AUCKLAND CITY
SYMPOSIUM

‘At the heart of the matter’

The cardiac patient for non-cardiac surgery

Saturday, March 23rd 2024

School of Medicine
The University of Auckland
New Zealand

Programme & Abstracts

Table of Contents

Welcome

Welcome to the Auckland City Symposium 2024: “At the heart of the matter”. The cardiac patient for non-cardiac surgery.

Cardiovascular risk assessment and managing patients with cardiac disease is core adult anaesthetic practice. We are thrilled to bring to you a raft of international and local experts to discuss the most recent advances at the interface of perioperative medicine, cardiology and anaesthesia.

Our international speakers in 2024 are top drawer.
We are delighted to have Professor Christian Mueller, co-author of the 2022 ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery joining us keynote speaker. He will be highlighting new recommendations, discussing controversies and adapting the guidelines to a patient centred approach.
The brilliant Dr Su-Yin MacDonell from St. Paul’s Hospital in Vancouver will discuss the contentious issues around the role of biomarkers post-operatively as well as discussing the model of an anaesthesia led out-reach service that she has helped establish.

In addition, we have a host of local superstars from cardiology and cardiothoracic anaesthesia to share insights on core topics including coronary artery disease, arrythmia, pulmonary hypertension, and more.

ACS 2024 is not to be missed – it’s jam packed with useful up to date knowledge and real-world application of cardiovascular assessment and management that can improve decisions and patient outcomes.

We would like to thank our delegates, speakers and industry partners whose support ensures a fantastic day for all who attend.

We hope you all enjoy the day.

Drs Helen Lindsay, Sara Allen, Dan Cochrane & Neil MacLennan, Co-Convenors ACS 2024

International Faculty

Professor Christian Mueller

Professor of Cardiology at the University Hospital in Basel, Switzerland
Director and co-founder of the Cardiovascular Research Institute Basel (CRIB)

Professor Mueller is co-founder and director of the Cardiovascular Research Institute Basel (CRIB), and a Professor of Cardiology at the University Hospital in Basel Switzerland. He is a member of several European Society of Cardiology (ESC) expert committees, including an author of the 2022 ESC guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery, as well an accompanying paper on quality indicators for the cardiovascular pre-operative assessment and management of patients considered for non-cardiac surgery (https://pubmed.ncbi.nlm.nih.gov/36069905/). Professor Mueller's research aims to improve the early diagnosis and management of cardiovascular disorders, particularly heart failure and myocardial infarction, authoring more than 1000 peer-reviewed publications. He has an impressive record for mentoring young researchers, is president of the GREAT network, and has been a reviewer for many prestigious journals, including the New England Journal of Medicine, the Lancet, Nature, European Heart Journal, and several granting bodies.

Dr Su-Yin MacDonell BSN MD MSc (Perioperative Medicine) FRCPC

Consultant Anaesthesiologist at St Paul's Hospital

Dr MacDonell started her career as a professional ballet dancer before completing her BSN at UVIC followed by medical school and Anesthesiology residency at UBC. Following residency, Dr MacDonell had additional training in Perioperative Vascular Medicine in Hamilton, Ontario, Critical Care Ultrasound Certification through the American College of CHEST physicians, a MSc in Perioperative Medicine, through the University College of London and a Certification in Inclusive leadership through Centennial College. She is an active member of the research group at PHC and has a research interest in noise in the operating room. As a staff Anesthesiologist at St. Paul's Hospital, she is the physician lead of Perioperative Medicine and the Anesthesia Perioperative Medicine Fellowship. In May 2022, Dr MacDonell was appointed the Division Head of Perioperative Medicine within the Department of UBC Anesthesiology, Pharmacology and Therapeutics. She is currently both an executive and planning committee member for the Society for Perioperative Care and Research in addition to being the co-creator of a Perioperative Medicine educational site: sphpom.com. She is the Co-Chair of the annual Whistler Anesthesiology Summit.

New Zealand Faculty

Speakers

Dr Anthony Kueh

Dr Fiona Stewart

Dr Jonathan White

Dr Cara Wasywich

Dr Sara Allen

Dr Andrew Martin

Dr Allan Brown

Dr David Sidebotham

Programme

0745hrs	Registration Desk Open – Exhibitor Area, Atrium, School of Medicine	
0800 – 0825	Opening and welcome	
SESSION 1:	**Diagnosing prognostic coronary disease**	**Chair: Dr Helen Lindsay**
0825 – 0855	The ESC Guidelines	Prof Christian Mueller
0855 – 0915	Non-invasive testing	Dr Anthony Kueh
0915 – 0935	Medical optimisation	Dr Fiona Stewart
0935 – 1005	Revascularisation	Dr Jonathan White
1005 – 1025	Panel discussion	Panelists
1025-1055	Morning Break – Exhibitor Area, Atrium, School of Medicine	
SESSION 2:	**Post-operative events**	**Chair: Dr Julius Dale-Gander**
1055 – 1125	Postoperative complications - what is the evidence?	Dr Su-Yin MacDonell
1125 – 1145	Where do biomarkers fit in?	Prof Christian Mueller
1145 – 1215	Perioperative surveillance: outreach team, a Canadian model	Dr Su-Yin MacDonell
1205 – 1245	Panel Discussion	Panelists
1245 – 1330	Lunch Break- Exhibitor Area, Atrium, School of Medicine	
SESSION 3:	**Anaesthesia for the cardiac patient**	**Chair: Dr Natasha Altman**
1330 – 1405	Heart failure	Dr Cara Wasywich
1405 – 1435	Pulmonary hypertension and right heart failure	Dr Sara Allen
1435 – 1500	Arrhythmia management	Dr Andrew Martin
1500 – 1525	The management of cardiac problems in pregnancy	Dr Allan Brown
1525 – 1545	Afternoon Break - Exhibitor Area, Atrium, School of Medicine	
SESSION 4:	**Outcomes & Case Series**	**Chair: Dr Dan Cochrane**
1545 – 1610	The winner's curse	Dr David Sidebotham
1610 – 1630	Quality measures vs perioperative outcomes	Prof Christian Mueller
1630 – 1655	Wrap-up questions & answers	
1655 – 1700	Closing comments and future meetings	
1700 – 1800	Drinks and Nibbles - Exhibitor Area, Atrium, School of Medicine	

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Diagnosing prognostic coronary disease: Non-invasive testing for coronary artery disease

Dr Anthony Keuh
Imaging Cardiologist, Te Toka Tumai & Auckland Heart Group

Current clinical guideline recommends non-invasive stress testing in asymptomatic patients with increased cardiovascular risk undergoing high-risk non-cardiac surgery who have poor functional capacity 1.

Stress echocardiogram is widely available and can provide useful information on physiological stress that can simulate intra-operative stresses. Prior studies have demonstrated the excellent negative predictive value of stress echocardiogram and appear to have incremental value in risk prediction of major cardiovascular events (MACE) beyond clinical assessment tool 2. Presence of obstructive coronary disease is associated with increased perioperative MACE and the sensitivity of stress echocardiogram for obstructive coronary disease is inherently poor such that alternative imaging is often required for those with positive stress tests. By convention, these patients with positive stress echocardiogram would undergo an invasive coronary angiogram for further coronary evaluation. Coronary CT angiogram (CTCA) has emerged as a useful non-invasive tool for anatomical assessment and has excellent sensitivity. In recent ESC guideline, CTCA has been given a IIa recommendation for the evaluation of patients undergoing intermediate or high-risk surgery who are unable to undertake functional testing 1. A recent prospective observational study of 215 patients in a head-to-head comparison of CTCA and dobutamine stress echocardiography suggested a significant incremental value of CTCA in addition to the Revised Cardiac Risk Index (RCRI) 3. RCRI with detection of stenosis of ≧50% stenosis provided the best predictive value of cardiovascular events (AUC 0.822, 0.763-0.872, $p<0.001$). On the contrary, a prospective multi-centred study evaluating CTCA in pre-operative non-cardiac surgery, supported the utility of CTCA in that the finding of extensive coronary disease is an independent predictor of MACE, but the model using combined RCRI and CTCA only showed a small incremental value beyond RCRI alone in predicting MACE 4. CTCA, however, resulted in overestimated risk, particularly amongst those with lower RCRI risk.

Given the current available data, to allow an informed discussion of risks and benefits with patients undergoing non-cardiac surgery, the clinical risk assessment tool using RCRI appears adequate while further testing with stress imaging or CTCA should be reserved for those at high risk with limited functional status in whom the result is likely to inform patient's surgical candidacy and change perioperative management.

1. Halvorsen S, Mehilli J, Cassese S, et al. 2022 ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery. Eur Heart J. 2022;43(39):3826-3924. doi:10.1093/EURHEARTJ/EHAC270
2. Cullen MW, Mccully RB, Widmer RJ, et al. Preoperative Dobutamine Stress Echocardiography and Clinical Factors for Assessment of Cardiac Risk after Noncardiac Surgery. Published online 2019. doi:10.1016/j.echo.2019.11.015
3. Ahn JH, Jeong YH, Park Y, et al. Head-to-head comparison of prognostic accuracy in patients undergoing noncardiac surgery of dobutamine stress echocardiography versus computed tomography coronary angiography (PANDA trial): A prospective observational study. J Cardiovasc Comput Tomogr. 2020;14(6):471-477. doi:10.1016/j.jcct.2020.02.001
4. Roshanov PS, Sessler DI, Chow CK, et al. Predicting Myocardial Injury and Other Cardiac Complications After Elective Noncardiac Surgery with the Revised Cardiac Risk Index: The VISION Study. Canadian Journal of Cardiology. 2021;37:1215-1224. doi:10.1016/j.cjca.2021.03.015
5. Duceppe E, Parlow J, Macdonald P, et al. Society Guidelines Canadian Cardiovascular Society Guidelines on Perioperative Cardiac Risk Assessment and Management for Patients Who Undergo Noncardiac Surgery. Canadian Journal of Cardiology. 2017;33:17-32. doi:10.1016/j.cjca.2016.09.008

Diagnosing prognostic coronary disease: Medical optimisation of a patient with coronary artery disease prior to non-cardiac surgery

Dr Fiona Stewart
Cardiologist, Auckland Heart Group

When time allows with elective surgical patients it gives a perfect opportunity to optimise a patient's cardiac treatment prior to surgery. The goal is to reduce perioperative myocardial injury and to improve the patient's long term health. Treatment aims to reduce the risk of plaque rupture and thrombosis the main cause for type 1 myocardial infarction and to improve coronary perfusion and reduce myocardial oxygen demand. Care needs to be taken to minimise perioperative hypotension, whilst avoiding tachycardia or hypertension that may occur if the medication is withheld.

Lifestyle interventions include smoking cessation and increasing exercise.

Lipid lowering therapies including statins, ezetimibe and the PCSK9 inhibitors which promote plaque stabilisation.

Antiplatelet agents are no longer given for routine primary prevention of coronary disease but are essential following acute coronary syndromes, stenting and coronary grafting and reduce thrombosis in patients with significant coronary disease. The number and choice of agent depends on timing from an acute event. The benefit of an antiplatelet agent needs to be balanced with the risk of bleeding from the surgery.

Antianginal medication particularly beta-blockers reduce myocardial oxygen consumption and inflammatory responses but are associated with severe hypotension and bradycardia given immediately preoperatively.

Withdrawal of cardiac medication either planned preoperatively or while a patient is nil by mouth may increase the risk of ischaemic events and arrhythmias.

Attention to comorbidities especially hypertension, diabetes, iron deficiency and COPD will also reduce cardiac risk.

There is always a friendly cardiologist happy to discuss patient management with you.

Postoperative complications: What is the evidence?

Dr Su-Yin MacDonell

University of British Columbia Department of Anesthesia; Perioperative Medicine Lead

An estimated 320 million surgeries are performed globally every year (1), increasingly performed on an ageing and comorbid cohort (2). Postoperative complications are common and associated with significant morbidity and mortality (3, 4), with a recent estimate ranking post-operative 30-day mortality as the third leading cause of death accounting for 7.7% of all global deaths (5). While modern advancements in perioperative care have resulted in an exceedingly low risk of intraoperative mortality, by comparison postoperative complication rates remain relatively fixed, occurring in up to 40% of adults undergoing inpatient non-cardiac surgery, and mortality rates ranging from 1-6% (3, 4, 6).

Patient sub-groups at risk of developing complications and death can be predicted with pre-operative risk tools and biomarkers; nearly all postoperative deaths occur in patients assessed as high-risk for complications (6). While these tools may serve to direct attention to those most at risk, they do not replace active surveillance. Perioperative medicine publications tend to focus on pre-operative optimisation and protocolized care packages, such as Enhanced Recovery after Surgery bundles, however there is much less discourse on the optimal structure and provision of post-operative care.

There is evidence to support the need for active surveillance of common postoperative complications. For example, the incidence of myocardial injury after non-cardiac surgery (MINs) is high, affecting up to 20% of patients, and is strongly associated with postoperative mortality (2). However, without regular surveillance, nearly 90% of MINS cases could go undetected (2, 9-11). It is important to note that elevated postoperative troponin levels also occur in non-ischemic myocardial injury, such as sepsis, pulmonary embolism, anaemia, and congestive cardiac failure, which may be associated with higher mortality than MINs (9). Myocardial injury screening has been incorporated into Canadian Guidelines (10,11) with differing recommendations for MINs screening depending on country.

There are many key papers that are useful for understanding the evolving subspecialty of perioperative medicine and many of these papers can be found (summarized) on the website https://www.sphpom.com. The papers that are likely to be the highest yield when beginning to understand the evolving landscape of perioperative medicine include the following studies: VISION (1), MANAGE (12), METs (13) and POISE 3 (14).

1. T. G. Weiser et al., Estimate of the global volume of surgery in 2012: an assessment supporting improved health outcomes. Lancet 385 Suppl 2, S11 (2015).
2. P. J. Devereaux et al., Association of Postoperative High-Sensitivity Troponin Levels With Myocardial Injury and 30-Day Mortality Among Patients Undergoing Noncardiac Surgery. JAMA 317, 1642-1651 (2017).
3. M. Pearse et al., Mortality after surgery in Europe: a 7 day cohort study. Lancet 380, 1059-1065 (2012).
4. K. Fecho, A. T. Lunney, P. G. Boysen, P. Rock, E. A. Norfleet, Postoperative mortality after inpatient surgery: Incidence and risk factors. Ther Clin Risk Manag 4, 681-688 (2008).
5. D. Nepogodiev et al., Global burden of postoperative death. Lancet 393, 401 (2019).
6. J. I. Portuondo, S. R. Shah, H. Singh, N. N. Massarweh, Failure to Rescue as a Surgical Quality Indicator: Current Concepts and Future Directions for Improving Surgical Outcomes. Anesthesiology 131, 426-437 (2019).
7. A. A. Ghaferi, J. D. Birkmeyer, J. B. Dimick, Variation in hospital mortality associated with inpatient surgery. N Engl J Med 361, 1368-1375 (2009).
8. Z. Sun et al., Postoperative Hypoxemia Is Common and Persistent: A Prospective Blinded Observational Study. Anesth Analg 121, 709-715 (2015).
9. P. J. Devereaux et al., Characteristics and short-term prognosis of perioperative myocardial infarction in patients undergoing noncardiac surgery: a cohort study. Ann Intern Med 154, 523-528 (2011).
10. E. Duceppe et al., Canadian Cardiovascular Society Guidelines on Perioperative Cardiac Risk Assessment and Management for

Patients Who Undergo Noncardiac Surgery. Can J Cardiol 33, 17-32 (2017).
11. E. Duceppe et al., Preoperative N-Terminal Pro-B-Type Natriuretic Peptide and Cardiovascular Events After Noncardiac Surgery: A Cohort Study. Ann Intern Med 172, 96-104 (2020).
12. P. J. Devereaux et al., Dabigatran in patients with myocardial injury after non-cardiac surgery (MANAGE): an international, randomised, placebo-controlled trial. Lancet 391, 2325-2334 (2018).
13. Wijeysundera DN, Pearse RM, Shulman MA, et al. Assessment of functional capacity before major non-cardiac surgery: an international, prospective cohort study. Lancet. 2018;391(10140):2631-2640. doi:10.1016/S0140-6736(18)31131-0METs trial
14. Marcucci M, Painter TW, Conen D, et al., on behalf of the POISE-3 Trial Investigators and Study Groups. Hypotension-Avoidance Versus Hypertension-Avoidance Strategies in Noncardiac Surgery: An International Randomized Controlled Trial. Ann Intern Med2023;176:605-14

Perioperative surveillance: Outreach team, a Canadian model

Dr Su-Yin MacDonell

University of British Columbia Department of Anesthesia; Perioperative Medicine Lead

While not all post-operative complications may be preventable, the ‘excess’ mortality associated with the development of a complication may be. A review of postoperative complications across multiple US centres showed marked variation in mortality despite comparable postoperative complication rates in equivalent centres (1,2). Institutional factors, including care teams with the ability to detect and manage complications early, may be a key component in reducing this ‘failure to rescue’ (1).

The immediate post-operative period reflects a time of potential physiological instability, coinciding with a transition from intensive monitoring and care, to less intensive, periodic observation on surgical wards. The development of post-operative cardiovascular or pulmonary complications may be preceded by physiologically abnormal vital signs, which may be missed by intermittent observation in increasingly busy surgical wards (3).

The cost of post-operative complications is increasing with an ageing population and more patients undergoing surgery who have multiple comorbidities (5). Post-operative care is typically coordinated by the surgical team, but increasingly may include collaborative involvement of internal medicine physicians, gerontologists, cardiologists, and anaesthesiologists.

An anesthesia-led, dedicated perioperative team targeting high-risk patients postoperatively could enhance outcomes. However, establishing such services is challenging and literature lacks guidance on practical implementation. St. Paul’s Hospital is the first programs in Canada to develop an anesthesia-led outreach program who follows high-risk surgical patients on the ward.

The strongest evidence supporting a multi-physician post-operative ‘shared-care’ model comes from the care of hip fracture patients. Integration of a Gerontology physician in the care of hip fracture patients has been shown to decrease post-operative complications, hospital length of stay, and overall mortality (6-14). While there is evidence that shared care models can benefit high risk patient groups like hip fracture patients, a systematic review of post-operative shared care models in other surgical groups showed no strong improvement in mortality or length of stay. This may reflect the lack of trials focused on higher risk surgical subgroups outside of hip fracture patients (15).

The role, structure and benefits of an anesthesia-led postoperative shared-care service is less clear in the current literature. In a previous study, a combined acute pain and critical care outreach service led by anesthesiologists decreased postoperative serious adverse events and 30-day mortality (16). Similarly, post-operative visits by dedicated anesthesiologists resulted in early detection of post-operative complications and post-operative myocardial infarctions within a week of surgery (17). Implementation of a dedicated team of ‘Anesthetist-hospitalists’ co-managing post-operative care resulted in reductions in complication rates and length of stay in medically complex patients undergoing major urologic procedures (18). Conversely, a prospective multicentre stepped-wedge cluster randomized interventional study investigated the effects of a structured post-operative anesthesia visit on postoperative day 1 and 3. Within this relatively low-risk population, the authors found no difference in 30-day mortality although the patients randomized to anesthesia visits did have lower renal complications, improvement of oxygenation and fluid therapy (19).

In our institution we pursue active surveillance of patients at risk of MINS. The vast majority of these patients are asymptomatic, and so without active surveillance they would go undetected (2, 11). Patients who experience all forms of MINS are at unacceptably high rates of MACE and all-cause mortality at one year (20). In this group of patients, however further research is needed to further define best practice.

1. I. Portuondo, S. R. Shah, H. Singh, N. N. Massarweh, Failure to Rescue as a Surgical Quality Indicator: Current Concepts and Future Directions for Improving Surgical Outcomes. Anesthesiology 131, 426-437 (2019).
2. A. A. Ghaferi, J. D. Birkmeyer, J. B. Dimick, Variation in hospital mortality associated with inpatient surgery. N Engl J Med 361, 1368-1375 (2009
3. M. Pearse et al., Mortality after surgery in Europe: a 7 day cohort study. Lancet 380, 1059-1065 (2012).
4. G. L. Ludbrook, The Hidden Pandemic: the Cost of Postoperative Complications. Curr Anesthesiol Rep 12, 1-9 (2022).
5. K. Fecho, A. T. Lunney, P. G. Boysen, P. Rock, E. A. Norfleet, Postoperative mortality after inpatient surgery: Incidence and risk factors. Ther Clin Risk Manag 4, 681-688 (2008).
6. K. V. Grigoryan, H. Javedan, J. L. Rudolph, Orthogeriatric care models and outcomes in hip fracture patients: a systematic review and meta-analysis. J Orthop Trauma 28, e49-55 (2014).
7. C. Kammerlander et al., Ortho-geriatric service--a literature review comparing different models. Osteoporos Int 21, S637-646 (2010).
8. D. Harari et al., Proactive care of older people undergoing surgery ('POPS'): designing, embedding, evaluating and funding a comprehensive geriatric assessment service for older elective surgical patients. Age Ageing 36, 190-196 (2007).
9. A. Giusti, A. Barone, M. Razzano, M. Pizzonia, G. Pioli, Optimal setting and care organization in the management of older adults with hip fracture. Eur J Phys Rehabil Med 47, 281-296 (2011).
10. A. H. Leung et al., An orthogeriatric collaborative intervention program for fragility fractures: a retrospective cohort study. J Trauma 71, 1390-1394 (2011).
11. M. Vidán, J. A. Serra, C. Moreno, G. Riquelme, J. Ortiz, Efficacy of a comprehensive geriatric intervention in older patients hospitalized for hip fracture: a randomized, controlled trial. J Am Geriatr Soc 53, 1476-1482 (2005).
12. L. Cogan et al., An audit of hip fracture services in the Mater Hospital Dublin 2001 compared with 2006. Ir J Med Sci 179, 51-55 (2010).
13. J. M. Huddleston et al., Medical and surgical comanagement after elective hip and knee arthroplasty: a randomized, controlled trial. Ann Intern Med 141, 28-38 (2004).
14. J. Guay, S. Kopp, Peripheral nerve blocks for hip fractures in adults. Cochrane Database Syst Rev 11, CD001159 (2020).
15. S. Mazzarello et al., Postoperative shared-care for patients undergoing non-cardiac surgery: a systematic review and meta-analysis. Can J Anaesth 66, 1095-1105 (2019).
16. D. A. Story et al., Effect of an anaesthesia department led critical care outreach and acute pain service on postoperative serious adverse events. Anaesthesia 61, 24-28 (2006).
17. A. Akkermans, L. M. Vernooij, W. A. van Klei, J. A. van Waes, Postoperative visits by dedicated anesthesiologists in patients with elevated troponin: a retrospective cohort study evaluating postoperative care utility and early detection of complications. Perioper Med (Lond) 9, 22 (2020).
18. G. Stier et al., Anesthesiologists as perioperative hospitalists and outcomes in patients undergoing major urologic surgery: a historical prospective, comparative effectiveness study. Perioper Med (Lond) 7, 13 (2018).
19. T. S. Investigators, Routine Postsurgical Anesthesia Visit to Improve 30-day Morbidity and Mortality: A Multicenter, Stepped-wedge Cluster Randomized Interventional Study (The TRACE Study). Ann Surg 277, 375-380 (2023).
20. C. Puelacher et al., Long-term outcomes of perioperative myocardial infarction/injury after non-cardiac surgery. Eur Heart J 44, 1690-1701 (2023).

Anaesthesia for the cardiac patient: Heart failure

Dr Cara Wasywich
Cardiologist, Te Toka Tumai & Auckland Heart Group

This talk covers areas of importance for the perioperative physician treating heart failure (HF) patients.

The updated 2023 ESC Guidelines for the diagnosis and treatment of acute and chronic HF will be reviewed as relevant to the perioperative period.

HF phenotyping and the impact this has on HF treatment will be reviewed.

Management of SGLT-2 inhibitors (now indicated for all HF phenotypes) will be discussed, highlighting the importance of the risk and management of euglycaemic diabetic ketoacidosis in the perioperative period.

The relevance of chronic HF on post op mortality will be reviewed.

Specific HF syndromes will be discussed to illustrate principles of perioperative management of patients with reduced ejection fraction and preserved ejection fraction.

At the end of the talk attendees should have a better understanding of modern HF management and the impact this has on perioperative management of HF patients.

Anaesthesia for the cardiac patient: Pulmonary hypertension and right heart failure

Dr Sara Allen
Cardiothoracic Anaesthetist & Intensivist, Department of Cardiothoracic and ORL Anaesthesia, Te Toka Tumai

In this presentation, the current definitions of pulmonary hypertension and how to diagnose pulmonary hypertension will be reviewed. Patient groups that are at risk of pulmonary hypertension are identified, along with clinical findings and investigations. The risks of pulmonary hypertension, particularly in the perioperative period, will be reviewed. Finally, important aspects of management of pulmonary hypertension will be discussed.

Definitions

At the 6th World Symposium on Pulmonary Hypertension in 2018, a new definition for pulmonary hypertension was proposed, of mean pulmonary artery pressure (mPAP) at rest > 20mmHg.1 The definition was based on population data demonstrating that normal mean pulmonary artery pressures measure 14.0 +/-3.3 mmHg – thus mPAP > 20mmHg represents 2 standard deviations from normal. The proposed new definition was endorsed and expanded in the 2022 European Society of Cardiology(ESC)/European Respiratory Society (ERS) Guidelines for the diagnosis and treatment of pulmonary hypertension (PH) to include a revised cut-off value for pulmonary vascular resistance (PVR) and a definition of exercise pulmonary hypertension.2 Additionally, new definitions of pre-capillary, post-capillary, and combined pre- and post-capillary PH were established, recognising the importance of pulmonary vascular resistance (PVR).

Measurement and Diagnosis

The clinical symptoms of PH are non-specific (most commonly, dyspnoea on minimal exertion), and clinical signs occur late and are usually related to right heart failure. Thus, PH is difficult to detect and diagnose at an early stage. It is important to consider the diagnosis of PH in patients presenting for non-cardiac surgery with underlying risk factors or causative conditions, such as left heart disease, pulmonary disease, connective tissue disease. ECG abnormalities may raise suspicion of PH, and in patients with clinical suspicion of PH, ECG right axis deviation has a high predictive value.3 However, a normal ECG does not rule out PH. Normal biomarkers (BNP, NT-proBNP) with a normal ECG is associated with a low risk of PH.2 CXR commonly shows abnormalities (right atrial, right ventricular, and pulmonary artery enlargement), and may show pruning of peripheral vessels, however CXR may also be normal. Other investigations may be useful in the assessment of patients with PH, such as lung function tests, arterial blood gas analysis, cardiopulmonary exercise testing, chest computed tomography, blood tests and immunology and abdominal ultrasound.

Echocardiography is a useful screening tool, which is largely non-invasive, rapid, and in the presence of an adequate jet of tricuspid regurgitation, can provide accurate estimates of pulmonary artery pressures. A tricuspid regurgitation jet velocity > 2.8m/s is associated with PH. In addition, signs of right ventricular (RV) pressure overload and dysfunction may be readily seen with echocardiography. Echocardiography also provides information on underlying left ventricular function, valvular function, and gives estimates of haemodynamic parameters. However, echocardiography does have limitations

– if no tricuspid regurgitation is present, no estimate of PAP can be obtained, although significant PH may be present. Thus, the gold standard for diagnosis and measurement remains the right heart catheter (RHC) study. Recommendations are for investigation with right heart catheter studies with standardised protocol to ensure complete information and avoid misdiagnosis. Selected patients will also undergo vasoreactivity testing to identify responders for calcium channel blocker treatment.

Outcomes in the Perioperative Period

A 2021 systematic review of the perioperative management of patients with pulmonary hypertension undergoing non-cardiac, non-obstetric surgery reported 30-day mortality range between 2-18% for elective procedures, and 15-50% for emergency procedures. Thus, PH is an important predictor of morbidity and mortality. Risk factors for mortality include procedure-specific and patient-specific factors, especially markers of PH severity such as poor functional status.4

Management Strategies

In the perioperative period, the most important strategies are those targeted to preservation of right ventricular function, and reduction in PVR. Meticulous attention to fluid status, with adequate preload but avoidance of right ventricular distention and worsening tricuspid regurgitation is essential. Inotrope and vasopressor support to ensure adequate mean arterial blood pressure (MAP) and therefore right ventricular perfusion pressure – often with combination therapies of pressor to support MAP (e.g., noradrenaline) and inodilator agents to reduce PVR (e.g., milrinone). Ventilatory support must ensure normal arterial oxygen and CO2 levels, to reduce hypoxic pulmonary vasoconstriction and the any acidaemia due to CO2. Early active management of acidaemia (e.g, with altered ventilation strategies, or use of renal replacement therapy) is important. Pulmonary vasodilators such as inhaled nitric oxide or prostacyclin may be used as support, however these will add little value if effective ventilation and haemodynamic support is not established also. Monitoring with invasive blood pressure and central venous pressures is essential, and in most specialised centres a pulmonary artery catheter will be used, however the pulmonary artery pressures should be interpreted with care – as both rising or falling PAP may indicate right ventricular dysfunction. Mechanical circulatory support may be used as a bridge to recovery or a bridge to transplant for selected patients with PH. Specific pulmonary vasodilator agents such as ambrisentan, tadalafil, and bosentan are indicated for selected patients, and liaison with specialist centres in regard to therapy is essential, as the choice of agent will vary according to underlying PH cause, and patient comorbidities. Patients presenting for care who are receiving specific pharmacotherapies for PH should have these continued, until PH respiratory specialist advice is gained.

1. Galiè N, McLaughlin VV, Rubin LJ, et al. An overview of the 6th World Symposium on Pulmonary Hypertension. Eur Respir J 2019; 53: 1802148 [https://doi.org/10.1183/13993003.02148-2018]
2. Humbert M, Kovacs G, Hoeper MM, et al. 2022 ESC/ERC Guidelines for the diagnosis and treatment of pulmonary hypertension. Eur Heart Journal 2022; 43: 3618-3731
3. Kovacs G, Avian A, Foris V, et al. Use of ECG and other simple non-invasive tools to assess pulmonary hypertension. PLoS One 2016; 11: e0168706.
4. Price L, Martinez G, Brame A et al. Perioperative management of patients with pulmonary hypertension undergoing non-cardiothoracic, non-obstetric surgery: a systematic review and expert consensus statement. BJA 2021; 126(4): 774-790.

Anaesthesia for the cardiac patient: The management of cardiac problems in pregnancy

Dr Allan Brown B.Sc. MB.ChB. FANZCA PGDipEcho. PTEeXAM

Cardiothoracic Anaesthetist, Departments of Cardiothoracic and ORL Anaesthesia & Woman's Health Anaesthesia, Te Toka Tumai

In the developed world, cardiovascular disease is one of the leading causes of maternal mortality and morbidity in pregnancy. Ideally preexisting cardiac disease should be fully evaluated prior to pregnancy, allowing for risk stratification and patient counselling. Current cardiac risk stratification tools represent a starting point from which to individualise the patients risk based on cardiac and non-cardiac factors. Many simple cardiac issues require little addition management and can be managed locally. However, it is not uncommon for cardiac disease to worsen, to be exacerbated by hypertensive disorders of pregnancy, or for it to be diagnosed for the first-time during pregnancy. Acute decompensated presentations carry the highest risk of maternal death. Anaesthetists are an integral part of the multidisciplinary teams that need to manage these patients, stabilise, and optimize them, transfer them, or support delivery locally if options are limited. In this talk I will give a brief description of how high-risk pregnancies are managed in our departments of Woman's health and Cardiovascular Anaesthesia.

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The winner's curse

Dr David Sidebottom
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The term 'discovery trial' refers to a randomised trial testing a novel intervention that reports a large, statistically significant treatment effect (i.e., a 'discovery'). A trial by Ronco et al., which appeared in the *Lancet* in 2000, is one such example.[1] The authors reported that mortality in critically ill patients treated with high-dose renal replacement therapy was 17% less than in patients treated with conventional-dose renal replacement therapy, a difference that was associated with a very small *p*-value. Soon, high-dose renal replacement therapy became a standard of care, including in my ICU. However, two subsequent small, randomised trials failed to replicate the effect seen in the Ronco study. Then, in 2009 a large, multicentre randomised trial, (RENAL) was published in the *New England Journal of Medicine*, which found an identical mortality between high-dose and standard renal replacement therapy.[2]

In this talk, I explain why large differences between trials can occur due to random chance alone, and how it is not necessary to invoke bias or fraud to explain the differences. In particular, I will discuss how small discovery trials are prone to effect size inflation, which has been termed the 'winner's curse'. I will show, using simulated statistical testing, that when the sample size is too small (i.e., low statistical power), statistically significant results are associated with an observed effect size that is roughly twice the true effect size. By contrast, when the sample size is large enough (i.e., high statistical power), the observed effect size for significant results approximates the true effect size.

The phenomenon of effect size shrinkage in large follow-up trials has been termed 'regression to the truth' and leads to the aphorism, 'Use a new drug quickly , while it still works'.

The winner's curse is explored in more detail in a recent editorial in *Anaesthesia*, which in a quirk of fate was released online on 27th October 2023 – Halloween.[3]

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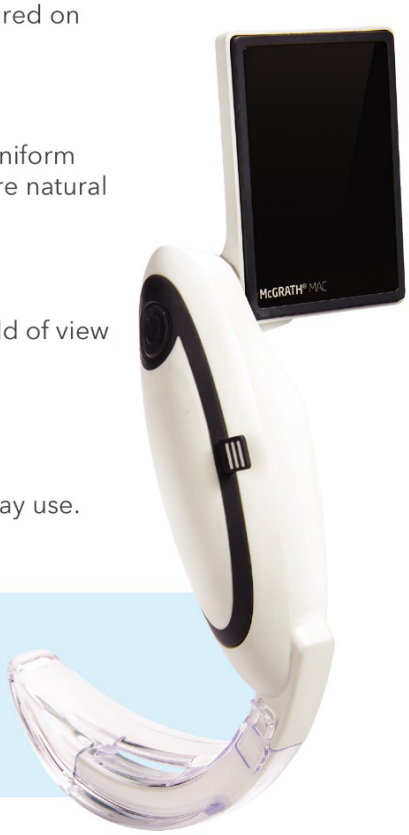

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