, Bariatric surgery

Introduction

Increasingly the anaesthetist's role is extending beyond the operating theatre. We present improved perioperative outcomes in bariatric surgery through anaesthetic involvement in the pre-, intra-, and postoperative phases. Historically bariatric surgery was deemed high risk requiring a minimum of high dependency postoperative care (HDU). At our institution, we have reduced the cancelled procedures due to lack of HDU beds via the development of Fast Track Pathway (FTP). The FTP involves risk stratification at multidisciplinary team meetings (MDT), prehabilitation, assessing suitability for "Enhanced Ward Care" (EWC) and using an anaesthetic checklist to facilitate "opiate-lite" anaesthetic technique. As a result, we achieved reductions in total HDU usage and length of stay (LOS) without changes in complication rates.

Method

The prehabilitation utilises a multi-dimensional approach with psychosocial, dietary and physiological optimisation including weight loss through diet and increased physical activities, smoking cessation, and anaemia correction. At MDT, patients were triaged to either HDU or EWC admission. The anaesthetic checklist focuses on an opiate-light technique, adoption of neuraxial technique, and routine use of neuro-muscular and depth of anaesthesia monitoring. During postoperative period, patient controlled analgesia is avoided and oral fluid intake is encouraged immediately with same-day mobilisation. EWC involves enhanced nursing ratio 2:1 with continuous bedside oxygen saturation and respiratory rate monitoring. EWC nurses were trained in the care of patients receiving non-invasive ventilation for obstructive sleep apnea.

This is a retrospective single-center observational study of patients undergoing bariatric surgery over two rounds, each lasting 22-weeks, round-1 (R1): January-May 2018 (n= 63) versus round-2 (R2): June-November 2018 (n=83). Primary outcomes measured were postoperative level of care, HDU usage, LOS, complication and readmission rates. These findings were directly compared with our pilot data (R0) relating to March 2010-September 2013, n=197 where FTP was not yet introduced [1].

Results

Demographics were similar, mean age (years) R0=45, R1=44.5, R2=45.6; mean BMI (Kg/m²) R1=45.1 vs R2=46.8. There was a reduction in average LOS (days) R0=2, R1=2.2 while in R2=1.6 (p=0.15). Rates of HDU usage postoperatively were also reduced with R0=36.6%, R1=30.2% and R2=21.9%, the majority received EWC. There were no differences in complication or readmission rates.

Conclusion

The national average LOS post-bariatric surgery was reported as 2.7 days [2]. Our study demonstrates perioperative anaesthetic interventions reduce HDU usage and LOS without impact on complications or readmissions rates, thereby positively influencing resource utilization.

Reference:

1. Gilhooly, David Andrew, Michelle Cole, and Suneetha Ramani Moonesinghe. "The evaluation of risk prediction models in predicting outcomes after bariatric surgery: a prospective observational cohort pilot study." *Perioperative Medicine* 7.1 (2018): 6.

2. Welbourn, Richard, et al. "The United Kingdom national bariatric surgery registry." *Second registry report 2014* (2014).

Audit on Goal Directed Fluid Therapy (GDFT) as part of ERAS in Liver resection

Introduction

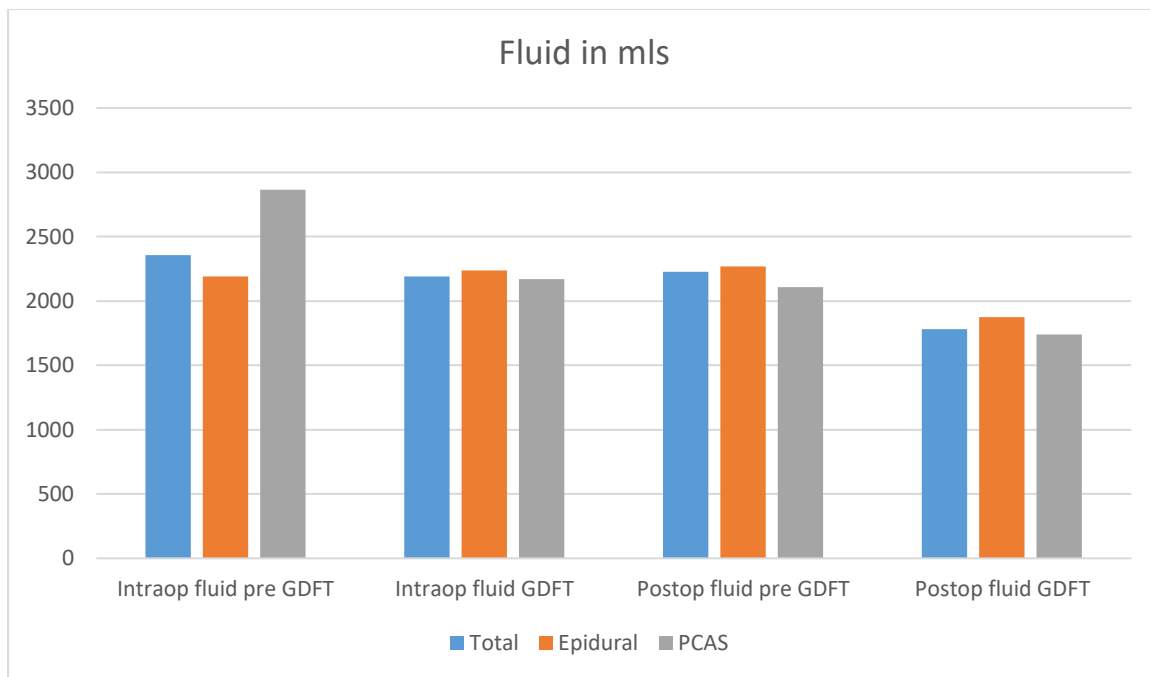
Enhanced Recovery after Surgery (ERAS) is a collection of evidence based interventions developed to overcome the deleterious effect of perioperative stress after major surgery and aid in early discharge. Optimal perioperative fluid management is an important component of Enhanced Recovery after Surgery (ERAS) pathways. Aim of the audit was to assess the intended benefits of goal directed fluid therapy using LiDCO in liver resections as part of ERAS.

Methodology

Single centre, retrospective, comparative study. After local governance approval, data of patients who underwent liver resection were compared from the year 2015(pre- GDFT) versus 2018(GDFT). Inclusion: liver resections (open and laparoscopic) only. Exclusion: transplant and patients needing additional non-liver surgery.

Results

		2015(n=47)			2018(n=76)		
Average age		65			64		
Most Common ASA score		2 (62%)			2 (68%)		
Redo/ major		3			8		
Open		39 (82%)			68 (89%)		
Laparoscopy		8			8		
Analgesia	Epidural	35 (75%)			25 (33%)		
	PCAS+WI	12			51		
Average Intraop fluid(mls)		Total	Epidural	PCAS	Total	Epidural	PCAS
		2355	2191	2863	2191	2239	2170
Average Postop fluid(mls)		Total	Epidural	PCAS	Total	Epidural	PCAS
		2227	2268	2109	1782	1876	1740
LOS HDU (days)		1.8			1.2		
LOS Hospital(days)		6.9			6.5		
Complications		17 (36%)			31 (40%)		



Conclusion

Data collected were comparable in terms of age, ASA status and complexity of procedures. Decrease in the length of HDU, as well as overall hospital stay was noted in the GDFT group. Post-operative complications were comparable too. There was 20% reduction in fluid requirements in the GDFT group, especially in the post-operative period. An important observation made was the decline in epidural analgesia and whether it could be a confounding factor is debatable. Benefits of goal directed fluid therapy although well established in major colorectal surgeries, still lacks evidence in major liver resections.

From this audit we conclude that GDFT has an important role in decreasing morbidity and length of stay following liver resections. However, limitations include small sample size, single centre and study methodology. More research is needed to provide robust evidence for the intended benefits of goal directed fluid therapy in liver surgery.

References

1. Melloul, E., Hübner, M., Scott, M. et al. World J Surg (2016) 40: 2425. <https://doi.org/10.1007/s00268-016-3700-1>.
2. Song, Wei et al. "The enhanced recovery after surgery (ERAS) program in liver surgery: a meta-analysis of randomized controlled trials." *SpringerPlus* vol. 5 207. 29 Feb. 2016, doi: 10.1186/s40064-016-1793-5.

Pre-operative intravenous-venous iron infusion (ferrinject) increases serum haemoglobin and reduces transfusion rates in major colorectal cancer surgery

Introduction

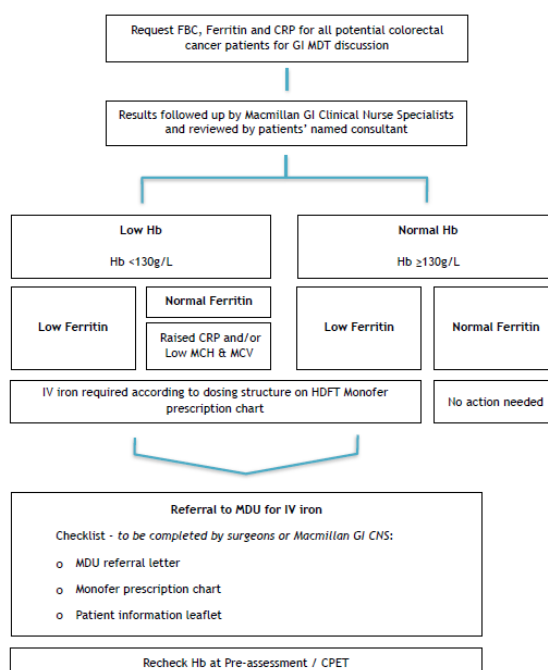
Anaemia is present in up to 90% of patients in the immediate postoperative period after major surgery (1). Post-operative blood transfusions are associated with unfavourable outcomes, particularly in patients with colorectal malignancy (2). Pre-operative IV iron infusion has previously been associated with an improvement in serum haemoglobin, especially when given greater than 7 days before surgery, however has not previously formed a routine part of patient care.

At Harrogate District Hospital (HDH) a pre-operative iron infusion protocol was introduced in July 2017 for patients scheduled for major colorectal surgery. The aim of this project was two fold; firstly to determine whether pre-operative iron infusion improves pre-operative serum haemoglobin levels and secondly to determine whether it led to a reduction in post-operative anaemia and blood transfusions.

Methods

All patients having major colorectal surgery between 1st July and 31st December were included in the study (n=51). Patients with anaemia were identified by Macmillan GI clinical nurse specialist at the earliest opportunity and IV iron was administered when clinically indicated, according to protocol shown. Repeat Hb levels were performed at anaesthetic pre-assessment whilst post-op Hb levels were taken on day 1 post-op. The requirement for blood transfusion was recorded over the entire patient hospital stay. Anaemia and transfusion rates collected in 2016 were used for comparison (n=65).

Pathway for management of iron deficiency anaemia in pre-operative major colorectal cancer surgery patients



Results

Pre-op anaemia was prevalent in 35% of colorectal cancer patients during the study period (n=18/51) and of this group, 55% received pre-operative intravenous iron transfusion (n=10/18). Average improvement in serum haemoglobin was 12.6 g/dl with individual changes in serum haemoglobin demonstrated in figure 1. The greatest increase in haemoglobin levels were seen in those receiving iron infusion at least 7 days prior to serum haemoglobin check.

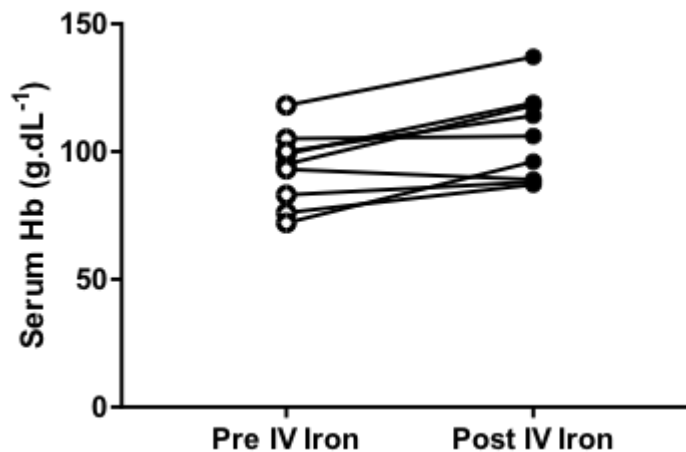


Figure 1: Serum haemoglobin (Hb) levels were increased with intravenous (IV) iron infusion ($p = 0.002$ assessed with paired t -test, $n=9$).

The pre-op anaemia rates in the pre and post-pathway group were 31% (n=20/65) and 35% (n=18/51) respectively. Post-op anaemia rate also followed a similar trend at 68% (n = 44/65) and 73% (n=37/51) respectively. Despite the higher rates of anaemia in the post-intervention group, transfusion rates were lower in the post-pathway group 6% (n=3/51) compared to 8% (n=5/65) in the pre-pathway group.

Conclusion

The introduction of intravenous iron infusion pathway has led to improvement in pre-operative haemoglobin level for patients undergoing major colorectal cancer surgery and reduction in overall post-operative blood transfusion rates despite higher anaemia rates. This may be related to a reduction in severity of anaemia.

References

- (1) Shander A et. al. Prevalence and outcomes of anaemia in surgery: a systematic review of the literature. American Journal of Medicine 2004 (supplement 7A), 116, 58-69.
- (2) Munoz M et. al. 'Fit to fly': overcoming barriers to preoperative haemoglobin optimisation in surgical patients. British Journal of Anaesthesia 2015, 115, 15-24

The Impact of a High-Risk Pre-Assessment Clinic on Outcomes in Major Colorectal Surgery Patients

Introduction

In February 2018, a high-risk pre-assessment clinic was introduced to improve the perioperative management of patients undergoing major colorectal surgery. This service comprises of face-to-face consultant anaesthetic assessment, cardiopulmonary exercise testing (CPET), frailty scoring, nutritional evaluation, anaemia optimisation and individualised risk assessment. These changes target two of the Perioperative Quality Improvement Programme's (PQIP) five improvement opportunities ^[1]

After one year we evaluated the service to assess:

- The efficacy of our risk prediction methods (we enter CPET values into the John Carlisle Risk Calculator ^[2])
- The impact upon perioperative anaemia and individualised risk assessment (PQIP improvement opportunities 1 & 2 ^[1])
- The impact upon length of stay and mortality

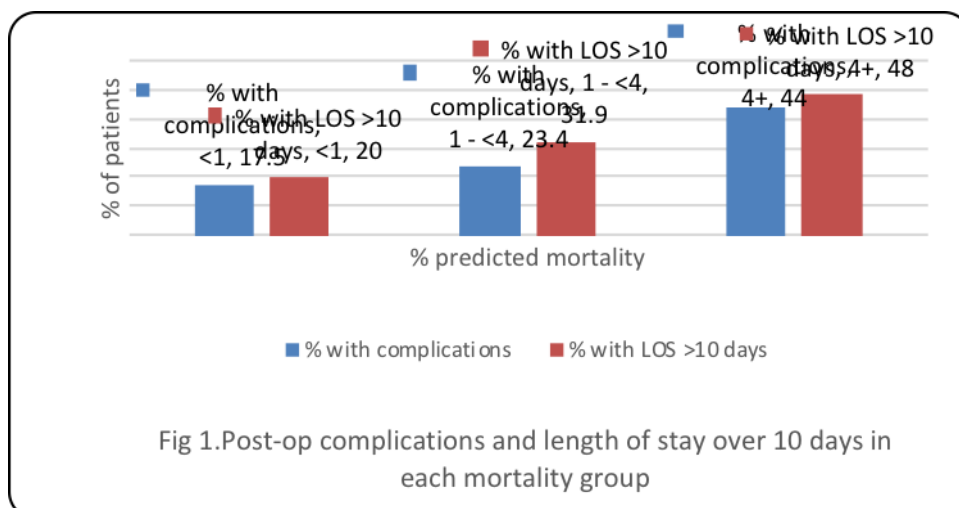
Methods

A retrospective note review was undertaken of all patients undergoing major colorectal surgery one year before (n=147) and one year after (n=144) the clinic was introduced. From each group, samples of patients were analysed looking at anaemia (n=50 pre and post-clinic introduction) and individualised risk assessment (n=20 pre- and post-clinic). Investigation and treatment of perioperative anaemia was assessed through evaluation of adherence to a recognised management algorithm ^[3].

Results

Risk Prediction

The outcome of the clinic classifies the patients into three risk categories depending on their predicted 30-day mortality. Retrospectively the data shows that these categories correlate with complication rates (Fig 1.)



Perioperative Anaemia

We demonstrated improvements in the investigation and optimisation of pre-operative anaemia in accordance with our algorithm ^[3], and improvements in perioperative anaemia outcome measures ^[3].

	Pre-Clinic	Post-Clinic
Mean pre-operative Haemoglobin (g/L)	124.0	129.1
Percentage of anaemic patients appropriately investigated	55	91
Number of intravenous iron transfusions in one year	2	51

Table 1: Improvements in perioperative anaemia outcome measures

Individualised Risk Assessment

After the introduction of the clinic, in the samples studied, 100% of patients received individualised risk assessment, compared with 20% prior to this. A larger proportion of patients now proceed to surgery with full knowledge of risk, and less patients are deemed ‘unfit for surgery’.

Length of Stay and Mortality

Median overall length of hospital stay has decreased from 11 days to 9.7 days. Elective admissions to HDU in this population increased by 59%. Ninety-day mortality has decreased from 8.9% to 3.5% although this figure includes both emergency and elective colorectal cancer patients.

Conclusion

The data supports the use of the Carlisle Risk calculator for our population. Introduction of this clinic has improved management of perioperative anaemia and provision of individualised risk assessment. Data suggests that our patients are benefitting from shorter stays in hospital and there has been a decrease in our overall mortality figures.

Planned future improvements include a prehabilitation programme and implementing individualised pain management through the use of rectus sheath catheters.

[1] NIAA Health Services Research Centre. Perioperative Quality Improvement Programme. 2018. Available from: <https://pqip.org.uk/FilesUploaded/PQIP%20Annual%20Report%202017-18.pdf> (accessed 25th March 2019)

[2] Carlisle, J. (2013). *Calculating Perioperative Risk*. The Preoperative Association.

[3] Munting KE, Klein AA. Optimisation of pre-operative anaemia in patients before elective major surgery - why, who, when and how? *Anaesthesia*. 2019 Jan;**74** Suppl 1:49-57

Defining risk thresholds for liver resection using cardiopulmonary exercise testing derived variables.

Abstract

Background

Cardiopulmonary exercise testing (CPET) is a valid measure of prognosis and postoperative outcome in hepatic resection.[1-3] Therefore, CPET is increasingly forming part of the preoperative assessment and risk stratification of patients prior to surgery. Surgery is increasingly performed by a minimally invasive laparoscopic approach and it is possible that patients with poorer cardiorespiratory reserve, as defined using CPET, may tolerate a laparoscopic procedure with improved outcome compared with open resection. Therefore, this study aimed to further examine the relationship between CPET variables and outcome in hepatic resection and to see if there was a significant difference in risk threshold between laparoscopic and open approach.

Methods

During 2014-2017, CPET was performed using standardised protocol on patients prior to resection. Outcomes were collected by retrospective analysis of electronic records. Regression analysis was applied to test association between CPET variables and outcome. Receiver-operating curve (ROC) analysis defined optimal thresholds for high and low risk patient groups.

Results

One hundred and thirty-six patients underwent CPET prior to hepatic resection. In both open ($n=78$) and laparoscopic ($n=58$) procedures the anaerobic threshold and peak VO₂ were significantly associated with Clavien-Dindo ≥ 1 and ≥ 2 complications and hospital length of stay. VE/VCO₂ was also associated with outcome in laparoscopic procedures. ROC curve analysis was applied with good accuracy and there was a clinically significant difference in risk thresholds between laparoscopic and open procedures (Table 1). When risk thresholds were used to dichotomise patients into high and low risk groups a significant difference was observed in development of postoperative complications and hospital length of stay (Figure 1).

Conclusion

Impaired preoperative reserve was associated increased morbidity after surgery with risk thresholds defined here clinically different for open and laparoscopic procedures. Routine measurement of CPET parameters can identify high-risk surgical patients having important

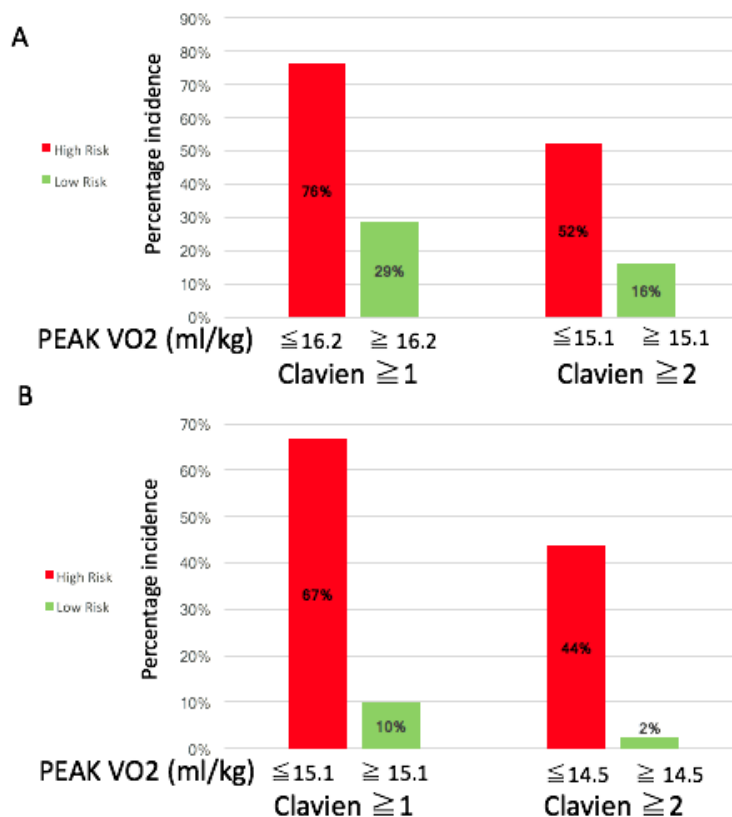
1. Kaibori, M., et al., *Assessment of preoperative exercise capacity in hepatocellular carcinoma patients with chronic hepatic injury undergoing hepatectomy*. BMC Gastroenterol, 2013. **13**: p. 119.
2. Kasivisvanathan, R., et al., *Cardiopulmonary exercise testing for predicting postoperative morbidity in patients undergoing hepatic resection surgery*. HPB (Oxford), 2015. **17**(7): p. 637-43.
3. Junejo, M.A., et al., *Cardiopulmonary exercise testing for preoperative risk assessment before hepatic resection*. Br J Surg, 2012. **99**(8): p. 1097-104.

implications for operative suitability, postoperative care location and potential for therapeutic intervention with exercise therapy.

Table 1. Optimal thresholds for defining risk of complications in laparoscopic and open procedures. Threshold taken as outermost left point on ROC curve. (NS = not significant)

		Clavien-Dindo ≥1						Clavien-Dindo ≥2					
		Area	SE	Sig.	Confidence interval		Threshold	Area	SE	Sig.	Confidence interval		Threshold
Laparoscopic	AT	0.844	0.059	0.001	0.728	0.96	9.55	0.832	0.054	0.029	0.726	0.937	9.55
	Peak VO2	0.855	0.054	0.0001	0.749	0.962	15.05	0.847	0.052	0.002	0.745	0.949	14.5
	Slope VEVC02	0.773	0.074	0.002	0.629	0.917	33.85	0.835	0.086	0.003	0.667	1.000	35.45
Open	AT	0.739	0.061	0.001	0.619	0.859	10.7	0.752	0.06	0.001	0.635	0.869	9.55
	Peak VO2	0.733	0.061	0.0001	0.613	0.854	16.15	0.808	0.049	0.0001	0.711	0.904	15.05
	Slope VEVC02	0.563	0.067	0.345	0.433	0.694	NS	0.626	0.069	0.07	0.492	0.761	NS

Figure 1. Application of risk thresholds for **A** open and **B** laparoscopic procedures to demonstrate significant difference in development of Clavien-Dindo Complications.



1. Kaibori, M., et al., *Assessment of preoperative exercise capacity in hepatocellular carcinoma patients with chronic hepatic injury undergoing hepatectomy*. BMC Gastroenterol, 2013. **13**: p. 119.
2. Kasivisvanathan, R., et al., *Cardiopulmonary exercise testing for predicting postoperative morbidity in patients undergoing hepatic resection surgery*. HPB (Oxford), 2015. **17**(7): p. 637-43.
3. Junejo, M.A., et al., *Cardiopulmonary exercise testing for preoperative risk assessment before hepatic resection*. Br J Surg, 2012. **99**(8): p. 1097-104.

Peri-operative malnutrition: A survey of UK Perioperative Medicine (POM) Leads

2

Introduction

Screening for nutritional risk and the assessment and management of malnourished patients in the peri-operative period is important in reducing post-operative morbidity and is recommended by national¹ and international bodies.^{2,3}

We aimed to explore variability in practice in screening, assessing and managing malnutrition in the perioperative period amongst UK hospitals by surveying POM Leads.

Methods

A draft survey was created using Google Forms and trialled locally. The final version was reviewed by the Royal College of Anaesthetists Council and disseminated to all UK POM Leads. E-mail reminders were sent to non-responders.

Results

92/170 (54.2%) of POM Leads completed the survey between December 2018 and April 2019.

In the majority of hospitals pre-operative screening was performed by nursing staff (75.0%). The commonest screening tools were the Malnutrition Universal Screening Tool (59.8%), Body Mass Index (57.6%) and percentage weight loss (20.7%).

37.0% performed no functional testing. Where functional testing was undertaken a self-reported questionnaire (23.9%) and timed get-up-and-go (14.1%) were used most frequently.

56.5% used albumin to assess malnutrition. 40.2% performed no specific biochemical tests.

54.0% of hospitals had no pathway for managing malnourished patients pre-operatively. When a patient was identified as malnourished 50.0% of hospitals referred onto a Dietician.

34.8% of hospitals prescribed oral nutritional supplements to malnourished patients. The remainder did not (40.2%) or were unsure of local practice (25.0%).

16.3% were confident their hospital was able to identify and manage patients with malnutrition pre-operatively; 53.3% disagreed with this statement (Figure 1). Reasons for disagreement are detailed in Table 1.

93.5% agreed that malnutrition had an impact on quality of life following surgery and 85.9% agreed that POM clinicians had a role in its' identification and management. 87.0% agreed that adopting a standard protocol for managing peri-operative malnutrition would improve patient outcomes.

Conclusion

Practice varies widely across the UK for screening, assessment and management of malnutrition in the peri-operative period. Most POM Leads felt they had an important role in identifying and managing malnourished patients, but few had confidence that this could be achieved at their local trust.

Future work should address the timing of nutritional risk assessment, clarity around the pathways and responsibilities for managing malnourished patients and improved training and education.

References

1. Nutrition support for adults: oral nutrition support, enteral tube feeding and parenteral nutrition: NICE, August 2017 (Accessed 20th April 2019)
2. ESPEN guideline: Clinical nutrition in surgery: Weimann A et al, Clinical Nutrition, 36, 623 - 650, 2017
3. American Society for Enhanced Recovery and Perioperative Quality Initiative Joint Consensus Statement on Nutrition Screening and Therapy Within a Surgical Enhanced Recovery Pathway: Wichmeyer PE et al, Anesthesia and Analgesia, 126(6), 1883 – 1895, 2018

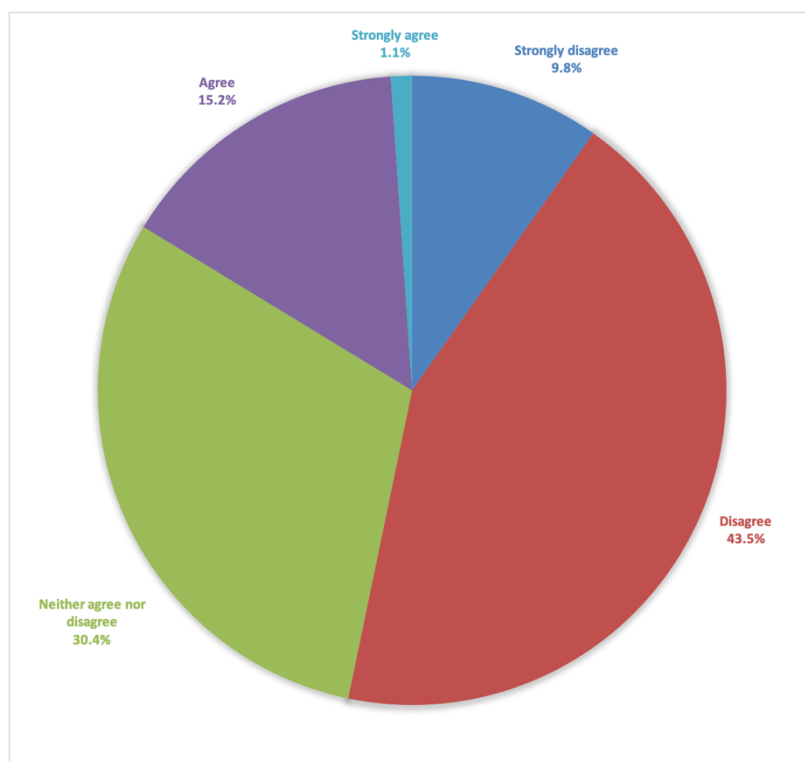


Figure 1. Responses to the statement “I am confident my trust can identify and manage pre-operative malnutrition”

Reason for lack of confidence	Responses
Patients seen too close to surgery for meaningful intervention	44
Unclear who is responsible for managing malnutrition	41
Lack of organisational support	37
Lack of training and education	32
Time constraints	22
Lack of working relationship with dieticians	21
Not the role of pre-assessment	17
Screening process not accepted	7
Clinical judgement better than screening	4

Table 1. Reasons given for lack of confidence in identifying and managing malnutrition

The use of bioelectrical impedance analysis (BIA) to predict post-operative complications in adult patients having surgery for cancer: A systematic review

1

Introduction

The aim of this review was to assess BIA as a tool in identifying patients at higher risk of post-operative complications following elective surgery for cancer.

Methods

A search was undertaken for studies reporting post-operative complications in adult patients having elective surgery for cancer where BIA was used during the peri-operative period.

The review was registered on the International Prospective Register of Systematic Reviews. (http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018103604)

Included studies were imported into Mendeley and duplicates removed. Two authors (AB and LM) independently reviewed included studies using Rayyan QCRI. Conflicts were resolved by a third author (SW). If additional information was required authors were contacted by e-mail.

A quality assessment was made using the Modified Downs and Black checklist.

Results

2116 non-duplicate abstracts were screened. 2026 were excluded on title and abstract. A further 75 were excluded following full-text review and an additional 3 during data extraction. 12 papers are included in this review. (Figure 1)

All papers describe single-centre, observational cohort studies. The majority of participants had upper gastrointestinal, colorectal or gynaecological cancer. Median sample size was 98 (range 30 – 293). BIA parameters included measures of lean mass, phase angle (PA), body-fat percentage and the distribution of body water.

5 studies reported post-operative complications using the Clavien-Dindo classification. The remainder used other classifications or were defined by the authors.

8 studies demonstrated an association between a measure of lean mass and/or PA and an increased risk of post-operative complications. 4 reported no association.

The median score at quality assessment was 13/28 (range 8 – 16).

Conclusion

This review demonstrates a possible association between a low PA and the development of post-operative complications in patients undergoing elective surgery for cancer. Furthermore, derived measures indicating low lean mass also appear to be associated with increased risk.

The heterogeneity in malignancies as well as inconsistencies in BIA measurements and the assessment method used for post-operative complications does not allow us to draw strong conclusions. The low quality scores reflect that all studies were non-randomised observational studies.

Overall, the included studies indicate a potential role for BIA in pre-operative risk stratification. Larger studies and consensus on terminology are warranted.

Figure 1. PRISMA Flow Diagram

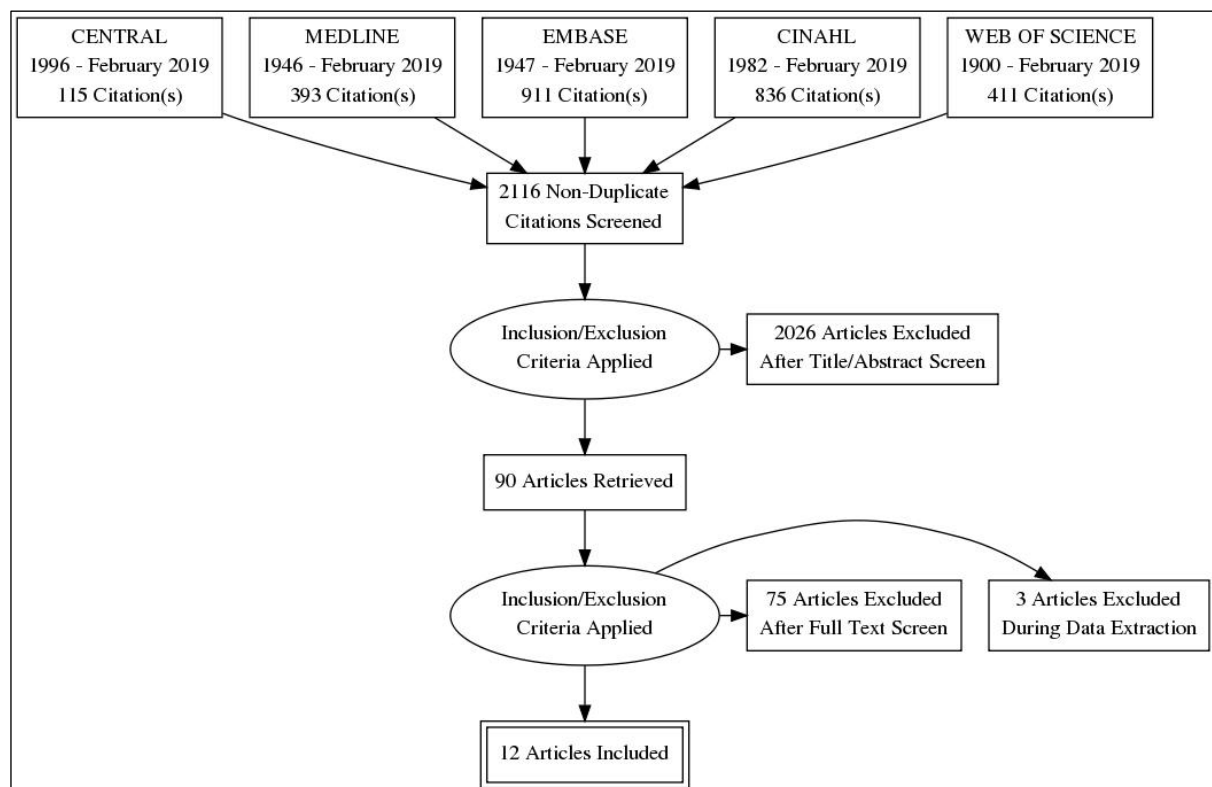


Table 1. BIA measures reported and association with post-operative complications

Author		Year		Cohort	n.	Measure/s	
Studies reporting phase angle	Pena	2018		Mixed cancer (Gastric, colorectal, head and neck and hepato-biliary)	121	PA SPA	
	Uccella	2018		Ovarian cancer	52	PA	
	Harter	2017		Mixed cancer (Gastrointestinal, head and neck, genito-urinary, breast, gynaecological and skin)	60	PA SPA	
	Mauricio	2017		Colorectal cancer	84	SPA	
	Cardoso	2017		Cervical and endometrial cancer	208	PA	
	Berstad	2012		Colorectal cancer	100	PA	
	Author	Year		Cohort	n.	Measure/s	
	Tamura	2019		Gastric cancer	153	MMI	
Studies reporting measure of lean mass	Harter	2017		Mixed cancer (Gastrointestinal, head and neck, genito-urinary, breast, gynaecological and skin)	60	SMI	
	Tsaousi	2016		Colorectal cancer	94	FFMI	
	Sato	2016		Gastric cancer	293	LBMI	
	Ida	2014		Oesophageal cancer	30	FFM SM	
	Berstad	2012		Colorectal cancer	100	FFM	
	Fritz	1990		Mixed cancer (Oesophago-gastric, colorectal and hepato-biliary)	115	LBM	
Association between BIA measure and complications						No association between BIA measure and complications	

(MMI = Muscle Mass Index, PA = Phase angle, SPA = Standardised Phase Angle, SMI = Skeletal Mass Index, LBM = Lean Body Mass, LBMI = Lean Body Mass Index, FFM = Fat-Free Mass Index, SM = Skeletal Mass)

STEPS Study: using wearable technology to predict peri-operative high-risk patient outcomes.

Introduction

STEPS is an observational pilot study. It aimed to establish the feasibility of gathering information about patients' activity levels from a smart watch (Garmin Vivoactive HR+), and use this information to screen for high risk patients prior to major abdominal surgery. This is one of the first studies to look for the association between CPET performance and data from wearable devices¹.

Methods

We recruited 49 patients undergoing cardiopulmonary exercise testing prior to scheduled major elective intra-abdominal surgery. They consented to wear a Garmin Vivoactive HR+ smartwatch, and complete an international physical activity questionnaire (IPAQ). Information gained from the watch included heart rate, total steps taken, floors climbed, distance from home travelled, sleep and temperature. We compared this information with CPET performance, and post-operative outcomes.

Results

42 of our patients who had CPET wore the device for an average of 6-7 days. 36 patients completed the IPAQ questionnaire. There was a moderately strong association between total distance, total steps taken and number of floors climbed, with both peak VO_2 , peak work, and anaerobic threshold. There was little association with peak heart rate and CPET variables, but a slower resting heart rate was associated with a better peak VO_2 . We were able to use model fit diagnostics, modelling several variables obtained through the wearable device to more accurately predict all of the four main CPET variables: Peak VO_2 , AT, VE/VCO_2 and Peak work.

Correlation between Garmin Watch and CPET variables:

Wearable variable	CPET variables			
	Peak VO_2	VE/VCO_2	AT	Peak Work
Floors climbed	0.57	-0.30	0.37	0.56
Intense minutes	0.08	0.06	-0.01	0.06
Average heart rate	-0.27	-0.01	-0.47	-0.18
Resting heart rate	-0.26	0.07	-0.36	-0.15
Max heart rate	0.00	-0.09	-0.18	0.16
Total steps	0.59	-0.19	0.39	0.48
Total calories	0.02	-0.07	-0.15	0.07
Total distance	0.62	-0.21	0.42	0.50

Table displaying correlation coefficients for linear associations of wearable variables and the four CPET measures of activity

We were able to establish that:

- Patients were amenable to wearing the device, and there were no reported problems.
- The data captured provided a wealth of information for analysis.
- There was reasonable correlation between some variables measured on the device and CPET performance.
- There was little correlation between self-reported activity levels, and both CPET and wearable device variables.

Conclusion

There was moderate correlation between some of the wearable device data and CPET performance, and little correlation with self-reported activity levels. We are confident from the information gained through this pilot study that a follow-up study is warranted. We will aim to further identify the correlations between the data from these wearable devices and CPET performance. Furthermore, larger numbers are

required to establish whether these variables are associated with post-operative outcomes, such as complications, length of stay, and 30-day mortality.

References

1. Cui. H. W. et al, *Anaesthesia*, 73; 738-745, 2018.

Implementation of a Novel Anaesthetist-Led Perioperative Pain (POpP) Initiative Reduces Acute Postoperative Total OMEDDs Below Preoperative OMEDDs: A Prospective Case Series

Abstract

Introduction. Opioid tolerant patients requiring surgery present multiple clinical challenges. The immediate postoperative period is traditionally viewed as a difficult time to encourage reduction in long-term opioid therapy given the additional stressors of acute pain and surgery. We hypothesized that a novel anaesthetist-led perioperative pain service in addition to our existing acute pain service could acutely reduce opioid use relative to preoperative doses, whilst not compromising postoperative analgesia-related recovery outcomes.

Methods. From April 2017, our department pioneered a unique anaesthetist-led (Dr CH) Peri-Operative Pain (POpP) service, engaging opioid tolerant patients referred by multiple preoperative sources on pre-defined criteria (patients treated with >50mg OMEDDs plus one of; chronic pain history; history of recreational medication or drug use; or opioid substitution therapy). Of 124 patients referred, 63 met these criteria. Patients were interviewed preoperatively, and seen at least second daily postoperatively by a single POpP anaesthetist. Expectations were set on the target of acute postoperative opioid reduction as well as reassurance that their acute pain concerns would be addressed as best as possible. A postoperative pain plan was formulated and agreed upon by the patient and key stakeholders including surgical team, acute pain service, GP and day of surgery anaesthetist. Multimodal analgesia and acute opioid rotation and/ or reduction was used in selected motivated patients, most often in conjunction with regional analgesia or ketamine infusion, in the immediate postoperative period.

Results.

POpP patient surgical procedures were joint replacement (43%); spinal (25%); major abdominal (16%); neurosurgery (3%); and breast (3%). Preoperative OMEDDs were [mean(SD)] 176mg (134mg). Patients were managed with and/or combinations of acute opioid rotation (38%), regional analgesia (37%) and postoperative ketamine infusion (58%). Overall reduction in OMEDDs by date of discharge was [-70 mg (124mg) $p = 0.0003$]; this was most marked in those with preoperative OMEDDs

>90mg [-104mg (130mg)] vs <90mg [-13mg (40mg)] $p=0.0025$. In order of frequency, patients were rotated to tapentadol; buprenorphine (patch or sublingual); hydromorphone; or methadone.

Conclusions.

Use of a single anaesthetist-led “POpP Service” engaged patients and multiple perioperative teams to comply with a comprehensive inpatient pain plan resulting in acute reduction in OMEDDs without compromising analgesia-related recovery outcomes in surgery associated with moderate to severe pain. Acute opioid rotation appears to be a viable technique to achieve this aim when used in selected patients in combination with regional analgesia.

The effect of a pre- and post- operative exercise programme versus standard care on physical fitness in people with upper gastrointestinal cancers- study protocol for a Randomised Control Trial (The PERIOP-OG Study)

Authors and Affiliations

Abstract

Introduction: Advances in surgery and peri-operative oncological treatments have improved survival for patients with gastric and oesophageal cancers. Neoadjuvant cancer treatment (NCT) can reduce physical fitness prior to surgical resection and this may compromise perioperative outcomes. The aim of this study is to assess the effect of a community-based exercise training programme (initiated immediately after cancer diagnosis and continued to before and after surgery) on physical fitness in patients with oesophagogastric cancer undergoing NCT followed by curative surgical resection.

Methods: PERIOP-OG is a pragmatic, multi-centre, randomised controlled trial with a planned recruitment of 64 patients with oesophageal and gastric cancers and scheduled for NCT and surgical resection. Following cancer diagnosis, patients are randomised to an exercise intervention or a usual care control group. The usual care group will receive standard clinical care but no formal exercise advice. The primary outcome is cardiorespiratory fitness (measured with a 6-minute walk test) assessed pre- and post-NCT, pre- and post-surgery and 6 weeks later. Secondary outcomes include health related components of fitness, physical activity, body composition, psychological well-being. Exploratory outcomes include post-operative morbidity, nutritional status and blood markers of inflammation.

Discussion: The PERIOP-OG trial will determine whether, when compared to usual care, exercise training initiated at time of cancer diagnosis and continued during NCT and after surgery can improve cardiorespiratory fitness as well as other important clinical outcomes. This trial will inform the design of larger prehabilitation trials to investigate whether exercise in combination with optimal nutritional and psychological support illicit greater benefits.

Trial Registration: ClinicalTrials.govNCT03807518

Keywords: Exercise, Physical Fitness, Cancer, Malignancy, Oesophagus, Gastric

Title

Accuracy of ASA physical status scoring in elective surgical patients

Introduction

The American Society of Anaesthesiologists (ASA) physical status score offers a simple categorisation of patients' preoperative physiological status, and was first created as a tool to allow retrospective analysis of patient records.¹ However, its use has extended beyond that initially intended, and it is now used for predicting perioperative risk, allocating resources, and for reimbursing surgical services. ASA status has been correlated with outcomes such as length of stay, intraoperative and postoperative complications, morbidity and mortality.^{2,3} The ASA score has been revised on several occasions since its inception, and in 2014 was updated to include smoking, alcohol intake, and BMI.⁴ We noted that preoperative ASA scoring in our department did not seem to reflect the 2014 revision, and hypothesised that a high proportion of patients were being under-scored.

Methods

We collected data retrospectively over 3 days, including a range of orthopaedic, gynaecological, ENT and general surgery. ASA scores by preassessment nurses, anaesthetists and theatre staff were compared to the actual score as assessed by the reviewer according to the revised tool.

Results

Data was collected from 111 patient records. Of these 37% of patients had at least one documented ASA score that was inaccurate according to the current definitions, and of those 100% were under-scored. The most common reason was a failure to include social alcohol intake and smoking as factors which increase ASA. Others included an underrating of medical conditions such as coronary artery disease. In order to improve the accuracy of ASA scores in our department, targeted interventions were carried out including teaching sessions and educational posters. Initial results show increased confidence in determining ASA scores in all anaesthetists and nurses surveyed post-education, and ongoing repeat audit of patient records demonstrates increased accuracy of ASA scoring.

Conclusion

The use of the ASA physical status score has become ingrained in our practice and is collected for every patient who undergoes surgery at our hospital. We found that in a significant proportion of patients the ASA score was not assessed accurately or consistently, with potential ramifications for risk assessment, financial reimbursement and data analysis. A particular example in our trust has been the overestimation of adjusted mortality rates for certain procedures due to underrating of ASA scores. We have demonstrated that simple education measures lead to increased accuracy of ASA physical status scoring.

References

1. Dripps. *Anesthesiol.* 24:111, 1963.
2. Sauvanet et al. *J Am Coll Surg.* 201:253-62, 2005.
3. Carey et al. *J Obstet Gynaecol Can.* 28:149-55, 2006.
4. Yates. *BJA Education.* 19:47-53, 2019.

Background:

Cardiopulmonary exercise testing (CPET) is increasingly used in preoperative risk stratification to actively modify and manage perioperative risk and occasionally to assist decision-making regarding non-operative management. Intestinal failure (IF) surgery is associated with significant perioperative risk. The role of CPET in assessing risk in IF patients is unproven. We aimed to assess if CPET variables could be evaluated to predict outcome in IF patients undergoing surgery.

Methods:

Consecutive patients receiving home parenteral nutrition (type III IF), undergoing preoperative CPET at Salford Royal Hospital between 2010 and 2017 were included in a prospective audit database. Clinical outcomes were retrospectively collected from electronic patient records. Demographic, surgical and CPET variables [anaerobic threshold (AT), peak oxygen flow (VO₂), ventilator effort (VE/VCO₂)] were evaluated as predictors of postoperative length of stay (HLOS), 30-day morbidity and mortality by univariable regression analyses.

Results:

112 patients underwent CPET. 90 (46 women, 44 men) underwent surgery, 22 did not and were excluded from analysis. The median (range) age was 57.5 (22-85) years. 11 (12%) had a history of hypertension, 14 (16%) COPD, 26 (29%) smokers, 11 (12%) diabetes. At CPET: Power 82 (0-137), AT 9.5 (6.5-23.5). 9 patients did not achieve an AT. Peak was 13.6 (5-23.7), VE/VCO₂ 33 (20-57). Duration of surgery was 360 (150-700) min. Postoperative length of stay in critical care was 5 (0-29) days and in hospital 32 (12-275). 2 patients died within 30 days of surgery, 3 patients in total died within 6 months and 11 within 12 months. 57 (63%) of patients experienced a complication (grade II-V) within 30 days; 41 (46%) of those were grade II; 1 (1%), grade IIIa; 5 (6%), grade IIIb; 8 (9%), grade IVa; 2 (2%), grade V. Univariate analyses:

HLOS: COPD 63.1 vs 42.2 (P 0.0059), power shorter LOS (P 0.152), VE/VCO₂ longer (P 0.138). **duration** longer LOS (P 0.0417)

12-month mortality: age higher (P 0.12), hypertension higher (P 0.124), smoker higher (P 0.060), power lower (P 0.0693), **VE/VCO₂** higher (P 0.0451)

Complication grade: age higher (P 0.175), **hypertension** higher (P 0.0195), COPD higher (P 0.0990), **diabetes** higher (P 0.0351), **power** lower (P 0.0002), **AT** (P 0.0002), **peak** (P 0.0002), **VE/VCO₂** higher (P 0.0488), **duration** (P 0.0159)

Conclusion:

Our study has shown that CPET could be utilised as a tool to evaluate risk in IF patients undergoing surgery. Specifically VE/VCO₂ is associated with a higher 12 month mortality and surgical complication rate.

IV iron: All in the timing?

This study reviews the timing of intravenous (IV) iron given for pre-operative anaemia prior to major surgery at Royal Berkshire Hospital (RBH) NHS Trust. The objective was to identify the interval between IV iron and surgery to determine if this affected outcomes. Guidance regarding the timing of iron pre-operatively recommends an interval of 4-6 weeks to optimise clinical response [1, 2]. This timing is not always achieved. There are concerns that giving IV iron shortly pre-surgery may not provide the stated benefits and may increase the speculated risks, namely infection [3].

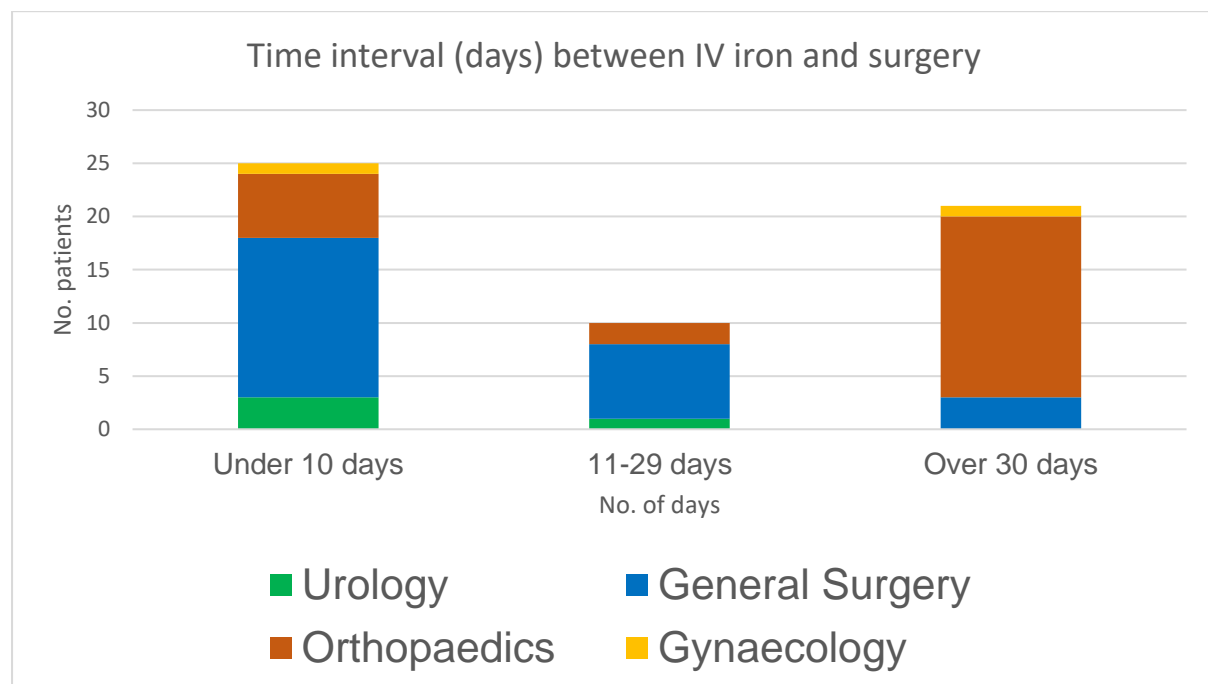
Methods

We conducted a single-centre, retrospective observational study over 12-months on patients who received IV iron for anaemia prior to major elective surgery. Data collection included patient demographics; baseline, post-infusion and post-operative haemoglobin values; baseline haematinics; interval between IV iron infusion and surgery and post-operative complications.

Results

Fifty-six patients received IV iron. The average baseline haemoglobin was 103 g/L. Results are divided into three groups depending on the timing of their preoperative infusion, shown in Figure 1. Results demonstrated that the majority (25 patients) received their IV iron within 10 days of surgery, the remaining distribution is shown below.

Figure 1



Average increase in haemoglobin preoperatively was as follows; 5.8 g/L under 10 days; 9.0 g/L 11-29 days and 11.1 g/L over 30 days. There were 5 post-operative infections confirmed, with 3/5 in the ≤ 10 days group. There was no difference in blood transfusions.

Conclusion

The Trust has embraced the NICE guidance [4] and Consensus guideline [2] and now administers over 200 IV iron infusions per year pre-operatively. Timing of IV iron remains an issue, and we speculate this is not restricted to the RBH. The ≥ 30 -day group had an increase in haemoglobin twice that of the ≤ 10 -day group, suggesting the latter are not fully optimised. Figure 1 demonstrates that orthopaedic cases have the option of postponement, whereas the cancer cases and their associated pathway time constraints, do not.

We acknowledge there is not agreement regarding IV iron and infection risks [3, 5, 6]. However, the ability of certain bacteria to acquire normally inaccessible iron by utilising the host stress hormones, namely noradrenaline [7-9]; and the knowledge that parenteral iron bypasses the hepcidin-induced safety advantages of tight plasma iron levels [10] are worth considering when the late delivery of IV iron is less likely to provide the perceived benefits.

References

1. Mueller, M.M., et al., *Patient Blood Management: Recommendations From the 2018 Frankfurt Consensus Conference*. JAMA, 2019. **321**(10): p. 983-997.
2. Munoz, M., et al., *International consensus statement on the peri-operative management of anaemia and iron deficiency*. Anaesthesia, 2017. **72**(2): p. 233-247.
3. Litton, E., J. Xiao, and K.M. Ho, *Safety and efficacy of intravenous iron therapy in reducing requirement for allogeneic blood transfusion: systematic review and meta-analysis of randomised clinical trials*. BMJ : British Medical Journal, 2013. **347**: p. f4822.
4. Padhi, S., et al., *Blood transfusion: summary of NICE guidance*. BMJ, 2015. **351**: p. h5832.
5. Avni, T., et al., *The Safety of Intravenous Iron Preparations: Systematic Review and Meta-analysis*. Mayo Clinic Proceedings, 2015. **90**(1): p. 12-23.
6. Shah, A., et al., *Safety and efficacy of iron therapy on reducing red blood cell transfusion requirements and treating anaemia in critically ill adults: A systematic review with meta-analysis and trial sequential analysis*. Journal of Critical Care, 2019. **49**: p. 162-171.
7. Freestone, P.P., et al., *The mammalian neuroendocrine hormone norepinephrine supplies iron for bacterial growth in the presence of transferrin or lactoferrin*. J Bacteriol, 2000. **182**(21): p. 6091-8.
8. Sandrini, S.M., et al., *Elucidation of the Mechanism by Which Catecholamine Stress Hormones Liberate Iron from the Innate Immune Defense Proteins Transferrin and Lactoferrin*. Journal of Bacteriology, 2010. **192**(2): p. 587.
9. Freestone, P.P., et al., *Growth stimulation of intestinal commensal Escherichia coli by catecholamines: a possible contributory factor in trauma-induced sepsis*. Shock, 2002. **18**(5): p. 465-70.
10. McIntyre, L.A., A. Tinmouth, and D. Fergusson, *Intravenous iron therapy for treatment of anaemia*. BMJ : British Medical Journal, 2013. **347**: p. f5378.

Impact of a pre-operative anaemia clinic on blood transfusion rates following elective orthopaedic surgery

Introduction

Peri-operative anaemia is a major contributor to postoperative complications including surgical site infection and the morbidity and mortality associated with allogenic blood transfusion [1]. As anaemia is a modifiable risk factor, implementing strategies to identify and manage it peri-operatively may reduce these risks, particularly in major surgery. Over 800 elective hip and knee arthroplasties are performed annually at the ***** Hospital; in 2016, 4.4% of these patients received a postoperative blood transfusion. At this time there was no established peri-operative anaemia pathway. In 2017, a pre-operative anaemia clinic was introduced to standardise care and reduce transfusion rates.

Methods

A consultant Anaesthetist led anaemia clinic commenced in May 2017. The pathway is initiated by an abnormal haemoglobin result identified during a nurse led pre-assessment clinic. Following a targeted patient history, further investigations include haematinics and referral for endoscopy according to NICE referral criteria [2]. Treatment options include iron therapy, erythropoietin or specialist referral following abnormal endoscopy. Elective surgery is postponed until investigations and treatment are completed.

Results

25/854 patients who underwent hip or knee arthroplasty from May 2017-May 2018 were identified by the anaemia clinic and investigated. 7/25 patients were referred for an endoscopy, with two patients requiring follow up of abnormal results. 15/25 patients received IV iron therapy, six had oral iron and one received erythropoietin. Postoperatively, 10/854 (1.2%) patients received a blood transfusion, 50% of whom had a haemoglobin >80g/L prior to transfusion. This is higher than the recommended restrictive transfusion threshold. In 2016, 37/850 patients received a postoperative transfusion; highlighting a 72.9% decrease in transfusion rates following the introduction of the anaemia clinic.

Conclusion

There has been a significant reduction in postoperative transfusion rates for elective arthroplasty surgery since commencing the clinic. This correlates with recommendations for management of peri-operative anaemia and Patient Blood Management [1,3]. Further work includes improving compliance with restrictive transfusion strategies and the potential use of intravenous iron infusion postoperatively to avoid allogenic transfusion.

References

1. Kotze A, Harris A, Baker C et al. British Committee for Standards in Haematology guidelines for the identification and management of pre-operative anaemia. *British Journal of Haematology*;171:322-31. 2015
2. Suspected cancer: Recognition and referral. NICE guideline. Published 23rd June 2015. <https://www.nice.org.uk/guidance/ng12>.

3. Munoz M, Acheson AG, Auerbach M et al. International consensus statement on the peri-operative management of anaemia and iron deficiency. *Anaesthesia*;72:233-47. 2017

Association between intraoperative hypotension and adverse clinical outcomes after non-cardiac surgery

1

Alberta

Introduction: Intraoperative hypotension occurs frequently during non-cardiac surgery and may be associated with organ ischemia; however, there has been limited multicenter data commenting on if and to what extent, hypotension results in unfavorable postoperative outcomes.¹⁻³ The purpose of this study was to investigate the incidence of intraoperative hypotension during non-cardiac surgery and to evaluate the impact of hypotension on 30 day major adverse cardiovascular and cerebrovascular events (MACCE) including 30 day mortality, acute myocardial infarction, and acute ischemic stroke.

Methods: We conducted a multi-center retrospective cohort study of prospectively collected electronic health record intra-operative blood pressure data (Optum de-identified Electronic Health Records [2007-2017]).⁴ Analysis included 368,222 adult patients undergoing non-cardiac surgery in the United States between 2008 and 2017. Mean arterial pressure thresholds were defined by absolute thresholds (≤ 55 mmHg, ≤ 65 mmHg, ≤ 75 mmHg) and relative thresholds (20% and 40% lower than baseline) in order to examine how the impact of hypotension varies with increasing severity. Hypotension was assessed using five methods: (a) the absolute maximum decrease (AMD) in MAP during the surgery period, (b) the time under each absolute threshold, (c) the total area under each threshold, (d) the time-weighted average MAP (TWA-MAP) for each threshold, and (e) the cumulative time under the pre-specified relative MAP thresholds.

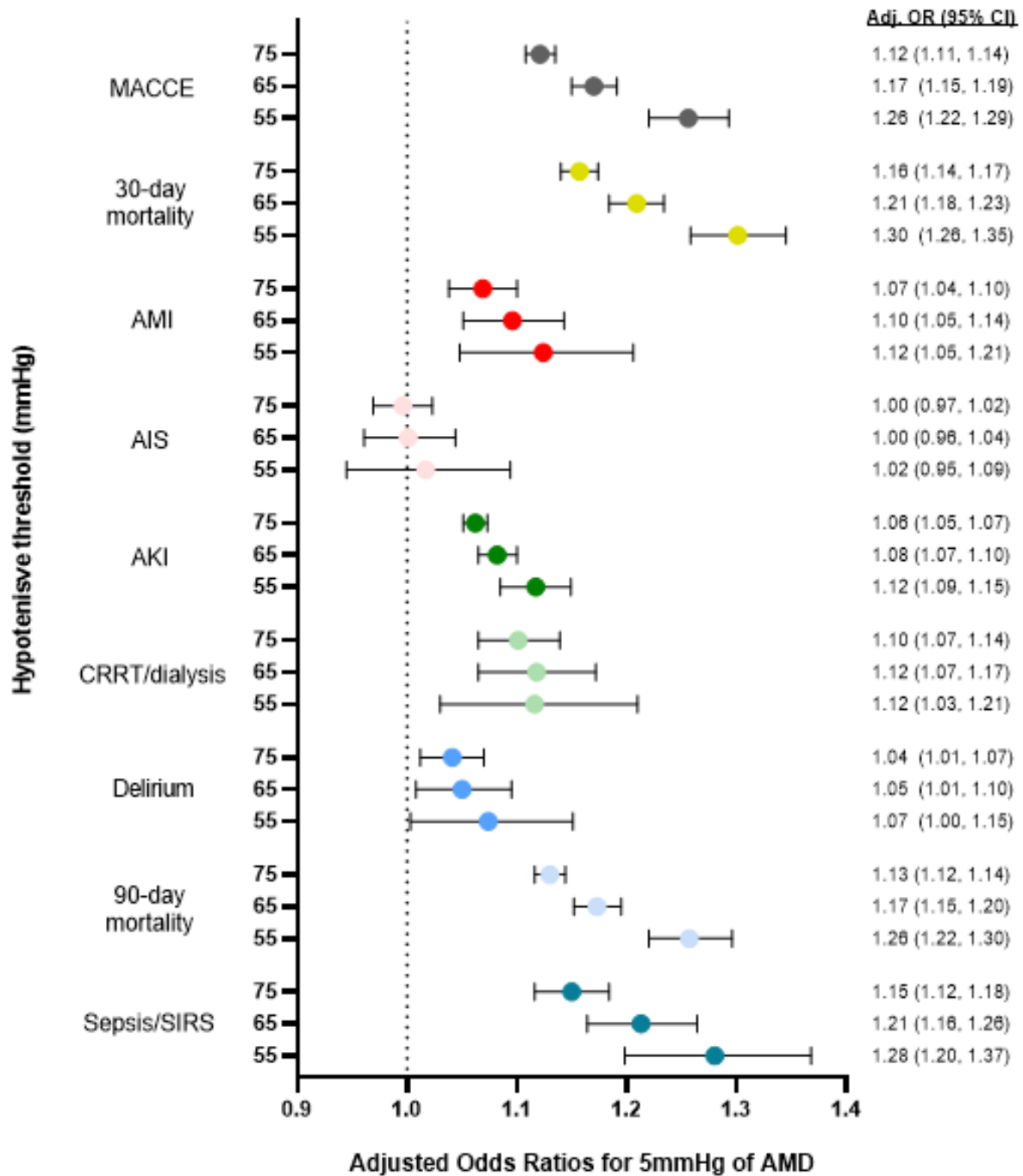
Results: Intraoperative hypotension was common with MAP ≤ 75 mmHg in 39.67% of cases, ≤ 65 mmHg in 19.39% of cases, and ≤ 55 mmHg in 7.62% of cases. Whether hypotension exposure was defined as cumulative time or area under various MAP thresholds, TWA-MAP, or AMD, intraoperative hypotension was significantly associated with MACCE. Odds of MACCE progressively increased as thresholds decreased from ≤ 75 to ≤ 55 mmHg. For an AMD < 65 and < 55 mmHg, the odds of MACCE increased by 17.0%; 95% CI (15.0, 19.1) and 26%; CI (22.0, 29.0), respectively.

Conclusion: Intraoperative hypotension during non-cardiac surgery is common and associated with 30-day MACCE.

References:

1. Salmasi et al., *Anesthesiology: The Journal of the American Society of Anesthesiologists*, 126.1, 47-65, 2017.
2. Walsh et al., *Anesthesiology: The Journal of the American Society of Anesthesiologists*, 119.3, 507-515, 2013.
3. Wesselink et al., *British Journal of Anaesthesia*, 121.4, 706-721, 2018.
4. <https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2014.0038>

Figure 1. Adjusted odds ratio of the likelihood of adverse clinical events for each 5 mmHg under the hypotensive thresholds. All outcomes were significant except for acute ischemic stroke (AIS) which showed an increasing risk with hypotensive depth.



Preassessment Computer Program Reduces Inappropriate Blood Testing in Elective ASA 1 and II Patients

Aims:

To audit our hospital's anaesthetic assessment unit's compliance with the 2003 NICE guidelines¹ for ASA I and II patients undergoing minor or intermediate surgery

To establish whether implementation of an internet-based assessment tool improves compliance with NICE guidelines.

Method:

Over a 4 month period (October-December 2014), 1000 ASA I and II patients undergoing minor/intermediate grade surgery were retrospectively identified using our electronic theatre recording system TheatremenTM (Trisoft Healthcare). Exclusion criteria included: Age <16 yrs or >80yrs, emergency surgery, major/complex surgery, obstetric surgery or lack of data regarding preoperative assessment.

Patients that met inclusion criteria had their ASA status, age, type and grade of surgery as well as preoperative investigations requested recorded. These were then compared to the 2003 NICE guidelines on preoperative blood tests for elective patients. Recommended tests were deemed appropriate if performed and inappropriate if not recommended by NICE. Tests in the amber category 'to be considered,' if performed, were assessed as being appropriate.

Following the results of this initial audit, we developed software that allowed patient demographics and surgery to be linked to NICE guidelines. Appropriate investigations were suggested by the program to aid the clinician pre-assessing the patient.

Six months following institution of the software, a re-audit of practice was conducted using the same audit criteria. On this occasion (November-December 2015), 500 patients were reviewed.

Inappropriate tests were divided by the number of patients within that specialty to give a percentage. These percentages pre and post program were compared using Chi Squared testing to allow a comparison of proportions for inappropriate blood tests.

Results:

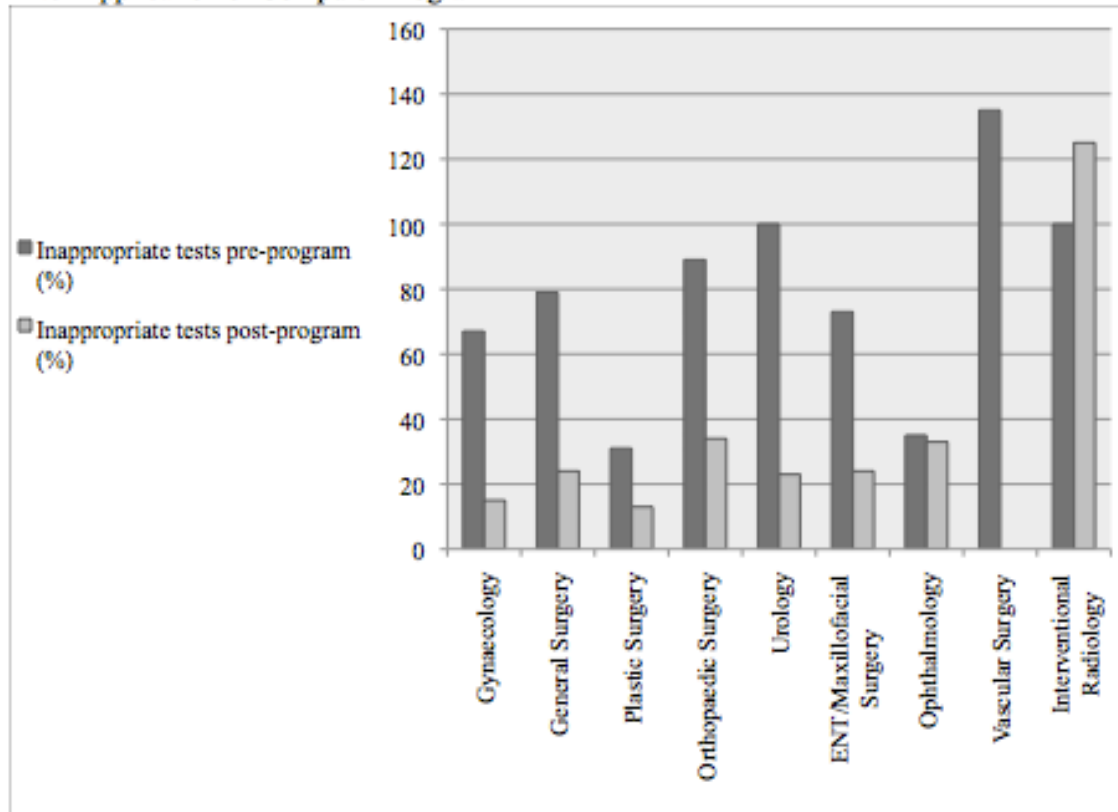
Over a 4 month period (September-December 2013), data for 1000 ASA 1 and 2 patients were reviewed. A total of 1287 preoperative blood tests were requested, of which 708 (55%) were deemed inappropriate according to 2003 NICE guidelines. There were notable differences in practice between different subspecialties.

Following institution of the computer program within preassessment, there was a 48% reduction (Figure 1) in the number of inappropriate preoperative blood tests (95% CI 43.1-52.5%, $p < 0.0001$). Extrapolating to our Trust's annual operative caseload, we calculated annual savings reach £9730.54 for ASA 1 and 2 patients undergoing minor or intermediate surgery.

Conclusion:

Implementation of a web-based tool to aid planning preoperative investigations is effective in reducing inappropriate blood tests with associated cost savings.

Figure 1. Comparison of Total Inappropriate Blood Tests Between Specialities Before and After Application of Computer Program



References:

- 1 <https://www.nice.org.uk/guidance/cg3>

The impact of a new in-patient perioperative service on Emergency General Surgical patients.

In the UK, we are facing an epidemic of elderly and higher risk emergency surgical admissions. Whilst most of these patients receive consultant led care in the first 24 hours of their admission, continued in-patient ward care is largely undertaken by surgical trainees. Complication rates (often medical) are high, and are frequently managed reactively. This is largely by the on-call medical registrar or by single organ specialists, who rarely have perioperative experience or the ability to provide continuity of care.

This has contributed to a higher mortality rate than US case-matched patients, prolonged lengths of stay, high stress levels among surgical trainees, and failure to rescue deterioration in medical conditions after surgery with poor patient reported outcomes and increasing litigation.

Aims

In response to these challenges, in June 2017 the Royal Devon and Exeter Hospital (RDE) employed an experienced intensive care physician to work alongside the 11 general surgeons to help manage their higher risk patients on the ward. The aims were to improve post-operative care and to decrease Medical Emergency Team (MET) call rates and ITU readmissions, improve surgical trainee feedback, patient mortality and lengths of stay.

Methods

A former intensive care consultant was employed as a full-time perioperative physician on the surgical wards. The job plan included: 4 joint ward rounds with the surgical team, twice weekly perioperative teaching sessions, development of perioperative guidelines for the management of common medical complications and regular attendance at the MDT board round to improve patient discharge planning. In addition, a care of the elderly senior registrar was seconded for 2 sessions per week.

Mortality, lengths of stay, perioperative complications, MET calls and ITU readmissions were compared with 214 sequential patients pre service (Jan-June 2017) with a similar group (216) post service (June-Dec 2017).

Results

MET call rates fell by 40% within 2 months. Mortality in emergency laparotomy patients fell significantly. The trainee feedback reported to the Southwest Deanery moved from “Red” (requiring imminent change and the threat of F1 removal from general surgery) to “Amber” with the presence of the ward-based intensivist cited as being largely responsible. Length of stay reduction in patients with pancreatitis was used to model a business case to expand the service.

Conclusions

The presence of a senior ward-based physician is associated with better patient outcomes, improves surgical trainee work experience, and may be cost effective in terms of surgical reduction in length of stay. Funding a dedicated consultant perioperative physician represents a 'Value Proposition' in the future care of general surgical patients.

Table 1

	Emergency laparotomy (NELA) patients		Pancreatitis	
	Pre Service n=104	Post service n=90	Pre service n=110	Post service n=126
Average NELA predicted mortality	9.9%	10.9%	n/a	n/a
In patient Mortality n (%)	11 (10.5)	4 (4.4)	2 (1.8)	3 (2.8)
Average Length of stay (days)	16	19.7	8.8	4.1

Title: Initial learning from a preliminary process evaluation in the Wessex-Fit-4-Cancer-Surgery trial

Authors and affiliations:

Introduction:

Fitter patients have better surgical outcomes. Poor physical fitness has been associated with increased length of hospital stay, increased morbidity and mortality in many patient cohorts undergoing major cancer surgery. Chemotherapy and radiotherapy have detrimental effects on physical fitness (Jack et al., 2014; West et al., 2014), which may in turn have a detrimental effect on the patients' ability to withstand surgery (Brunet et al., 2017). Research also suggests psychological factors including depression and low self-efficacy (confidence) to self-manage prior to surgery predict poorer recovery of health-related quality of life (QoL) in the years following surgery (Foster et al., 2016). Intervening immediately after diagnosis by providing both physical and psychosocial prehabilitation may therefore improve patient outcomes.

Methods:

The Wessex Fit-4-Cancer Surgery (Wesfit) is a multi-centre efficacy randomised controlled trial investigating the impact of exercise and/or psychological prehabilitation on post-surgical outcomes including length of hospital stay, short term morbidity and QoL. 300 patients scheduled for major cancer surgery will be randomised to one of four study arms: usual care, a personalised structured responsive exercise training programme (SRETP), person-centered counselling (PCC), and PCC combined with SRETP. Personal trainers delivering SRETP are also trained to deliver a behaviour change support programme – 'Healthy Conversations' designed to support longer-term exercise participation. The study is delivered collaboratively with local cancer charity organisations and leisure providers to assess the potential for large scale implementation. The trial is also designed to fit with current clinical pathways.

To evaluate the initial feasibility and acceptability of trial processes and interventions, we conducted a preliminary process evaluation using semi-structured one-to-one interviews.

Eight patients and seven healthcare professionals (HCPs) delivering the trial took part. Data was analysed using Thematic Analysis.

Results:

Both patients and HCPs considered the study intense and time consuming but regarded SRETP useful. Healthy Conversations supported some patients in planning for long-term exercise maintenance after surgery. Experiences of PCC among patients were mixed with some reporting benefits while others preferred to draw on existing social networks and support at this time. Most HCPs regarded PCC as not very useful in preparation for surgery and preferred supporting patients in problem-focused coping and short interventions deliverable in one or two sessions when surgery was imminent.

Conclusion:

Results from the 12-week post-surgery evaluation informed the national roll-out of Wesfit that is currently underway.

References:

Jack S, West MA, Raw D, Marwood S, Ambler G, Cope TM, et al. The effect of neoadjuvant chemotherapy on physical fitness and survival in patients undergoing oesophagogastric cancer surgery. *Eur J Surg Oncol*;40(10):1313–20., 2014

West MA, Loughney L, Barben CP, Sripadam R, Kemp GJ, Grocott MPW, et al. The effects of neoadjuvant chemoradiotherapy on physical fitness and morbidity in rectal cancer surgery patients. *Eur J Surg Oncol*;40(11):1421–8., 2014

Brunet J, Burke S, Grocott MPW, West MA, Jack S. The effects of exercise on pain, fatigue, insomnia, and health perceptions in patients with operable advanced stage rectal cancer prior to surgery: a pilot trial. *BMC Cancer*;17(1):153. 2017

Foster C, Haviland J, Winter J, Grimmett C, Seymour KC, Batehup L, et al. Pre-surgery depression and confidence to manage problems predict recovery trajectories of health and wellbeing in the first two years following colorectal cancer: Results from the CREW cohort study. *PLoS One*;11(5). 2016

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Implementation of a Pre-Operative Diabetes Management Program

Introduction: Elevated glucose and Hemoglobin A1C (A1C) levels have been linked to an increase in perioperative complication rate (1). Through an innovative care model that screens and aggressively manages glucose levels pre, intra and postoperatively, we hypothesize that elective surgical patients with poorly controlled diabetes will have improved perioperative glucose management.

Methods: Surgical patients with preexisting poorly controlled diabetes or a new diagnosis (type 1 or 2) amenable to treatment with an A1C over 7.5% were referred to Endocrinology with time-sensitive pre-surgical appointment(s). The Endocrinology team managed the patients according to their expertise, with surgery being delayed if needed for further optimization in direct communication with the surgical team and preoperative clinic. Experimental group patients were flagged in the electronic health record on the day of surgery, mentally alerting intraoperative and postoperative providers of the intensive preoperative management. Additionally, an Endocrinology referral was generated automatically for inpatient postoperative follow-up. Over two years, thirty surgical patients (29 non-cardiac and 1 cardiac) completed the preoperative element of this program, with most patients having a postoperative Endocrine consult. Surgical procedures were represented across a wide spectrum including general, orthopedic (spine and joint), vascular, and cardiac. A matched cohort was identified based on demographic variables, similar surgical procedure and pre-operative A1C levels.

Results: Experimental patients had a trend towards improved fasting day-of-surgery glucose levels (DOS) with a median of 131 mg/dL (average 153 mg/dL) compared to 168 mg/dL (average 181 mg/dL) in control patients ($p=0.21$). Four experimental patients and no control patients were treated with insulin prior to surgery start. There was a statistically significant increase in discharge to skilled nursing facilities in the control group vs experimental group (10% vs 33%) and usage of home health services (17% vs 3%) ($p=0.01$). No differences in postoperative complications were observed and there was a trend towards decreased length of stay in the experimental group (average 3.4 vs 4.1 days, $p=0.73$). A plot comparing A1C with DOS glucose showed no linear relationship (Figure 1).

Conclusion: Clinically meaningful reductions in DOS glucose and increased aggressive day of surgery insulin treatment were observed in the experimental group. No relationship was seen between preoperative A1C levels and DOS glucose. However, perioperative glucose levels may be more important for surgical morbidity than Hemoglobin A1C(2). Statistically significant differences were seen in discharge disposition to skilled nursing facilities and home health care, possibly reflecting underlying levels of patient health engagement.

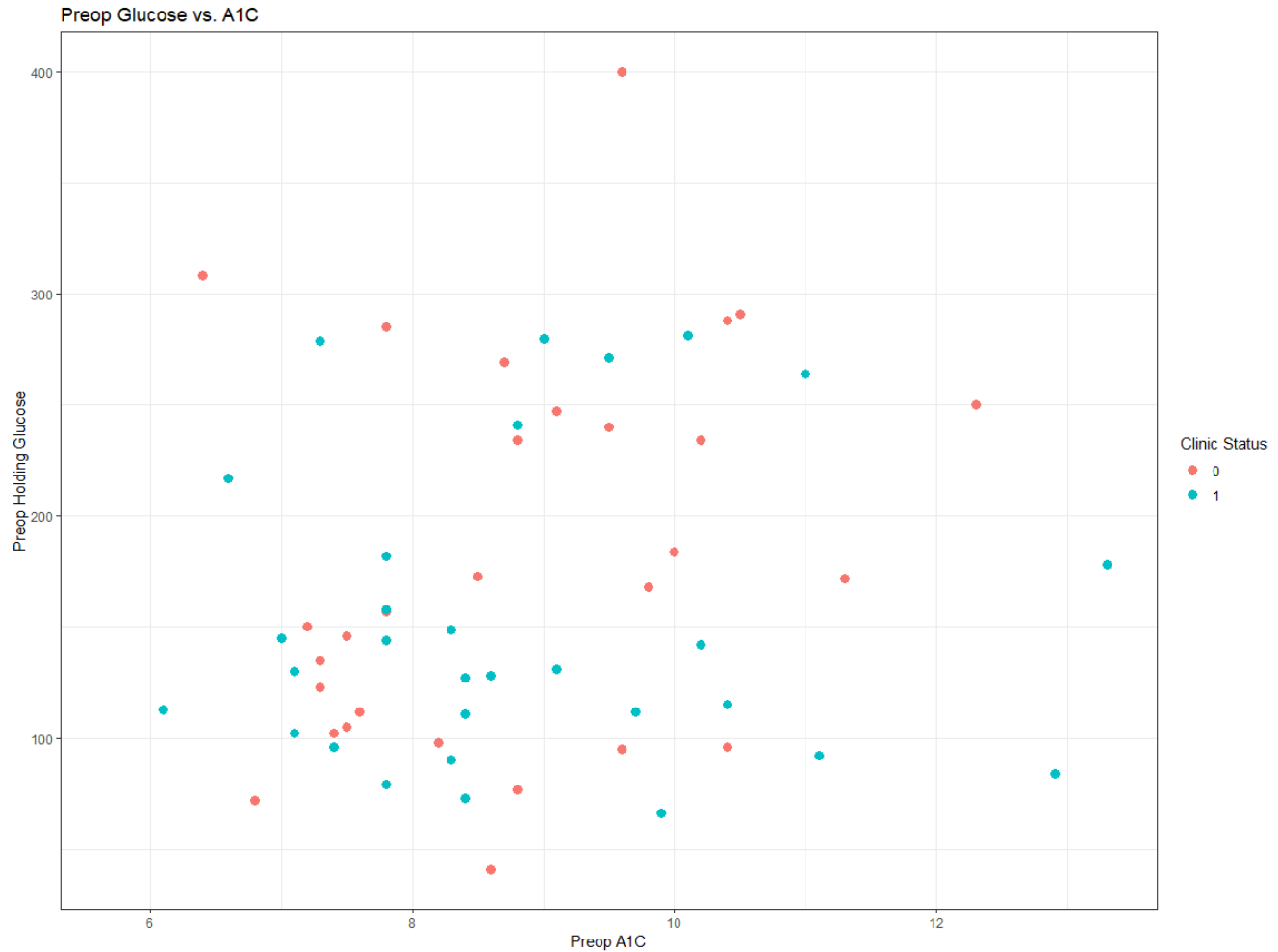


Figure 1: Plot of pre-operative A1C and fasting day of surgery glucose level (mg/dL). Blue points: Experimental patients, Orange points: Matched patients.

References

1. Setji T, Hopkins TJ, Jimenez M, Manning E, Shaughnessy M, Schroeder R, et al. Rationalization, Development, and Implementation of a Preoperative Diabetes Optimization Program Designed to Improve Perioperative Outcomes and Reduce Cost. *Diabetes spectrum : a publication of the American Diabetes Association*. 2017;30(3):217-23.
2. Chrastil J, Anderson MB, Stevens V, Anand R, Peters CL, Pelt CE. Is Hemoglobin A1c or Perioperative Hyperglycemia Predictive of Periprosthetic Joint Infection or Death Following Primary Total Joint Arthroplasty? *The Journal of arthroplasty*. 2015;30(7):1197-202.

Title

Prehabilitation- a holistic approach

Authors**Introduction**

Prehabilitation and its benefits for patients with upcoming major surgery is well documented, with successful programmes running in many UK hospitals. Most involve focussed interventions eg exercise programmes, incentive spirometry and lifestyle modification advice (diet, smoking, alcohol). These have shown reductions in post-operative pulmonary complications and length of hospital stay.¹ Anxiety and depression are also known to influence surgical outcome, even after known psychological factors are accounted for.² Following patient focussed groups and multidisciplinary development meetings, as part of the St George's and Macmillan Cancer Care Strategic Partnership, we created our prehabilitation programme centred around what our patients felt were of value to them; health advice, support, surgery specific information, what to expect throughout their surgical journey.

Methods

We designed a weekly, multidisciplinary run session "Get Set 4 Surgery" that provides nutrition and exercise advice, psychological management, the perioperative journey at St George's, and surgery specifics e.g. urinary catheters, thromboprophylaxis. Patients awaiting major cancer surgery at St George's are invited to attend with a "plus one". The afternoon is run as a combination of interactive talks, short films, informal questions, Macmillan support information, reinforced with patient information booklets and on line resources.

Results

Our pilot ran from November 2017-2018. We delivered our sessions to over 220 patients plus their 145 friends/relatives. Feedback collected during the sessions and post operatively showed 100% of attendees found them informative and would recommend to others. Patients feel supported and find their anxieties about the practicalities of their surgery are allayed. Deep breathing exercises and increasing physical activity were the most frequently mentioned lifestyle modifications. Post operatively an improvement in mobilisation on day 1 has been seen, particularly in the colorectal group.

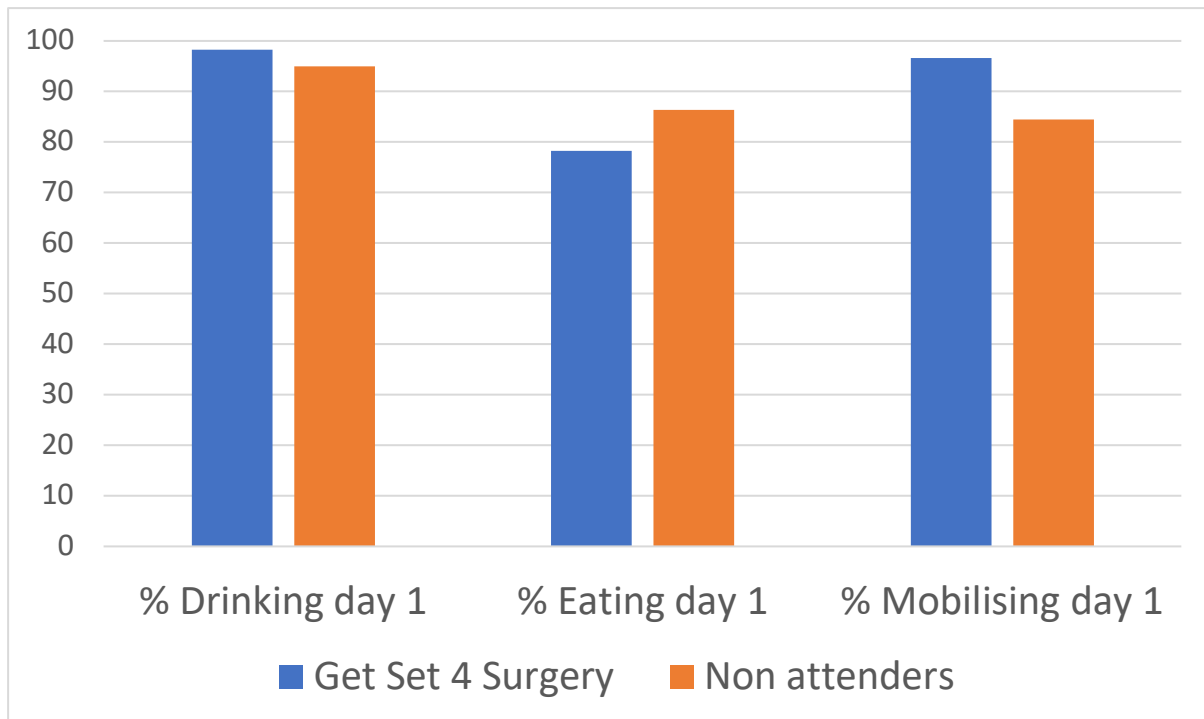


Figure 1. DrEaM data day 1

Conclusion

The holistic delivery of our prehabilitation programme at St George's has allowed our team to help a large number of patients prepare physically and emotionally for their upcoming major cancer surgery. Achieving high value for patients should be the goal of the care that we deliver.³ We deliver simple, reproducible advice so that patients feel confident and empowered to continue this at home. We continually respond to patient feedback to develop the content and delivery of this programme in order to improve their experiences.

References:

1. Moore J et al, *Anaesthesia*, 72(3), 317-327, 2017
2. Carli F et al, *Acta Oncol*, 56(2), 128-33, 2017
3. Porter M, *NEJM*, 363 (26), 2477-2481, 2010

Risk prediction and outcomes from an anaesthetic shared decision-making clinic

Introduction

Preoperative assessment identifies patients who are at increased risk of perioperative complications.¹ Our anaesthetic shared decision-making (SDM) clinic evaluates patients identified as high risk and facilitates individualised risk discussions and perioperative care planning. Quantifying individual patient risk is challenging; many scoring tools are available and their validity is limited. We audited our patients' risk assessment and outcomes following their SDM clinic attendance.

Methods

We reviewed the medical records of 50 patients attending the SDM clinic between January and June 2018, collecting data on documented risk assessment, outcome of the SDM consultation, postoperative complications, and 30-day and 6-month postoperative mortality.

Results

The mean patient age was 71.8 years (range 19 – 98), with 48% male. 74% of patients were referred prior to orthopaedic surgery.

Eight patients (16%) chose a non-surgical option for their condition following SDM clinic attendance. Nine (18%) had surgery deferred pending further optimisation, and 33 (66%) intended to proceed with surgery. Thirty out of 42 patients had undergone surgery at the time of case note review.

Fourteen of the 30 patients who underwent surgery (47%) had a documented individualised risk prediction; 7 (23%) were quoted risks for both morbidity and mortality; 6 (20%) for morbidity alone; 1 for mortality alone. Of the whole cohort, 31 patients (62%) were quoted a numerical morbidity or mortality risk.

Median predicted 30-day mortality was 2.25% (range 0.1%-50%). Actual mortality for the cohort was 0% at 30 days and 3.3% (1 death) at 6 months.

Median predicted morbidity rate was 9.5% (range 1 – 80%). Complications were reported in five patients (16.7%).

Fifteen of the 50 patients (30%) developed significant medical issues unrelated to their planned surgery during the 12-month post-clinic period.

Conclusion

This audit corroborates our Trust PQIP (Perioperative Quality Improvement Program) data, confirming that our assessment and documentation of risk is not standardised and falls below national standards.

In this small data set there is a discrepancy between predicted and actual mortality, possibly indicating that our current practice tends to over-estimate the true 30-day mortality risk. The risks we estimate for significant perioperative morbidity appear to be more accurate.

This high-risk group of patients frequently experience unrelated medical issues in the year after SDM clinic referral.

Reference

1. Pearse RM, Holt PJ, Grocott MP. Managing perioperative risk in patients undergoing elective non-cardiac surgery. *Br Med J* 2011; **343**: 734-9.

Goal-Directed Fluid Therapy in Renal Transplantation

Interim analysis April-2019

Introduction

Following an audit raising concerns regarding excessive fluid filling, with consequent transfusion and post-operative cardiac complications, and need for ICU admission, we have implemented a goal-directed fluid therapy approach. This involves the management of intra-operative fluid and vasopressor administration using the ClearSight (CS) non-invasive cardiac output monitor.

Methods

Retrospective data from 41 patients was obtained prior to the implementation of the ClearSight protocol. Prospective data collection has been completed for 23 patients who have been managed using the CS protocol. In the CS group eight patients received an organ from a donor after brain death, six from cardiac death and nine were living donors. Of those patients in the CS group who were on dialysis, the mean time from dialysis to surgery was 24 ± 31 hours and these patients had been anuric for an average of one year¹.

Results

There was no significant difference between the two groups regarding baseline demographic and disease prevalence. In those patients managed using the CS protocol hypotension (defined as a MAP below 65mmHg for one minute or longer) occurred for only 4.4% of each case on average, with a mean case duration of 255 minutes.

In the protocol group there was a low incidence of post-operative ileus and a high rate of mobilisation on the first post-operative day (Table 1). There was no difference in the rate of creatinine reduction between the two groups at 24 hours, seven days, and 90 days post-operatively.

Conclusion

Using CS protocol resulted in dramatic reduction in intra-operative fluid administration due to the recommendations in the protocol, which is likely to improve patient and renal graft outcomes. We anticipate improvements in bowel function and mobility due to the reduction in fluid volumes administered.

¹ The volume of crystalloid and colloid administered followed a normal distribution, other metrics analysed had a non-parametric distribution (Kolmogorov-Smirnov test of normality with Lilliefors significance correction).

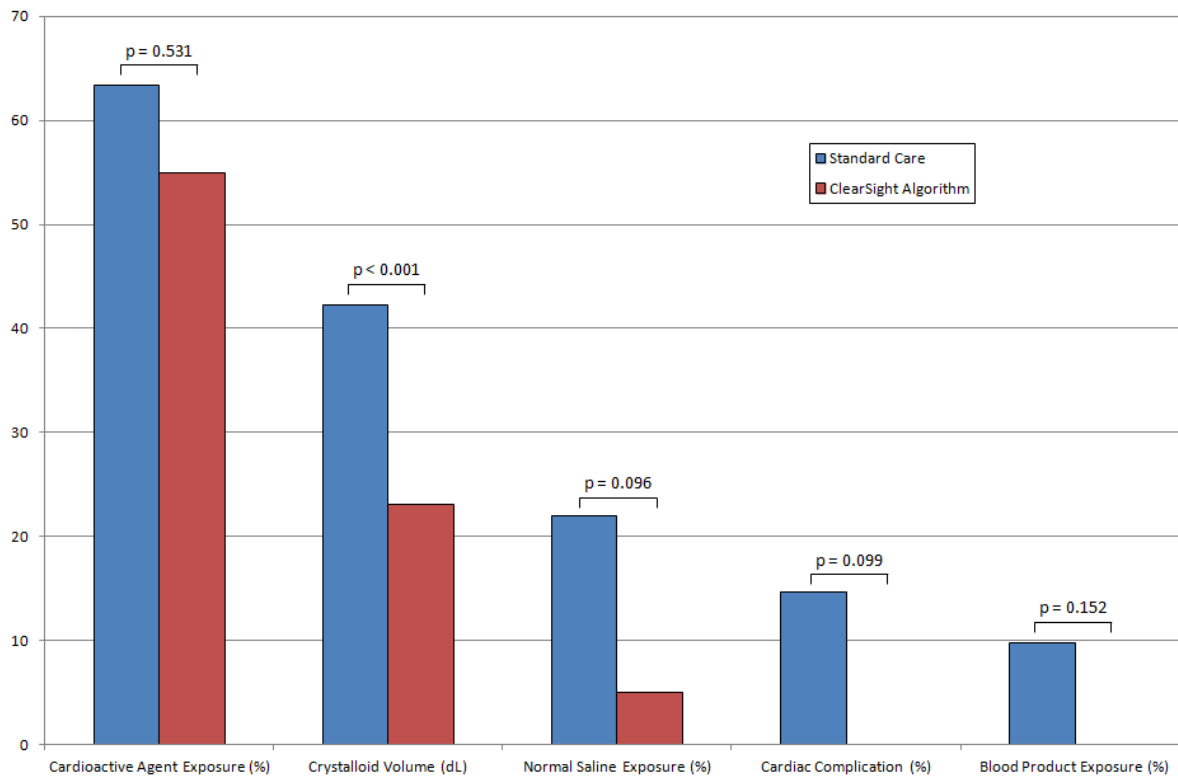
Table 1

Metric		Standard Care	ClearSight Protocol	Significance
Crystalloid/colloid administration		4,220ml	2,370ml	< 0.0001 ^a
Normal saline exposure		22.0%	4.3%	0.074 ^b
Operative blood product exposure		9.8%	0%	0.152 ^b
Vasopressor requirement	Any vasopressor	63.4%	50.0%	0.306 ^b
	Ephedrine	43.9%	27.3%	0.199 ^b
	Metaraminol	12.2%	9.1%	0.711 ^b
	Phenylephrine	17.1%	27.3%	0.344 ^b
Pulmonary oedema		14.6%	0%	0.099 ^b
Creatinine reduction (%)	24 hours	23%	21%	0.505 ^b
	7 days	54%	60%	0.464 ^b
	90 days	71%	74%	0.218 ^b
Length of hospital stay		6 [5 – 7] days	7 [6 – 9] days	0.352 ^b

^a Independent samples t-test, two tailed test.

^b Independent samples Mann-Witney U Test.

Figure 1



References

1. O'Malley CM, Frumento RJ, Hardy MA, et al. A randomized, double-blind comparison of lactated Ringer's solution and 0.9% NaCl during renal transplantation. *Anesthesia and analgesia* 2005;100:1518-1524, table of contents.
2. Chowdhury AH, Cox EF, Francis ST, Lobo DN. A randomized, controlled, double-blind crossover study on the effects of 2-L infusions of 0.9% saline and plasma-lyte(R) 148 on renal blood flow velocity and renal cortical tissue perfusion in healthy volunteers. *Annals of surgery* 2012;256:18-24.
3. Reid F, Lobo DN, Williams RN, Rowlands BJ, Allison SP. (Ab)normal saline and physiological Hartmann's solution: a randomized double-blind crossover study. *Clin Sci (Lond)* 2003;104:17-24.
4. Machnicki G, Lentine KL, Salvalaggio PR, Burroughs TE, Brennan DC, Schnitzler MA. Kidney transplant Medicare payments and length of stay: associations with comorbidities and organ quality. *Archives of medical science : AMS* 2011;7:278-286.

Validation of the Perioperative Nutrition Screen (PONS) against the Malnutrition Universal Screening Tool (MUST)

Introduction

Malnourished patients have increased postoperative morbidity and mortality.¹ Preoperative nutritional optimisation improves perioperative outcomes.² However, there is not consensus regarding the optimal nutritional screening tool in the preoperative patient. We aimed to validate the recently proposed perioperative nutrition screen (PONS)³ against the Malnutrition Universal Screening Tool (MUST) which is widely used in the United Kingdom.

Methods

All patients undergoing cardiopulmonary exercise testing as part of preoperative evaluation were screened with PONS and MUST scores. A positive answer to any component of the PONS implies the patient is at risk of malnutrition and requires a dietician evaluation. The MUST scores each component from 0-2 and is then summated (0: low; 1: medium; ≥ 2 : high risk of malnutrition). A MUST score of 1 suggests a need for observation and review whilst a score of 2 or greater should trigger dietician referral.

Results

283 patients (57.2% male) were recruited with a mean age 67.5 years (SD 11.8), smokers 11.7%, diabetes mellitus 11%, COPD 13.1%, atrial fibrillation 5.7%, ischaemic heart disease 10.6%, hypertension 42.8%, cerebral vascular disease 7.1% and anaemia 30.7%.

Table 1 illustrates the results of the PONS and MUST scores including the individual components. 32.5% screened positive with PONS compared to 26.9% using MUST.

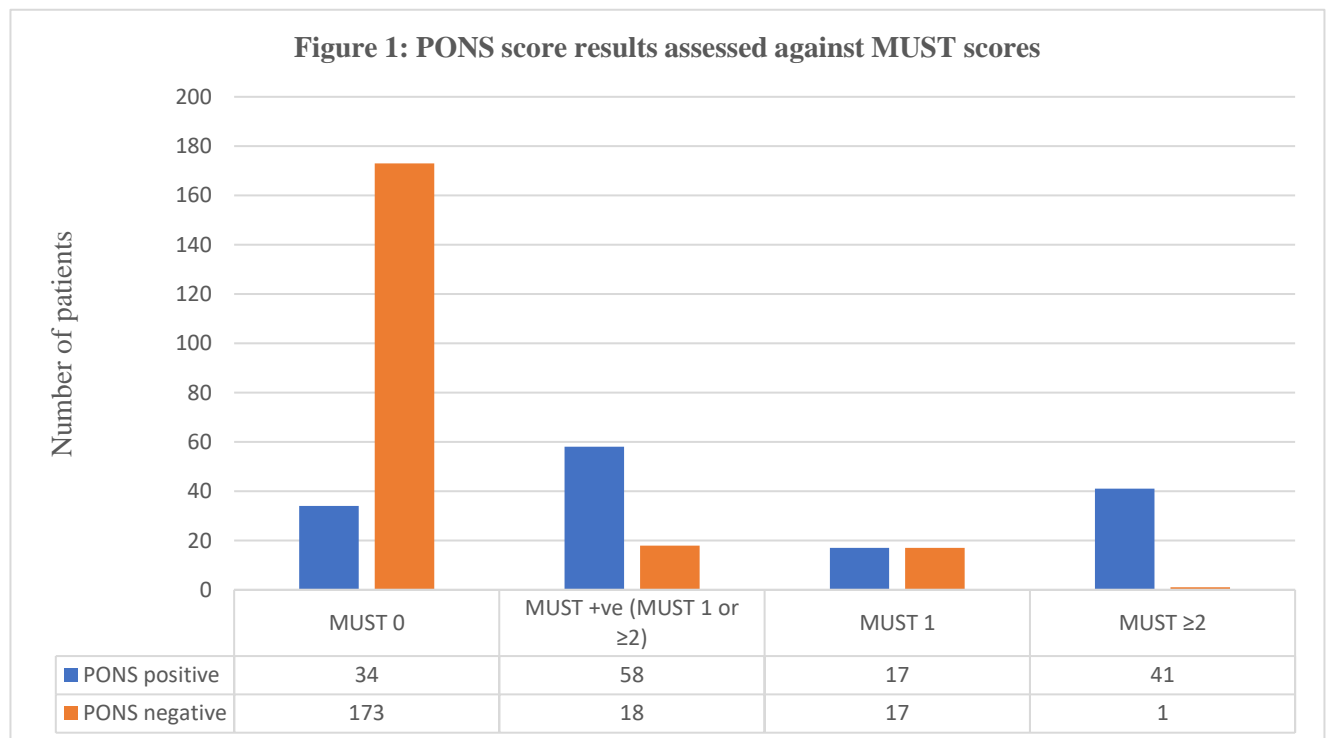
Figure 1 illustrates the result of individual patient PONS scores when assessed against the MUST score of the same patient. Of the 34 (12%) patients who were PONS positive but MUST negative 79.4% had reduced dietary intake, 14.7% had a low albumin and 5.9% both. Thus, PONS identified additional patients with nutritional impact symptoms not identified by MUST. 18 (6.4%) patients were MUST positive but PONS negative. The majority of this discordancy (88.9%) was due to patients with lesser degrees of unintentional weight loss (i.e. 5-10%) (MUST 1), 5.6% due to a BMI 18.5-20 when aged ≤ 65 years (MUST 1) and 5.6% due to both (MUST 2). Half of MUST 1 scoring patients were PONS positive and the other PONS negative.

Conclusion

PONS is a simple screening tool that identifies the majority of patients identified by MUST and a further subset of patients primarily with acutely reduced oral intake. Further work is needed to evaluate which tool identifies those at highest risk of post-operative complications.

Table 1:

	PONS Score		MUST score	
	Number	%	Number	%
Albumin <30g/L	15	5.3		
BMI <18.5 (<20 if age>65)	16	5.7		
BMI < 18.5			8	2.8
BMI 18.5 - 20			13	4.6
Unplanned weight loss 5-10% in past 3-6 months			35	12.4
Unplanned weight loss >10% in past 3-6 months	30	10.6	30	10.6
Eating <50% of subject's normal diet in the preceding week	65	23.0		
Acutely unwell and no nutritional intake for >5 days			13	4.6
Patients PONS positive	92	32.5		
Patients MUST positive (score ≥ 1)			76	26.9
Patients with MUST score 1			34	12.0
Patients with MUST score ≥ 2			42	14.8



References

1. Correia MI, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stay and costs evaluated through a multivariate model analysis. Clin Nutr. 2003 Jun;22(3):235-9.
2. Weimann A, Braga M, Carli F et al. ESPEN guideline: Clinical nutrition in surgery. Clin Nutr. 2017 Jun;36(3):623-650.
3. Wischmeyer PE, Carli F, Evans DC et al. American Society for Enhanced Recovery and Perioperative Quality Initiative Joint Consensus Statement on Nutrition Screening and Therapy Within a Surgical Enhanced Recovery Pathway. Anesth Analg. 2018 Jun;126(6):1883-1895.

Pre-Operative Management of Polytrauma Patients An Audit of Beaumont Hospital's Initial Management of Polytrauma Patients

Introduction:

10-20% of polytrauma patients require an emergency operation within 6 hours of presentation to the Emergency Department (ED)¹. The use of trauma teams improves outcomes in patients with serious and/or multiple injuries². Beaumont hospital is a trauma centre and neurosurgical centre in Dublin, Ireland. Despite this, there is no organised trauma team in the hospital. We carried out a retrospective audit of the initial management of polytrauma patients in Beaumont hospital and set out standards according to NICE guidelines for trauma teams^{3,4}.

Standards Set:

- 100% of polytrauma patients having a documented Secondary Survey
- Time to be seen by an ED doctor <30 minutes
- Time to Computed Tomography(CT) <60 minutes

Methods:

All adult polytrauma patients admitted to Beaumont Hospital's ED during 2016-2017 were included in this audit. Polytrauma is defined as any patient having an Injury Severity Score >15 at admission. Patients transferred from other hospitals to Beaumont were excluded. The Trauma Audit Research Network(TARN) database was utilized to ensure sensitivity. All included patient charts were collected and manually searched for a documented secondary survey.

Results:

In 2016-2017, 482 patients were admitted from ED with an ISS > 15. 321(67%) of these patients were transferred in from other hospitals, and therefore excluded. Of the 161 patients included, only 54(34%) had a documented secondary survey in their medical notes. The average time taken to be seen by a doctor was 88 minutes. Average time to CT was 285 minutes.

Conclusions:

In this retrospective audit of Beaumont hospital's initial management of polytrauma patients, we did not achieve any of the standards set. It is clear that having an allocated trauma team with a strict protocol will help identify polytrauma patients, get them seen by the correct personnel and have earlier trauma CTs.

Having efficient identification and management of these patients will lead to reduction in missed injuries and earlier times to theatre.

Beaumont Hospital ED is introducing a new polytrauma protocol in which all trauma patients must have a trauma proforma completed. Our aim is to close loop this audit with re auditing once this protocol is in place.

References:

1. Huber-Wagner S, Lefering R, Kay M, Stegmaier J, Khalil P, Paul A et al. Duration and predictors of emergency surgical operations - basis for medical management of mass casualty incidents. *European Journal of Medical Research*. 2009;14(12):532.
2. Tiel Groenestege-Kreb D, van Maarseveen O, Leenen L. Trauma team. *British Journal of Anaesthesia*. 2014;113(2):258-265.
3. Major trauma: assessment and initial management | Guidance and guidelines | NICE [Internet]. Nice.org.uk. 2016 [cited 12 June 2018]. Available from: <https://www.nice.org.uk/guidance/ng39>
4. 3. Major trauma: service delivery [Internet]. Nice.org.uk. 2016 [cited 12 June 2018]. Available from: <https://www.nice.org.uk/guidance/ng40/evidence/full-guideline-2313258877>

Introduction

- Intrathecal morphine (ITM) has been shown to have superior analgesic efficacy for major abdominal surgery. The most feared complication with the use of intrathecal morphine is respiratory depression. Nevertheless the wide variety of definitions of respiratory depression makes it difficult to estimate the incidence of it.
- Our primary aim was to describe the proportion of patients with respiratory depression amongst patients who did or did not receive ITM after major liver resection at our tertiary level centre. The definition of respiratory depression was based on the ASA Practice Guidelines for the Prevention, Detection and Management of Respiratory Depression Associated with Neuraxial Opioid Administration².
- Our secondary aim was to explore the relationship between dose of ITM and respiratory depression as measured by nadir respiratory rate (RR), nadir oxygen saturation (SaO₂) and worse sedation level.

Methods

- After local ethics committee approval, the data from all patients undergoing major liver resection and who were admitted to the high dependency unit (HDU) between January 2013 and December 2018 were extracted.
- As per usual protocol at our institution, all patients received continuous oximetry, 1:1 nursing observation and supplemental oxygen.
- Respiratory depression was defined as RR<10 and/or SaO₂ <90% and/or sedation score of “difficult to rouse” or “unable to rouse”.

Results

- 190 patients were identified. 153 patients received ITM. The median dose of ITM was 300mcg (IQR 300-400mcg). Patients were more likely to have an open approach to liver resection (*c/f* laparoscopic) if they received ITM (124/53 vs. 23/37, $p=0.027$) with no other differences observed. There were no difference in age, obstructive sleep apnoea status, NSQIP risk of serious complications and operative time between those who did or did not receive ITM.
- Respiratory depression occurred in 88/198 patients amongst patients undergoing major liver resection. The frequency of respiratory depression was significantly different in those who received ITM compared to those who did not: 77/153 vs. 11/37 ($p=0.028$) even after accounting for open vs. laparoscopic approach (adjusted odds ratio 2.3 (95% CI 1.1-5.0)).
- There was weak negative correlation between ITM dose and nadir RR and nadir SaO₂ ($r = -0.22$ and $r = -0.15$ respectively) ($p=0.003$ and $p =0.039$ respectively).

Conclusion

- The rate of respiratory depression is significantly higher in patients receiving a median dose of 300mcg ITM for major liver resection compared with those who did not. Within a narrow range of ITM dosing, a weak relationship with dosing and various definitions of respiratory depression was found. More studies are required to properly delineate a dose-response relationship.

Reference

1. Sultan P, Gutierrez MC, Carvalho B. *Drugs*. 71(14):1807-19. 2011

2. American Society of Anesthesiologists Task Force on Neuraxial Opioids and the American Society of Regional Anesthesia and Pain Medicine. Anesthesiology. 124(3): p. 535–52. 2016.

The ‘Colchester Older Persons’ Evaluation for Surgery (COPES)’ clinic: a multidisciplinary approach to preoperative management of frail, older patients

Introduction

In 2014-15, 2.5 million patients over 75 years old underwent surgery compared to 1.5 million in 2006-7. The population is aging with increasing numbers of comorbidities, and associated frailty.^[1]

The Royal College of Anaesthetists recommends that preoperative assessment for these complex older patients takes a “cross-specialty approach”.^[2] In Colchester, the COPES clinic has been introduced in which selected high-risk patients are seen by a Consultant Anaesthetist and Consultant Geriatrician. This aims to medically optimise patients prior to surgery and to facilitate shared decision making.

Methods

This clinic was introduced in October 2018.

The following data was collected from COPES clinic letters from October to February 2018-19 (n=46):

- Patient/ surgery characteristics: age, comorbidities, frailty score and any cognitive impairment
- Interventions: medication changes, specialty referrals, other
- Outcomes of surgery following the COPES clinic

Patients were asked to complete feedback forms to evaluate the service.

Results

52% of patients had 4-6, and 28% had 7-9 comorbidities. The majority had Rockwood frailty scores of 4 or 5.

28% of patients had medications changed, 48% had specialty referrals, 17% received intravenous iron, 8.7% required diabetes optimisation and 28% of patients had investigations including echocardiograms, MRI and CT scans.

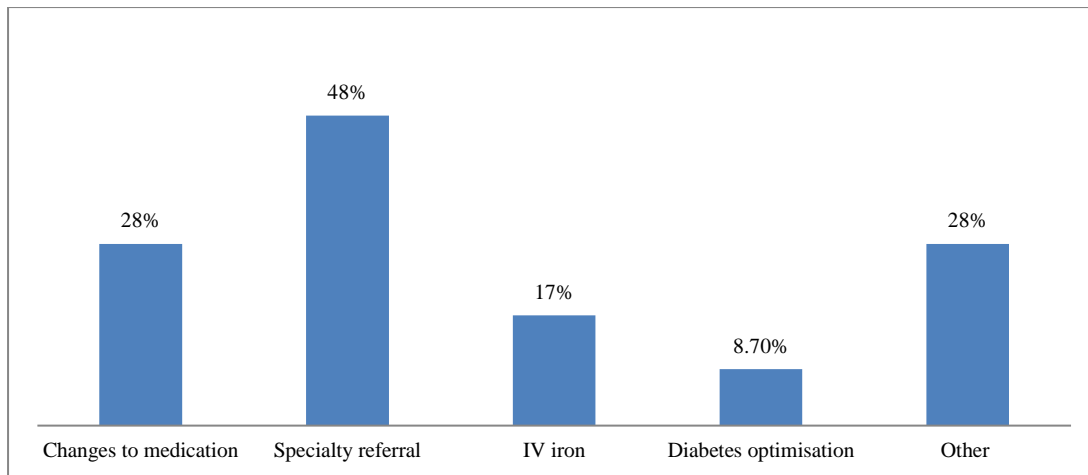


Figure 1: Interventions resulting from the COPES clinic

12/46 patients had surgery deemed unlikely to go ahead after shared decision making with the patients in conjunction with the multidisciplinary team involved in their care. 2 patients died of their comorbidities after deciding not to proceed with surgery. 12/46 patients underwent surgery; 4 developed post-operative complications, none died and the mean length of stay is 3.38 days, median is 3 days. The remaining 22/46 patients are awaiting surgery.

Patient feedback questionnaires (n=10) were overwhelmingly positive. Everyone felt that they were treated with respect, their fears were addressed and they were clear in the next steps in management.

Conclusion

The 'COPES' clinic helped address frailty and comorbidities by optimising patients' medical conditions and allowed alternatives to surgery to be considered.

Patients were very satisfied with the COPES clinic and felt that it has prepared them for the surgery.

References

1. Lin, H. *Frailty and post-operative outcomes in older surgical patients: a systematic review*. BMC Geriatrics 16(1), p157, 2016.
2. RCoA. *Guidelines for the Provision of Anaesthesia Services*. <https://www.rcoa.ac.uk/system/files/GPAS-2019-02-PREOP.pdf>. p10. 2019.

The role of Cardio Pulmonary Exercise Testing (CPET) in preoperative triage.

Introduction:

The uses of Cardiopulmonary Exercise Testing (CPET) to stratify perioperative risk and to inform perioperative triage are well established ^{1,2}. However other potential roles in the perioperative pathway: contributing to shared decision making and directing pre-operative optimisation have not been evaluated ².

In a prospective cohort study, we aimed to evaluate the role of CPET in a newly established perioperative medicine (POM) service for colorectal surgery.

Methods:

CPET was introduced at University Hospital Southampton in 2016 and performed on all patients presenting for major colorectal surgery. Baseline co morbidity data and objective functional data (DASI score) was recorded for all patients. Outcome data was collected: post-operative complications (Clavien-Dindo), length of critical care stay, length of hospital stay and one-year mortality. Pre-operative interventions arising from information derived from the CPET test were recorded, as were shared decision making outcomes from pre-operative high risk clinics.

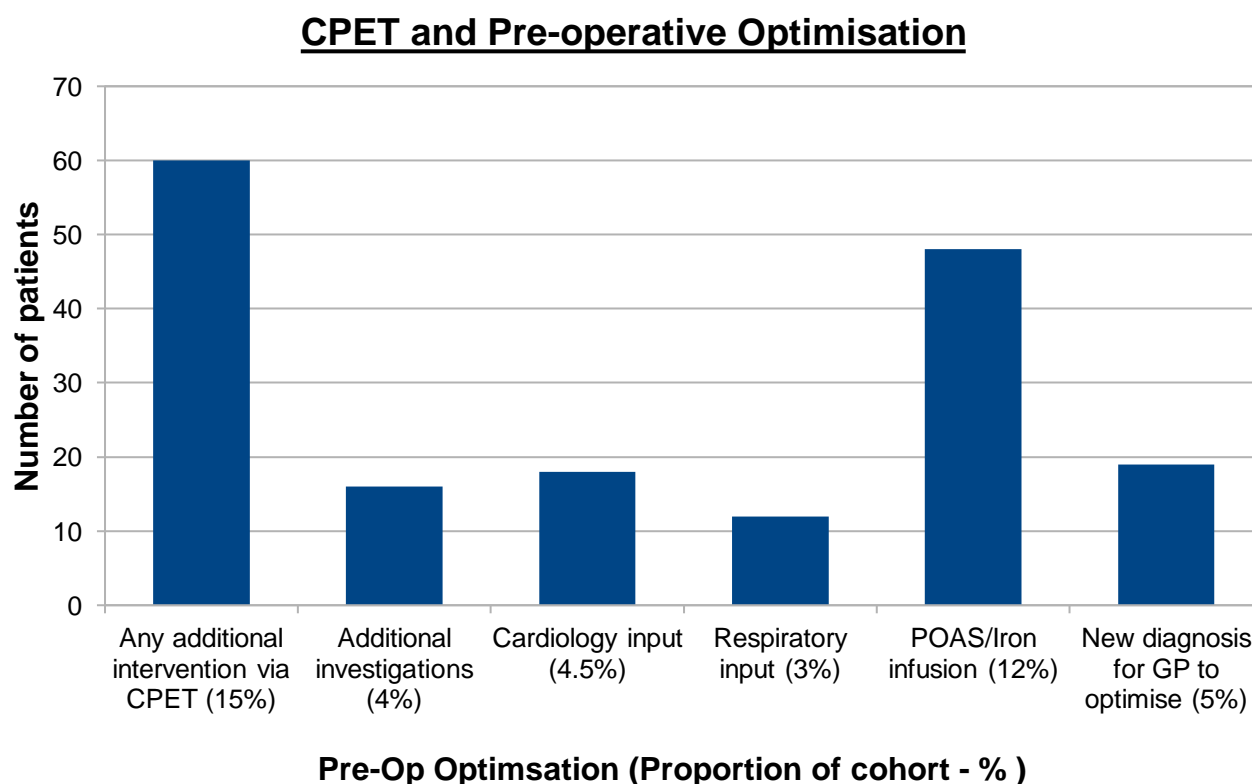
Results:

401 patients were tested over a two year period (2016/17). The cohort was 55% female, 45% male; mean age of 68 years. 119 patients underwent right sided procedures (right hemicolectomy), 131 underwent left sided procedures (left hemicolectomy, anterior resection, APER), 58 underwent 'complex procedures' (pelvic exenterations, panproctocolectomy, intestinal failure). Patient demographics, outcomes and CPET results are summarised in table 1. CPET influenced the management of 28% of patients. 8.4% of patients did not proceed to surgery based on a shared decision making process in a high-risk clinic. In 2% percent of cases the original procedure was changed (e.g. resection vs diversion). Moreover, some 15% of patients received new intervention (figure 1) – notable examples include new diagnoses of readily optimisable respiratory, cardiovascular and metabolic conditions, treatment for these, optimisation of medication for chronic comorbidities and referral to specialist services where appropriate. The association between CPET variables and clinical outcomes are awaited but provisional analysis, demonstrates a positive association between AT, VO₂peak and VE/VCO₂ and hospital length of stay, complications and one year mortality.

Table 1 CPET outcomes:

	Not proceeding with surgery after shared decision making based on CPET	Not proceeding with surgery as defined by other*	Number of patients proceeding with surgery
(% of total cohort)	34 (8.4%)	18 (4.4%) *Principally defined by: <ul style="list-style-type: none"> • Resolution of symptoms • Progressive or incurable disease • Use of other treatment modality 	308 (77%)
Anaerobic Threshold <i>Mean (SD)</i>	7.9 (3.1)	11.4 (3.4)	11.28 (4.4)
VO₂peak <i>Mean (SD)</i>	11.2 (3.7)	17.4 (6.6)	16.8 (7.4)
VE/VCO₂ <i>Mean (SD)</i>	41.2 (7.1)	34.9 (6.5)	33.8 (9.9)
Anaemia	11.7%	11.1%	11.5%
Mean Age (years)	73.7	67.8	68
Mean BMI	29.2	26.9	27.3
Male	(53%)	(78%)	(51%)
Female	(47%)	(22%)	(49%)

Figure 1 CPET and optimisation:

**Conclusion:**

CPET plays an important role in the evaluation of patients before major surgery. It allows objective assessment of the severity of known comorbidities, diagnosis of previously unidentified comorbidities and optimisation of the treatment of known chronic conditions. By providing an individualised risk assessment, CPET contributes to the shared decision making process and informs consent in patients who then proceed to surgery.

References:

1. Levett DZ, Grocott MP. Cardiopulmonary exercise testing for risk prediction in major abdominal surgery. *Anesthesiol Clin.*33:1–16, 2015.
2. Older, P, Levett, D. Cardiopulmonary Exercise Testing and Surgery. *Annals of the American Thoracic Society.* 14:10:13-15, 2017

Title:

Airway and respiratory-related Adverse Events in Patients Undergoing General Anaesthesia for Elective Gynaecology Surgery: A Retrospective Case-control Study

Introduction:

Majority of patients presenting for elective gynaecology surgery are usually relatively healthy. Improved practices has made anaesthesia-related mortality rare events, but concern about unanticipated morbidity continues. While studies have investigated risk factors for airway complications in the general surgical population, there is less data specifically in the gynaecological patient population. This study aims to evaluate incidence of airway-related adverse events from a specialist hospital database and identify risk factors that may predispose a patient to these events during general anaesthesia.

Method:

This study was approved by Singhealth Centralised IRB. We analysed records of major and minor gynaecological operations from 2007–2016 in a single tertiary hospital specialising in obstetrics and gynaecology.

The airway events recorded were aspiration, bronchospasm, difficult airway, hypoxia, hypercapnia, laryngospasm and mortality. Surgical, patient and anaesthesia factors were analysed. For patients who were identified to have difficult airway, we reviewed the anaesthetic chart for its proceedings.

Result:

There were 128516 patients who underwent gynaecological surgeries from 2007 to 2016, of which 105228 (81.9%) were done under general anaesthesia. 94.3% are ASA 1 and 2. Majority (73%) were minor cases lasting less than 30mins. 150 (0.15%) patients had an airway-related adverse event, of which 0.04% lead to unplanned ICU admission. The most common events are laryngospasm (30%), difficult airway (26%) and bronchospasm (24%). Significant risk factors after univariate analysis were IHD (OR 2.0, 95% CI 0.366-10.919), obesity (OR 0.868, 95% CI 0.376-2.001), anaemia (OR 3.2, 95% CI 1.263, 8.108), asthma (OR 2.423, 95% CI 2.423-5.067), laparoscopic surgery (OR 1.583, 95% CI 0.995-2.521) and major surgery (OR 1.907, 95% CI 1.184-3.072). After adjusting for confounders, anaemia, asthma, laparoscopic and major surgery remained significant.

Conclusion:

There is a low incidence of airway and respiratory-related complications over the last 10 years. More caution needs to be taken during assessment of patients undergoing major laparoscopic surgery.

HIGH RISK ANALGESICS & PERI-OPERATIVE INTERVENTION

A pilot audit to identify the number of patients on high risk analgesics, ascertain their care pathway and current pain management; with the aim to assist in planning future multi-disciplinary opioid reduction interventions in the peri-operative stage.

The North has been identified to have a significant number of patients prescribed opioids compared to the South of the UK (2.5% versus 1.7% Todd et al, 2018).

Patients reach high doses of opioids escalating through tolerance rather than the increased dose improving function or reducing pain scores (The Faculty of Pain Medicine (FoPM), 2018). FoPM suggests patients on high doses should have a clinical assessment to identify a course of action to manage both pain and level of opioid use.

Chronic opioid use is proven to affect post-operative outcomes, causing admission to critical care, longer length of stay and higher risk of complications. Some small studies have investigated peri-operative interventions using a multifactorial approach to reducing patients' opioid use. Although limited by sample size, the evidence suggests better post-operative outcomes and patient satisfaction.

Methods: Measurements, design and patients

Over a two-week period, nursing staff at Newcastle upon Tyne Hospitals NHS Foundation Trust (NUTH) collected data from 1041 patients attending pre-assessment appointments. The Specialist Acute Pain Team, with their clinical expertise and evidence, identified high risk analgesics. Data recorded included analgesic name, referral speciality and whether under pain management.

Results

44 patients on high risk analgesics were identified (4.23%). Figure 1 shows the breakdown of analgesics, with some patients on multiple agents. 2.1% of patients were found to be on opioids, similar to that found by Todds et al. However, Todd et al also included Tramadol whereas it was not included in this audit. The majority of patients were not under specialist pain management (84%). Patients on the Neurosurgery and Orthopaedic pathways were prescribed the most analgesics.

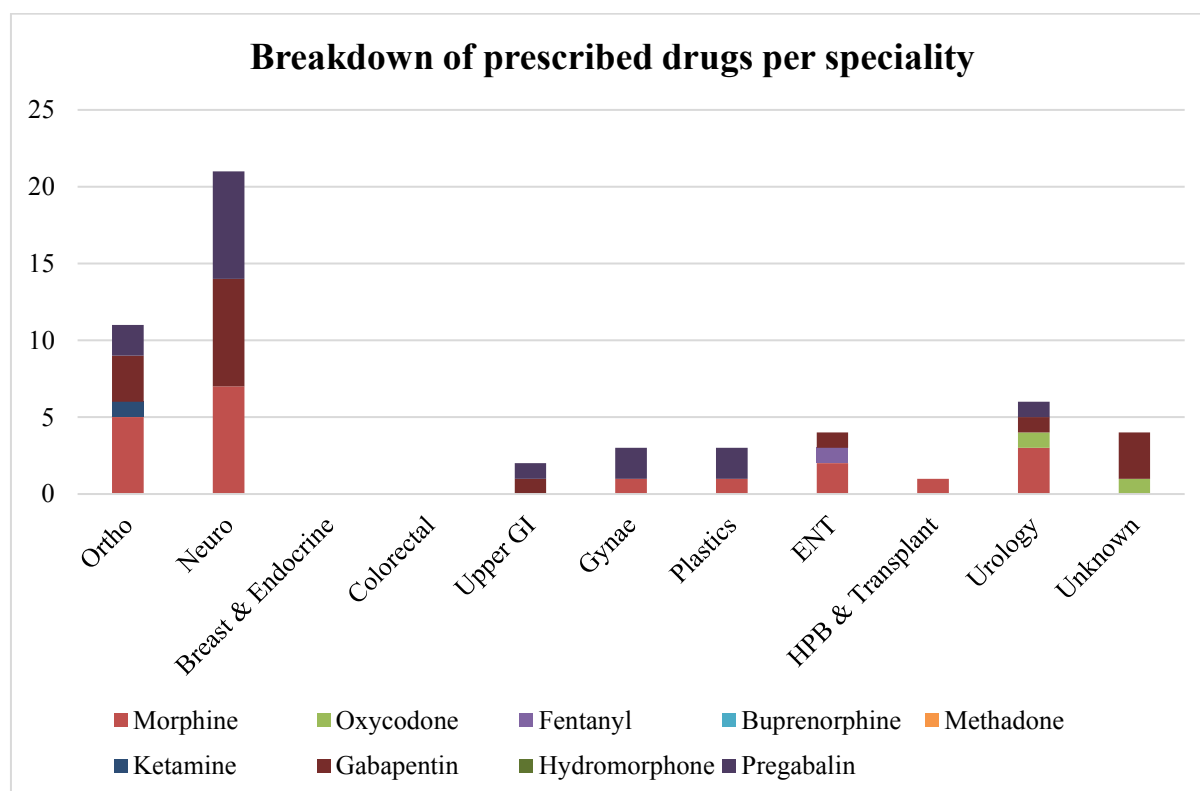


Figure 1: Breakdown of prescribed drugs per speciality

Conclusion

The project confirmed that a high rate of the patients assessed may benefit from a multi-disciplinary opioid reduction intervention perioperatively to optimise analgesics. Most patients were within Neurosurgery and Orthopaedic specialties on elective, rather than cancer pathways and are therefore undoubtedly a useful group to initiate peri-operative interventions. As high numbers did not have regular pain management reviews, it is even more important to review this in a peri-operative setting.

References

Todd. A, Akhter. N, Cairns.J ,Kasim. A, Walton. N, Ellison. A, Chazot. P, Eldabe1. S, Bamba. C ‘The Pain Divide: a cross-sectional analysis of chronic pain prevalence, pain intensity and opioid utilisation in England’ BMJ Open 2018;8:e023391. doi: 10.1136/bmjopen-2018-023391

The Facility of pain medicine, of the Royal College of Anaesthesia ‘Briefing Statement to Health Professionals on the Management of Opioid Medications’ 2018
<https://www.rcoa.ac.uk/system/files/FPM-Opioid-letter-2018.pdf>

Associations between postoperative muscle wasting and postoperative outcomes in older patients undergoing colorectal cancer surgery: a retrospective study

Introduction

Preoperative sarcopenia in older patients is a risk factor for adverse postoperative outcomes after colorectal cancer (CRC) surgery. Postoperative muscle wasting in this group has not been studied previously although it could potentially be used as a surrogate marker for declining physical functioning. The aim of this study was to determine associations between postoperative muscle wasting, overall survival (OS) and postoperative outcomes in older patients who underwent surgical treatment for CRC.

Methods

We included patients ≥ 70 years who underwent surgery for CRC in Gelre hospitals, The Netherlands, between 2011-2015. Cross-sectional area of skeletal muscle was measured at the level of the 3rd lumbar vertebra on preoperative and postoperative (within 6-18 months) abdominal CT-scans. Relative changes in muscle mass were calculated and muscle wasting was determined to be present if a decrease of >1 standard deviation (SD) in muscle cross-sectional area was observed. Associations between muscle wasting and OS were evaluated with Cox regression analyses. Predictors of muscle wasting were analyzed with logistic regression analyses.

Results

The study cohort consisted of 204 patients (Figure 1). Median age was 76 (range 70–91) and 62% were male. Rectal cancer was present in 25%, and 10% had metastases at baseline. Most patients (77%) had laparoscopic surgery, and 25% had severe postoperative complications (Clavien-Dindo ≥ 3). Mean change in muscle mass was +1.6% ($\pm 6.0\%$), and 28 patients had postoperative muscle wasting ($>6.0\%$ decline). Muscle wasting predicted OS in univariate analyses (unadjusted HR 2.2, 95% CI 1.2–4.0), but when adjusting for age, comorbidities, severe postoperative complications and metastatic disease, the strength of the association decreased (adjusted HR 1.5, 95% CI 0.8–3.1). Patient characteristics, tumor stage or treatment characteristics were not associated with muscle wasting. Severe postoperative complications (OR 2.6, 95% CI 1.1–5.8), intensive care unit (ICU) admissions (OR 2.5, 95% CI 1.1–5.9) and length of hospital stay (LOS) >14 days (OR 2.3, 95% CI 1.0–5.3) were predictors of postoperative muscle wasting.

Conclusion

In older patients who underwent surgery for CRC, postoperative muscle wasting was not an independent predictor of OS. Severe complications, ICU admissions and longer LOS were

associated with muscle wasting. Further research is needed to evaluate the impact of muscle wasting on older patients' functional status and quality of life.

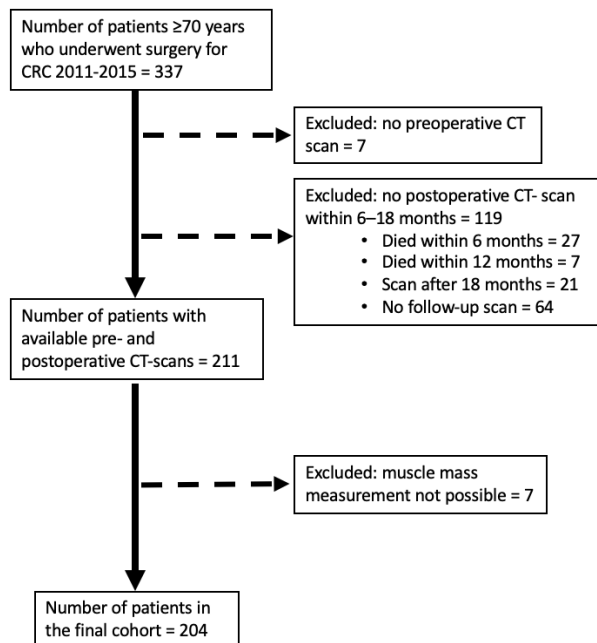


Figure 1. Flow chart of patient inclusion

Evaluating the ACS-NSQIP surgical risk calculator in predicting 30 day complications and Length of stay in Gynaecology Oncology patients

Introduction

The aim of the study was to assess the ability of the ACS NSQIP (American College of Surgeons National Surgical Quality Improvement Program) surgical risk calculator to predict complications occurring within 30 days post operative and length of hospital admission in cohort of patients undergoing Gynaecology oncology operations.

Methods

We randomly selected 75 patients who underwent gynaecology oncology surgery for cervical, ovarian and endometrial cancer in a tertiary referral centre from 2016 to 2018, with 25 patients from each cancer type. We input the pre-operative risk factors from each patient in to the ACS NSQIP risk calculator and generated predicted risk profiles and predicted length of stay for each patient. We compared the predicted and observed outcomes by measuring the Brier score and ROC area under the curve. We assessed the capacity of the risk calculator to correctly predict length of stay by classifying the prediction as underestimating, correctly estimating or overestimating.

Results

25 patients of each cancer group (ovarian, endometrial, cervical) were randomly selected. 60 % of the cohort were under 65, 14% aged 65-74 and 25% aged 75-84. 77% of the cohort were ASA 1-2. There was difference between the 3 cancer groups with 100 % of the cervical group ASA grade 1-2 and 96% under 65, compared to 56% of the ovarian group under 65 and 72% ASA 1-2. The overall observed rate of any complication was 21% compared to the mean predicted rate of any complication of 4.86%. The ROC area under the curve was low 0.534 and brier score was 0.18 for any complication. Length of stay was predicted correctly for 42 %, underestimated in 47% and overestimated in 11%.

Conclusion

The ACS NSQIP tool poorly predicted 30 day post operative complications for patients undergoing gynaecology oncology surgery for our cohort of patients, with a much higher rate of complication than the tool predicts. The length of stay was largely underestimated. This indicates the need for a more specific tool for predicting complications and length of stay in Gynaecology oncology patients.

EBPOM 2019

Title: Postponed surgery to optimize patients with acute obstructive colon cancer - a retrospective study

Aim: Obstructing right sided colon cancer usually is treated with acute resection. It is known that patients with obstructive colon cancer (OCC) have worse mortality and morbidity rates compared to patients without obstruction. The aim of our study is to analyse if postponing surgery and thereby optimising the patients' medical condition improves post-operative outcomes in patients with acute right sided OCC.

Method: We retrospectively analysed all patients who underwent curative surgery for OCC in our hospital between January 2011 and December 2017. Patients were divided into two groups: acute resection and postponed surgery. Post-operative results between the groups were compared.

Results: Thirty seven patients (57%) of 65 patients presenting with acute right sided OCC were treated with curative intent. In seven patients (19%) surgery was postponed (5-20 days) after presentation to optimise their condition. One patient (14%) received a temporary ileostomy and eight minor complications, no major complications, were found. Thirty patients had an acute resection. Five patients (17%) received a permanent colostomy and one patient (12%) a temporary ileostomy. Six patients (20%) developed 11 major complications. Besides major complications, a total of 21 minor complications were found.

Conclusion: This study shows the feasibility of postponing surgery in patients that present with acute right sided colon cancer.

The utility of frailty screening in predicting severe postoperative complications in older patients undergoing colorectal cancer surgery: a retrospective study

Introduction

Surgical resection is the only curative treatment option for colorectal cancer (CRC). Frail older patients are at risk for adverse outcomes which may outweigh the benefits of surgery. The first step in preventing adverse outcomes is to identify the patients at risk. The Dutch 'Safety Management System' (VMS)-instrument is a frailty screening tool that is used to assess frailty upon hospital admission in four different geriatric domains: risk of delirium, history of falls, undernutrition and physical impairment. The aim of this study was to determine whether VMS-frailty can be used to predict severe postoperative complications in older patients undergoing CRC surgery.

Methods

Consecutive patients ≥ 70 years who underwent elective surgery for stage I-III CRC in seven Dutch hospitals in 2014-2018 were included. Data were retrieved from the Dutch Colorectal Audit database and hospital records. Frailty was present if the patient was considered at risk in at least two geriatric domains (VMS-score ≥ 2). The main outcome was severe postoperative complications (Clavien-Dindo (CDC) III-V) within 30 days of surgery. Secondary outcomes were complications requiring reinterventions (CDC III), intensive care unit (ICU) admissions ≥ 2 days (CDC IV) and 30-day mortality (CDC V). Predictors of severe complications were assessed with multivariate logistic regression analyses.

Results

Of the 1723 patients in the cohort, 205 (11.9%) were VMS-frail. Compared to non-frail patients, frail patients were older (81 vs 77 years, $p < 0.001$), more often female (59% vs 43%, $p < 0.001$), had higher ASA-scores (ASA III-IV 55% vs 29%, $p < 0.001$), and more comorbidities (Charlson Comorbidity Index (CCI) ≥ 2 46% vs 31%, $p < 0.001$). Frail patients

more often underwent colon resections (83% vs 72%, $p<0.001$) and open surgery (24% vs 17%, $p=0.005$). Tumor stage did not differ between the groups (stage III 28% vs 32%, $p=0.316$). Severe complications occurred significantly more often in VMS-frail patients (25% vs 14%, $p<0.001$). In multivariate analysis, VMS-frailty remained a significant predictor of overall severe complications (OR 1.86, 95% CI 1.29–2.69). VMS was also an independent predictor of reinterventions (OR 1.63, 95% CI 1.04–2.58), ICU admissions ≥ 2 days (OR 2.65, 95% CI 1.63–4.30), and postoperative mortality (OR 2.36, 95% CI 1.1–5.0).

Conclusion

As a quick frailty screening tool, VMS can identify older patients who are at an increased risk of severe postoperative complications after CRC surgery. Whether the incorporation of VMS-screening into preoperative risk modeling improves risk prediction warrants further study.

Peri-operative Anaemia Management:

A Real-world Experience of the Intravenous (IV) Iron Service at the Surgical Day Unit, ****Hospital

Introduction

Pre-operative anaemia is common, and is associated with increased transfusion rates and adverse post-operative outcomes. At *** Hospital, a pre-operative anaemia clinic was introduced in 2016.

An IV iron (iron isomaltoside 1000, 10%), is used in this clinic. This study evaluated our IV iron service and assessed the efficacy and safety of IV iron.

Methods

We reviewed medical notes of 50 patients undergoing colorectal, urology, liver, upper GI, orthopaedics that attended the IV iron service between Jul'18-Dec'18. Data on haematinics, blood transfusion and length of hospital stay (LOS) was analysed.

Mean patient age was 66 years and mean body weight was 74.7 kg. 60% of patients were female. At baseline, haemoglobin (Hb) was captured in 100% patients, with an average value of 105 g/L. Among 50 patients, 96% had a Hb < 120 g/L, 54% had a Hb < 110 g/L, and 30% had a Hb < 100 g/L. Ferritin and transferrin saturation (TSAT%) level were captured in 90% and 86% of patients, respectively. The average values for ferritin and TSAT% suggest that most patients had iron deficiency anaemia.

Results

The average IV iron cumulative dose was 1330 mg.

Most patients (86%) received their total prescribed dose in one administration. The average time interval between IV iron infusion and the surgery was 26 days (Table 1).

No ADRs of hypersensitivity reported. 98% of infusions were completed successfully.

Table 1

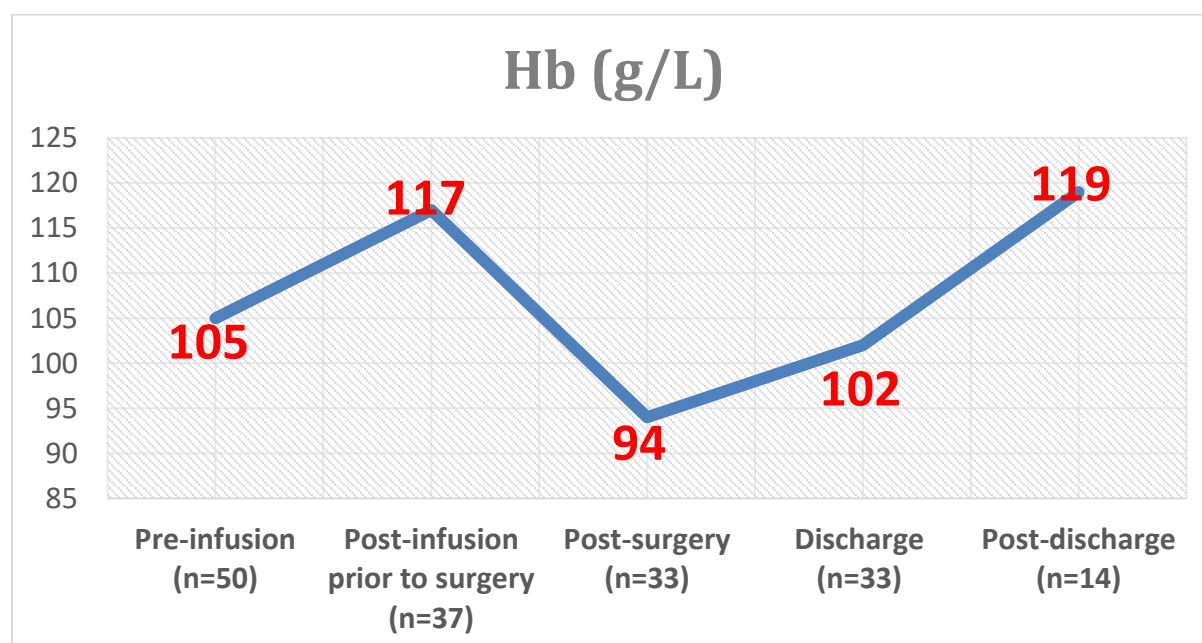
Parameter	n=50
IV iron dose (mg)	n=50
Mean	1330
Min-Max	500-2800
≥1000 mg prescriptions	
n (%) receiving > 1000 mg	29 (58%)
n (%) receiving ≤ 1000 mg	22 (42%)
Appointments	
Total number of appointments	57
Total number of patients (%) receiving total dose in one administration	43/50 (86%)
n (%) of patients receiving > 1000 mg of iron in one	21 (42%)

administration.	
Time interval between IV iron and surgery	n=29
Mean gap (days) (median, SD)	26 (16, 28)
Min-Max	0-104
Safety	
n (%) of ADR	3/57 (5%)
n (%) of infusions completed successfully	56/57 (98%)

Hb rose substantially from 105 g/L to 117 g/L post IV iron infusion, dropped to 94 g/L post surgery, then rose to 102 g/L at discharge, and reached 119 g/L post discharge (Fig. 1).

Post Surgery Outcomes - Only 1 out of 50 patients needed blood transfusion intra/post-op (# of blood units = 6). Average length of hospital stay was 7 days, Min-Max = 0-33 days.

Figure 1



Conclusion

Treatment with iron isomaltoside resulted in a substantial increase in haemoglobin, and a high proportion of patients reached a Hb level of more than 120 g/L before surgery.

Some patients remained anaemic even after treatment indicating that patients had high iron needs, and possibly required to be treated earlier in order to reach a satisfactory Hb level at the time of surgery.

Only one patient required blood transfusion in this dataset highlighting effectiveness of this treatment. Iron isomaltoside was well tolerated.

The Impact of a Perioperative Medicine Programme on postoperative outcomes of Urological Patients.

Introduction

A perioperative medicine programme was introduced in 2016 at **** Hospital . Comprising of early risk assessment via CPET testing, education and behaviour change advice given via surgery school and comorbidity management via high risk patient shared decision making clinics. Urology patients were one of the pilot cohorts for this pathway. This abstract presents the impact of this service on postoperative outcomes including pulmonary complications, critical care utilisation and overall length of hospital stay.

Methods

From April 2016 outcome data has been collected prospectively on all urological patients referred to the perioperative medicine team, undergoing cystectomy and nephrectomy at UHS. This has been compared with baseline outcome data collected retrospectively from 2015 before the introduction of the perioperative medicine programme.

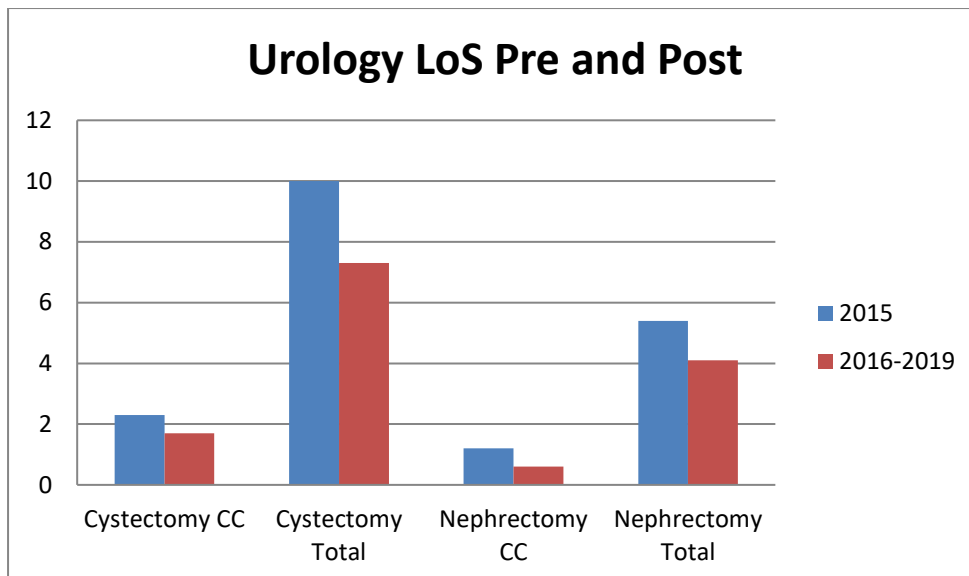
Results

From April 2016 to March 2019, 318 patient underwent elective urological resection cystectomy (n=133) and nephrectomy (n=185) at UHS. Of these 87% were seen by the perioperative medicine team. Outcome results were averaged over the 3yr period 2016-2019 and compared with data from 2015. See Table 1

Table 1

	Critical care days Mean (range)	Total Length of Stay Mean (median)	Pulmonary Complications (n=)
CYSTECTOMY			
2015 (n=53)	2.3 (0-24)	10 (6)	9.4% (5/53)
2016-2019 (n=124)	1.7 (0-15)	7.3 (5.5)	6.5% (8/124)
NEPHRECTOMY			
2015 (n=67)	1.2 (0-14)	5.4 (6)	9.0% (6/67)
2016-2019 (n= 154)	0.6 (0-9)	4.1 (3)	7.1% (11/154)

Figure 1



Compared with the baseline. Patients undergoing cystectomy / nephrectomy since the introduction of the perioperative medicine pathway stayed 0.6 days less in critical care, 2.3 and 1.3 respectively days less in hospital (Figure 1), and had a reduction in pulmonary complications of 31% (cystectomy) and 22% (nephrectomy).

Conclusion

A perioperative medicine pathway is useful in patients undergoing elective urological resection and appears effective in reducing length of stay and postoperative pulmonary complications.

A Perioperative Anaemia Service – A cost effective way of reducing blood transfusions in elective surgery

Introduction

The association of anaemia and poor outcomes after major surgery is well established (Baron et al., 2014; Musallam et al., 2011). It is also well established that blood transfusion is harmful (Acheson, Brookes, & Spahn, 2012; Wilson et al., 2017). There is some evidence for a reduction in blood transfusion when perioperative anaemia is actively managed (Diez-Lobo, Fisac - Martin I, Bermejo-aycar, & Munoz, 2007; Lidder et al., 2007) and ‘perioperative anaemia services’ are quite common, with national guidelines supporting their existence (Munoz et al., 2017) with an increasing evidence for their cost-effectiveness (Froessler, Rueger, & Connolly, 2018). Whilst we await robust outcome data for treatment leading to improved outcomes the fiscal piece is becoming difficult to ignore.

Method

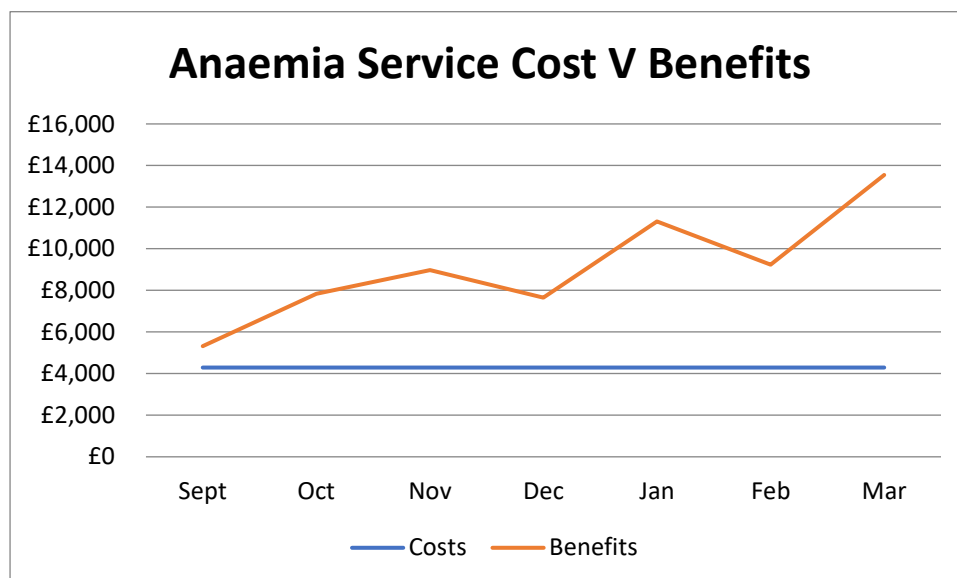
A retrospective observational audit was undertaken in 2016 to determine the baseline prevalence of anaemia and transfusion for all cystectomies, and colorectal resections (Delroy-Buelles, Fernandes, & Plumb, 2017). Following this, a pilot anaemia service was run in colorectal and urology from 2017-2018 to assess the feasibility of an ‘anaemia service’ and gather data for a business case to fund a perioperative anaemia nurse and 1PA of consultant time. These posts were funded from September 2018, when the service was widened to include all GI, Liver, urological and maxfax resections. Here we outline the financial efficiencies demonstrated by the service.

Results

During the first 7 months of the funded service, 471 patients were referred to the service with an Hb <120. A tariff of £49 was applied to each patient to cover the time spent reviewing the anaemia status and planning treatment within a virtual clinic. An average of 30% of all referred patients required an iron infusion. This was charged as a day case procedure (£300) which was offset against the cost of the average dose of IV iron (£200). Blood transfusion savings were calculated based on a 50% reduction in transfusion rate identified in the pilot service, where 19% of anaemic patients required a transfusion.

		Sept	Oct	Nov	Dec	Jan	Feb	Mar	TOTAL
Anaemia costs	0.8 WTE B6 Nurse	£2,699	£2,699	£2,699	£2,699	£2,699	£2,699	£2,699	£18,893
	1 PA Consultant	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000	£1,000	£7,000
	0.3 WTE B3 Admin	£592	£592	£592	£592	£592	£592	£592	£4,144
TOTAL		£4,291	£4,291	£4,291	£4,291	£4,291	£4,291	£4,291	£30,037
Number of referrals		31	60	69	54	86	68	103	471
Anaemia Benefits	Virtual Clinic Tariff @£49 for all referrals	£1,519	£2,940	£3,381	£2,646	£4,214	£3,332	£5,047	£23,079
	Anaemia Iron Infusions - Income from admission minus cost of iron £300-£200=£100 per patient	£2,000	£1,600	£1,700	£2,000	£2,300	£2,000	£2,500	£14,100

	Blood transfusion savings £300 per infusion saved, based on 50% reduction	£1,800	£3,300	£3,900	£3,000	£4,800	£3,900	£6,000	£26,700
TOTAL		£5,319	£7,840	£8,981	£7,646	£11,314	£9,232	£13,547	£63,879



The overall cost of the service over 7 months = £30,037, the benefits = £63,879, resulting in a net benefit of £33,842 .

This net benefit does not account for length of stay reductions, as a recent GIRFT Provider report has reported anaemic surgical patients have an average length of stay 2.5 days longer than non-anaemic patients (NHS Improvement, 2018) .

Conclusion

Investment in a perioperative anaemia service has proven to be cost effective in optimising anaemic patients prior to surgery. Net benefit is likely to increase with time as referrals increase and length of stay savings realised.

References

- Acheson, A. G., Brookes, M. J., & Spahn, D. R. (2012). Effects of allogeneic red blood cell transfusions on clinical outcomes in patients undergoing colorectal cancer surgery: a systematic review and meta-analysis. *Ann Surg*, 256(2), 235-244. doi:10.1097/SLA.0b013e31825b35d5
- Baron, D. M., Hochrieser, H., Posch, M., Metnitz, B., Rhodes, A., Moreno, R. P., . . . European Society of, A. (2014). Preoperative anaemia is associated with poor clinical outcome in non-cardiac surgery patients. *Br J Anaesth*, 113(3), 416-423. doi:10.1093/bja/aeu098

- Delroy-Buelles, A., Fernandes, P., & Plumb, J. S. C. A. a. t. A. (2017). *PRE-OPERATIVE ANAEMIA - IS THERE A PROBLEM? - ESTABLISHING A SERVICE* Paper presented at the SARS, Dublin.
<http://surgicalresearch.org.uk/wp-content/uploads/2016/12/PERIOPERATIVECARE.pdf>
- Diez-Lobo, A. I., Fisac - Martin I, M. P., Bermejo-aycar, I., & Munoz, M. (2007). Preoperative intravenous iron administration corrects anemia and reduces transfusion requirement in women undergoing abdominal hysterectomy. *Transfusion Alternatives in Transfusion Medicine*, 9(2), 114-119. doi:10.1111/j.1778-428X.2007.00060.x
- Froessler, B., Rueger, A. M., & Connolly, M. P. (2018). Assessing the costs and benefits of perioperative iron deficiency anemia management with ferric carboxymaltose in Germany. *Risk Manag Healthc Policy*, 11, 77-82. doi:10.2147/RMHP.S157379
- Goodman, H., Parsons, A., Davison, J., Preedy, M., Peters, E., Shuldham, C., . . . Cowie, M. R. (2008). A randomised controlled trial to evaluate a nurse-led programme of support and lifestyle management for patients awaiting cardiac surgery 'Fit for surgery: Fit for life' study. *Eur J Cardiovasc Nurs*, 7(3), 189-195. doi:10.1016/j.ejcnurse.2007.11.001
- Lidder, P. G., Sanders, G., Whitehead, E., Douie, W. J., Mellor, N., Lewis, S. J., & Hosie, K. B. (2007). Pre-operative oral iron supplementation reduces blood transfusion in colorectal surgery - a prospective, randomised, controlled trial. *Ann R Coll Surg Engl*, 89(4), 418-421. doi:10.1308/003588407X183364
- Munoz, M., Acheson, A. G., Auerbach, M., Besser, M., Habler, O., Kehlet, H., . . . Klein, A. A. (2017). International consensus statement on the peri-operative management of anaemia and iron deficiency. *Anaesthesia*, 72(2), 233-247. doi:10.1111/anae.13773
- Musallam, K. M., Tamim, H. M., Richards, T., Spahn, D. R., Rosendaal, F. R., Habbal, A., . . . Jamali, F. R. (2011). Preoperative anaemia and postoperative outcomes in non-cardiac surgery: a retrospective cohort study. *Lancet*, 378(9800), 1396-1407. doi:10.1016/S0140-6736(11)61381-0
- NHS Improvement. (2018). *Getting it Right First Time. Adult Anaesthesia and Perioperative Medicine Review - Provider Report*. NHS Improvement.
- Wilson, M. J., van Haaren, M., Harlaar, J. J., Park, H. C., Bonjer, H. J., Jeekel, J., . . . Schipperus, M. (2017). Long-term prognostic value of preoperative anemia in patients with colorectal cancer: A systematic review and meta-analysis. *Surg Oncol*, 26(1), 96-104. doi:10.1016/j.suronc.2017.01.005

An audit comparing emergency laparotomy care in a DGH to NELA standards . Does pre-operative mortality risk scoring really affect resource allocation?

Introduction

The fourth patient report of the NELA [1] states that all patients undergoing emergency laparotomy should receive a documented preoperative assessment of risk based on objective risk scoring and senior clinical judgement. This should guide allocation of resources and subsequent delivery of care. This audit assessed the performance of a DGH across three NELA key performance measures; pre-operative documentation of risk of death, presence of both a consultant surgeon and anaesthetist in theatre when mortality risk $\geq 5\%$ (as per P-POSSUM score) and admission to critical care when risk $>10\%$.

Methods

A first data collection was completed from 30 emergency laparotomies performed in Craigavon Area Hospital, Northern Ireland between November 2018 and January 2019. Patient notes were reviewed to check for completion of a pre-operative mortality risk score. Those not calculated contemporaneously were calculated retrospectively. Subsequent admissions to critical where mortality score exceeded 10% was assessed. First cycle results were presented at the local departmental audit meeting in January, highlighting the need to complete objective risk scoring. This was again raised at junior induction and the use of the NELA risk assessment app promoted throughout the hospital's surgical and anaesthetic teams. A subsequent second data collection of a further 29 emergency laparotomies was then completed between February and March 2019. This 2nd cycle assessed any change in completion rate of mortality scoring, measured consultant presence in theatre for high risk cases and re-examined critical care admissions for those with a mortality score $>10\%$.

Results

Rates of pre-operative mortality scoring fell and were below the national standard in both cycles. Consultant presence in theatre for high risk cases was higher than the national standard. Similarly, admission rates to critical care for the highest risk cases were higher than the national standard across both cycles and increased to 100% in cycle 2.

Table 1 Comparison of local, national and NELA green-rating standards of pre-operative mortality risk documentation, consultant presence in theatre when mortality risk $\geq 5\%$ and admissions to ICU/HDU when mortality risk $>10\%$.

Standard	Pre-operative documentation of mortality risk	Consultant surgeon present in theatre when risk $\geq 5\%$	Consultant anaesthetist present theatre when risk $\geq 5\%$	Both consultants present in theatre when risk $\geq 5\%$	Admission to ICU/HDU where risk $\geq 5\%$
Local cycle 1	57%	N/A	N/A	N/A	94%
Local cycle 2	52%	93%	86%	86%	100%
National	75%	92%	88%	83%	87%
NELA Green rating	85%	85%	85%	85%	85%

Conclusion

Promotion of objective mortality scoring did not improve the rate of pre-operative mortality score documentation . Despite a poor performance on this measure, consultant theatre presence exceeded the national standard, as did admissions to critical care for the highest risk patients, which reached 100%. An objective pre-operative mortality score, or lack thereof, did not appear to adversely alter resource allocation.

References

1. NELA Project Team. Fourth Patient Report of the National Emergency Laparotomy Audit. RCoA London 2018.