

**More detailed information to be shown on the JLA website for the questions discussed at the final workshop.**

PSP Name	Total number of verified uncertainties identified by the PSP	Uncertainty (PICO formatted indicative uncertainty where possible. Advised minimum requirements are 'Population' and 'Intervention'. Not all submissions may be suitable for PICO structure, but they should be in a format that will ultimately be of value to the research community)	Explanatory note (a plain language summary of up to 150 words, explaining key points of the uncertainty and why it is important, for research funders to begin working on. PSPs may wish to include examples of the original survey submissions here)	Date of the priority setting workshop	Rank of the uncertainty at the final workshop. (If no rank was agreed, please indicate)	Evidence (reference, and weblink where available, to the most recent relevant systematic review identified by the PSP, plus a maximum of 2 other systematic reviews, including protocols for future systematic reviews, that the PSP considers relevant.)
Heart Surgery PSP	45	How does a patient quality of life (QOL) change (eg disability-free survival) due to heart surgery and what factors are associated with this?	Quality of life (QOL) is a frequently assessed outcome in high quality scientific publications in cardiac surgery, often in those addressing issues related to rehabilitation. Recent guidelines regard it as a necessary criteria to consider when making a recommendation, along with life expectancy. Nonetheless, most systematic reviews report insufficient data regarding this outcome. ~ Will QOL improve after heart surgery? Compare the QOL for patients undergoing on pump vs off pump CABG. What predicts poor outcome after cardiac surgery that impacts quality of life?	11-Jul-19	1	Anderson L, Taylor RS. Cardiac rehabilitation for people with heart disease: an overview of Cochrane systematic reviews. Cochrane Database of Systematic Reviews. 2014(12); Pogosova N, Saner H, Pedersen SS, Cupples ME, McGee H, Höfer S, et al. Psychosocial aspects in cardiac rehabilitation: From theory to practice. A position paper from the Cardiac Rehabilitation Section of the European Association of Cardiovascular Prevention and Rehabilitation of the European Society of Cardiology. European journal of preventive cardiology. 2015;22(10):1290-306.
Heart Surgery PSP	45	How can we address frailty and improve the management of frail patients in heart surgery?	Frailty is a topic frequently assessed in current Guidelines, recurring more often when management of chronic heart failure is explored. Albeit scientific literature recognizes the need for frailty assessment in guiding clinical practice, no consensus is in place even in terms of which score to use and currently used risk stratification tools as EuroSCORE II and STS score do not take account of it as a variable, as pointed out in the last ESC/EACTS Guidelines on myocardial revascularization. It can be clearly seen, therefore, how research would benefit from a scientifically stricter evaluation of the impact of frailty on cardiac surgery. ~ How to address and quantify frailty in heart surgery patients? Does frailty has implications for heart surgery patient and how it can help patients to choose treatment options?	11-Jul-19	2	<a href="https://www.sign.ac.uk/sign-147-management-of-chronic-heart-failure.html">https://www.sign.ac.uk/sign-147-management-of-chronic-heart-failure.html</a> ; Sousa-Uva M, Neumann FJ, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. Eur J Cardiothorac Surg. 2019;55(1):4-90.; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64.
Heart Surgery PSP	45	How can we improve the outcomes of heart surgery patients with chronic conditions (obesity, diabetes, hypertension, renal failure, auto-immune diseases etc)?	Specific chronic conditions are taken into account in current evidence-based recommendations and investigated in systematic reviews (e.g. general advisory statements for obese patients undergoing surgery or more specific procedural recommendation like the skeletonized internal mammary artery harvesting in obese and/or diabetic patients to reduce the risk of wound infection, perioperative arterial pressure and glycaemic optimization, pharmacological and non-pharmacological interventions to protect kidneys; auto-immune diseases have been less thoroughly examined, still forms of vasculitis constitute a chapter in the ESC guidelines on aortic diseases. However, despite the abundance of literature output on these themes, the broadness of the question and gaps still present in the evidence would probably advice for further	11-Jul-19	3	Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. Eur J Cardiothorac Surg. 2018;53(1):5-33; Zacharias M, Mugawar M, Herbison GP, Walker RJ, Hovhannisyan K, Sivalingam P, et al. Interventions for protecting renal function in the perioperative period. Cochrane Database of Systematic Reviews. 2013(9). Poirier P, Alpert MA, Fleisher LA, Thompson PD, Sugerman HJ, Burke LE, et al. Cardiovascular evaluation and management of severely obese patients undergoing surgery: a science advisory from the American Heart Association. Circulation. 2009;120(1):86-95.
Heart Surgery PSP	45	Does prehabilitation (a programme of nutritional, exercise and psychological interventions before surgery) benefit heart surgery patients?	Prehabilitation has been researched more recently and less thoroughly than rehabilitation; systematic reviews and scientific statements by relevant associations focused on dietary measures address mostly general concepts of cardiovascular disease prevention. Evidence about preoperative exercise benefit in cardiac surgery can be found in systematic reviews. The SIGN Guideline on the Management of stable angina provide a review of trials investigating psychological interventions preparing patients for surgery. ~ Does prehabilitation improve outcomes in cardiac surgery patients? and in frail patients? Is there any effective prehabilitation for cardiac surgery?	11-Jul-19	4	Katsura M, Kuriyama A, Takeshima T, Fukuhara S, Furukawa TA. Preoperative inspiratory muscle training for postoperative pulmonary complications in adults undergoing cardiac and major abdominal surgery. Cochrane Database of Systematic Reviews. 2015(10);
Heart Surgery PSP	45	When should heart valve intervention occur for patients without symptoms?	People with severe valve disease take years to develop symptoms that include shortness of breath, chest pain, or even sudden death. Some patients may never develop symptoms at all. Major heart surgery is a very good treatment for patients with symptoms but can cause complications and is often associated with prolonged recovery. The dilemma is therefore: should we operate in everyone when valve disease is severe to avoid the risk of heart failure and death or wait until symptoms develop so that patients are spared unnecessary major surgery? ~ Should aortic valve replacement be performed before symptoms develop secondary to aortic stenosis? Would long term survival be improved if the surgery was undertaken before the onset of symptoms?	11-Jul-19	5	Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP, Guyton RA, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Journal of the American College of Cardiology. 2014;63(22):2438-88; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64.
Heart Surgery PSP	45	How does minimally-invasive heart surgery compare to traditional open surgery?	Minimally invasive techniques have been developed that allow surgery to be performed through smaller incisions, or without the use of the heart lung machine. These operations reduce the extent of the surgical incision and have been shown to limit perioperative bleeding and blood transfusion in trials. However, minimally invasive techniques are technically more challenging and therefore have potential additional risks. Whether these operations are better than traditional open surgery or new percutaneous techniques and devices is unclear. ~People asked is Minimally Invasive Direct Coronary Artery Bypass (MIDCAB) better then open heart surgery? Does endoscopic vein harvesting EVH contribute to early discharge and better patient experience?	11-Jul-19	6	Kirmani BH, Jones SG, Malaisrie SC, Chung DA, Williams R. Limited versus full sternotomy for aortic valve replacement. Cochrane Database of Systematic Reviews. 2017(4); Abbraha I, Romagnoli C, Montedori A, Ciocchi R. Thoracic stent graft versus surgery for thoracic aneurysm. Cochrane Database of Systematic Reviews. 2016(6);
Heart Surgery PSP	45	How do we minimise damage to organs from heart-lung machine/heart surgery (heart, kidney, lung, brain and gut)?	Organ injury or failure affecting the heart, lung, brain, or kidneys, complicates up to 50% of all cardiac surgery operations. Organ protection is a major theme in cardiac surgery research and strategies tailored to optimise this outcome are considered in all major guidelines. However, despite decades of research, the pathogenesis of these conditions remains poorly understood and effective organ protection interventions are not in widespread use. ~ Can something with cardiopulmonary bypass (CPB) be done to prevent inflammatory aspects of heart surgery? How do myocardial protection techniques impact on outcome of heart surgery? Does use of cerebral oximetry during CPB reduce acute renal failure in cardiac surgical patients? Can stroke be prevented post-surgery?	11-Jul-19	7	Yu Y, Zhang K, Zhang L, Zong H, Meng L, Han R., Cerebral near infrared spectroscopy (NIRS) for perioperative monitoring of brain oxygenation in children and adults. Cochrane Database of Systematic Reviews. 2018(1); Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. Eur J Cardiothorac Surg. 2018;53(1):5-33.

Heart Surgery PSP	45	Can we use 3D bioprinting or stem cell technology to create living tissues (heart valves/heart) and repair failing hearts (myocardial regeneration)?	3D printing in combination with stem cell technology offers the potential for surgical prosthesis that have enhanced durability, low thrombogenicity, and plasticity. This would reduce the requirements for repeated procedures over the lifetime of the patient, as well as both the need for anticoagulation and risk of thrombosis. No RCTs were identified to examine 3D bio-printing. Systematic review identified 38 trials on stem cell therapy for chronic ischaemic heart disease. These trials did not demonstrate efficacy, however, there were important design limitations in all of these trials, which limit the interpretation. ~ Can stem cell therapy be of any use in heart surgery? Can stem cells be used to create transplantable components (i.e. valves) rather than use mechanical or pig or cow tissue? Is 3D printing of valves and solid hearts realistic or does it bring false hope?	11-Jul-19	8	Fisher SA, Zhang H, Doree C, Mathur A, Martin-Rendon E. Stem cell treatment for acute myocardial infarction. <i>Cochrane Database Syst Rev.</i> 2015(9):CD006536; Fisher SA, Doree C, Mathur A, Taggart DP, Martin Rendon E. Stem cell therapy for chronic ischaemic heart disease and congestive heart failure. <i>Cochrane Database of Systematic Reviews.</i> 2016(12); Moazzami K, Roohi A, Moazzami B. Granulocyte colony stimulating factor therapy for acute myocardial infarction. <i>Cochrane Database Syst Rev.</i> 2013(5):CD008844.
Heart Surgery PSP	45	What are the most effective ways of preventing and treating post-operative atrial fibrillation?	New onset atrial fibrillation can occur in about 30% of people undergoing heart surgery where it is associated with morbidity including stroke, prolonged hospitalisation, and increased healthcare costs. There are no effective interventions that prevent or reduce the frequency of postoperative atrial fibrillation (AF). The evidence in favour of both pharmacological and non-pharmacological prophylaxis is low because of the quality and the heterogeneity of the data, and choice of the best individualized intervention for patients is still problematic. Moreover, recommendations for management of anticoagulation in postoperative atrial fibrillation in the EACTS guidelines remain class IIa level C. ~ What is the best option for management of postoperative AF? are there patient sub groups according to pathology/ co-morbidities that affect the management strategies?	11-Jul-19	9	Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. <i>Eur J Cardiothorac Surg.</i> 2018;53(1):5-33; Huffman MD, Karmali KN, Berendsen MA, Andrei AC, Kruse J, McCarthy PM, et al. Concomitant atrial fibrillation surgery for people undergoing cardiac surgery. <i>Cochrane Database of Systematic Reviews.</i> 2016(8);
Heart Surgery PSP	45	How do we reduce and manage infections after heart surgery including surgical site/sternal wound infection and pneumonia?	The incidence of surgical site infections (SSI) in UK cardiac surgery centres was 3.8% following coronary artery bypass grafts (CABG) and 1.7% in non-CABG operations. This is associated with a 10-fold increase in mortality, a six-fold increase in the risk of readmission to hospital. Likewise, pulmonary complications such as lower respiratory tract infection can lead to prolonged ICU and hospital stay and result in a six-fold increase in mortality. The Cardiothoracic Interdisciplinary Research Network has recently completed a Cochrane systematic review of trials of interventions to prevent or reduce SSI in cardiac surgery. Identified evidence gaps related to choice of preoperative skin antiseptic, antibiotic prophylaxis duration and choice, dexamethasone effect on wound healing, dressing removal time, and benefits of microbial sealants. Evidence on the prevention of post-surgery lower	11-Jul-19	10	Dumville JC, McFarlane E, Edwards P, Lipp A, Holmes A, Liu Z. Preoperative skin antiseptics for preventing surgical wound infections after clean surgery. <i>Cochrane Database of Systematic Reviews.</i> 2015(4); Liu Z, Dumville JC, Norman G, Westby MJ, Blazeby J, McFarlane E, et al. Intraoperative interventions for preventing surgical site infection: an overview of Cochrane Reviews. <i>Cochrane Database of Systematic Reviews.</i> 2018(2); (NICE) NiHaCE. Surgical site infections: prevention and treatment : guidance (CG74). 2008.
Heart Surgery PSP	45	How can we improve the communication between the medical team and patients/carers regarding the risks and benefits of heart surgery?	Communication between caregivers and patients has been rarely investigated in cardiac surgery. Our search identified a recent systematic review comparing telemedicine and usual communication, which contained a subgroup analysis of trials (only 2) conducted in cardiac surgery. More research is needed. ~ How could heart surgery procedures be better explained to patients and their family? Will including patients live or on video chat affect outcomes of multidisciplinary team?	11-Jul-19	11	Anderson L, Brown JPR, Clark AM, Dalal H, Rossau HKK, Bridges C, et al. Patient education in the management of coronary heart disease. <i>Cochrane Database of Systematic Reviews.</i> 2017(6); Fiodgren G, Rachas A, Farmer AJ, Inzitari M, Shepperd S. Interactive telemedicine: effects on professional practice and health care outcomes. <i>Cochrane Database Syst Rev.</i> 2015(9):CD002098.
Heart Surgery PSP	45	What are the benefits of heart surgery in older patients?	Most guidelines comment on the surgical risk in older patients, mostly exploring the concept of frailty and comparing cardiac surgery with interventional alternatives, and several high quality systematic reviews assess the efficacy of strategies targeted to optimize the treatment in older patient. Moreover, careful patients selection and preoperative assessment in geriatric patients has been investigated across various surgical disciplines along with rehabilitation strategies targeted to the patient's age	11-Jul-19	12	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. <i>Cochrane Database of Systematic Reviews.</i> 2018(1); Sousa-Uva M, Neumann FJ, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. <i>Eur J Cardiothorac Surg.</i> 2019;55(1):4-90.; Falk V, Baumgartner H, Bax JJ, De
Heart Surgery PSP	45	What are the long-term outcomes, including life expectancy, after heart surgery?	Life expectancy deserves similar considerations to the ones made for quality of life. It is surely a criteria considered in risk stratification and in guidelines, while it was not assessed in any systematic review identified in our search. The question should be considered unanswered mostly because long term outcomes should be included in heart surgery research when investigating every issue, as part of good research practice. What are the factors that affect patients' survival? and what is the impact of cardiac surgery on quality of life and life expectancy in elderly patients?	11-Jul-19	13	Sousa-Uva M, Neumann FJ, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. <i>Eur J Cardiothorac Surg.</i> 2019;55(1):4-90; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. <i>Eur J Cardiothorac Surg.</i> 2017;52(4):616-64; Erbel R, Aboyans V, Boileau C, Bossone E, Bartolomeo RD, Eggebrecht H, et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). <i>Eur Heart J.</i> 2014;35(41):2873-926.
Heart Surgery PSP	45	What are the best ways to prevent, diagnose and treat patients with acute aortic dissection (including long-term management)?	The European Guidelines on the diagnosis and treatment of aortic diseases identify a series of gap in current knowledge mostly related to aortic aneurysm and chronic dissection that can nonetheless be extended to aortic dissection. ~ Research into aortic dissection including diagnosis, management, new procedures is needed. What can we do to improve early diagnosis of aortic dissection? How can emergency treatment Aortic Dissection be improved? At what measurements should aortic repair be considered with aortic aneurysms?	11-Jul-19	14	Erbel R, Aboyans V, Boileau C, Bossone E, Bartolomeo RD, Eggebrecht H, et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). <i>Eur Heart J.</i> 2014;35(41):2873-926; L. F. Hiratzka, G. L. Bakris, J. A. Beckman, R. M. Bersin, V. F. Carr, D. E. Casey, K. A. Eagle, L. K. Hermann, E. M. Isselbacher, E. A. Kazerooni, N. T. Kouchoukos, B. W. Lytle, D. M. Milewicz, D. L. Reich, S. Sen, J. A. Shinn, L. G. Svensson, D. M. Williams, G. American College of Cardiology Foundation/American Heart Association Task Force on Practice, S. American Association for Thoracic, R. American College of, A. American Stroke, A. Society of Cardiovascular, A. Society for Cardiovascular, Interventions, R. Society of Interventional, S. Society of Thoracic and M. Society for Vascular ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the diagnosis and management of patients with thoracic aortic disease. A Report of the

Heart Surgery PSP	45	Does ERAS (Enhanced Recovery After Surgery) improve outcomes in heart surgery?	Enhanced recovery is a modern evidence-based approach that helps people recover more quickly after having major surgery. Whilst the principles of enhanced recovery can be applied to all cases of surgery, specially designed pathways for cardiac surgery help patients benefit from the principles more effectively. ~ Does Enhanced Recovery after Surgery (ERAS®) improve clinical outcomes of cardiac surgery? Which is the best timing to awake the patient after the surgery? Does local anesthesia improve recovery after cardiac surgery?	11-Jul-19	15	Smith MD, McCall J, Plank L, Herbison GP, Soop M, Nygren J. Preoperative carbohydrate treatment for enhancing recovery after elective surgery. Cochrane Database of Systematic Reviews. 2014(8); Wong WT, Lai VKW, Chee YE, Lee A. Fast track cardiac care for adult cardiac surgical patients. Cochrane Database of Systematic Reviews. 2016(9).
Heart Surgery PSP	45	Does having access to specialist cardiac nurses or consultants by electronic methods improve outcomes for heart surgery patients?	Effectiveness, acceptability and costs of interactive telemedicine have been assessed in Flodgren et al. review with a specific subgroup analysis concerning in trials following cardiac events and cardiac surgery or procedures. Even though the findings about effectiveness can be encouraging, costs and acceptability of the intervention are not clearly reported. ~ Does having access to specialist cardiac nurses or consultants by electronic means improve outcomes?	11-Jul-19	16	Flodgren G, Rachas A, Farmer AJ, Inzitari M, Shepperd S. Interactive telemedicine: effects on professional practice and health care outcomes. Cochrane Database Syst Rev. 2015(9):CD002098.
Heart Surgery PSP	45	What is the best strategy for managing acute heart failure after heart surgery (inotropic drug, mechanical support or intravascular devices)?	Current guidelines contain recommendations focused on patients affected by heart failure, additional references can be identified among NICE and SIGN guidelines, society statements and systematic reviews. Low quality evidence is available for preoperative beta-blockers therapy in heart failure prevention. Limited prospective randomized, multicentre data are available for mechanical circulatory support use, and there are concerns about their cost-effectiveness. ~ What is the optimal inotrope for support for coming off bypass in patients with right heart failure? Does the use of Impella / Intra-Aortic Balloon Pump (IABP) improve outcomes in patients after cardiac surgery with low cardiac output syndrome?	11-Jul-19	17	Rihal CS, Naidu SS, Givertz MM, Szeto WY, Burke JA, Kapur NK, et al. 2015 SCAI/ACC/HFSA/STS Clinical Expert Consensus Statement on the Use of Percutaneous Mechanical Circulatory Support Devices in Cardiovascular Care (Endorsed by the American Heart Association, the Cardiological Society of India, and Sociedad Latino Americana de Cardiologia Intervencion; Affirmation of Value by the Canadian Association of Interventional Cardiology-Association Canadienne de Cardiologie D'intervention). Catheter Cardiovasc Interv. 2015;85(7):E175-96; Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. Eur J Cardiothorac
Heart Surgery PSP	45	What can patients do (in terms of their lifestyle choices - exercise, diet, smoking, well-being etc.) before and after heart surgery to improve outcomes?	Cardiac rehabilitation is an extensively investigated topic in cardiac surgery research. On the other hand, despite general advices concerning prevention of cardiovascular diseases can be widely found in guidelines and systematic reviews, specific evidence in favour of prehabilitation are gaining increasing strength in the past years. However, which interventions may benefit which kind of patient certainly needs further research. ~ Will exercise before surgery improve outcomes? What exercises or sports should the patients engage in or avoid? Does improving nutritional status before surgery have an impact on outcomes of cardiac surgery?	11-Jul-19	18	Katsura M, Kuriyama A, Takeshima T, Fukuhara S, Furukawa TA. Preoperative inspiratory muscle training for postoperative pulmonary complications in adults undergoing cardiac and major abdominal surgery. Cochrane Database of Systematic Reviews. 2015(10); Ziehm S, Rosendahl J, Barth J, Strauss BM, Mehnert A, Koranyi S. Psychological interventions for acute pain after open heart surgery. Cochrane Database of Systematic Reviews. 2017(7); Egholm JWM, Pedersen B, Møller AM, Adami J, Juhl CB, Tønnesen H. Perioperative alcohol cessation intervention for postoperative complications. Cochrane Database of Systematic Reviews. 2018(11).
Heart Surgery PSP	45	How do transcatheter techniques for heart valve surgery compare to traditional open surgery (TAVI vs AVR)?	Recommendation on the choice of surgical or transcatheter intervention have been made and updated on current guidelines on the base of 4 major trials and several observational studies. NICE Guidelines on transcatheter aortic valve implantation are available. Despite the abundant amount of evidences, because of the relatively new topic and of the recent advancements in both techniques, further research is mandatory. ~ Compare the outcomes of TAVI valves vs open procedures using either conventional prosthesis or modified TAVI. What are the long-term outcomes from transcatheter valve procedures in the intermediate risk patients?	11-Jul-19	19	Holmes DR, Mack MJ, Kaul S, Agnihotri A, Alexander KP, Bailey SR, et al. 2012 ACCF/AATS/SCAI/STS expert consensus document on transcatheter aortic valve replacement: developed in collaboration with the American Heart Association, American Society of Echocardiography, European Association for Cardio-Thoracic Surgery, Heart Failure Society of America, Mended Hearts, Society of Cardiovascular Anesthesiologists, Society of Cardiovascular Computed Tomography, and Society for Cardiovascular Magnetic Resonance. The Annals of thoracic surgery. 2012;93(4):1340-95; Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP, Guyton RA, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: executive summary: a
Heart Surgery PSP	45	What are the best cardiovascular medications for management in heart surgery (e.g. ACE-inhibitors, antiplatelet, anticoagulant)?	Numerous references were identified by our search strategy in terms of the best cardiovascular medicines to use in perioperative management for cardiac surgery, both in recent guidelines and systematic reviews. However, considering the broad and controversial nature of the question, further research may be required. ~ What anti-platelet agents should be used routinely after CABG surgery? Effect of NOACs vs warfarin for post operative AF?	11-Jul-19	20	Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. Eur J Cardiothorac Surg. 2018;53(1):5-33; Andras A, Stansby G, Hansrani M. Homocysteine lowering interventions for peripheral arterial disease and bypass grafts. Cochrane Database of Systematic Reviews. 2013(7); Lewicki M, Ng I, Schneider AG. HMG CoA reductase inhibitors
Heart Surgery PSP	45	Do outcomes of heart surgery and follow-up time vary by postcode/location and how to reduce the variation?	Despite our search could not identify relevant sources, the effect of location on outcome in cardiac surgery is a rarely explored concept that could however change current practice, as highlighted in recent publications. ~ Are postcodes indicative of outcomes in cardiac surgery? Why does the follow-up periods vary so much, district to district? Is there any way to narrow the variation in outcomes across cardiac units?	11-Jul-19	21	<i>no reference</i>

**Data management spreadsheet for use by Priority Setting Partnerships for all questions received. Spreadsheet to be published on the JLA website at [www.jla.nihr.ac.uk](http://www.jla.nihr.ac.uk) on completion of the PSP.**

Correct at 11 July 2019

Note: Others include researchers and unknown

ID	Uncertainty (PICO formatted indicative uncertainty where possible. Advised minimum requirements are 'Population' and 'Intervention'. Not all submissions may be suitable for PICO structure, but they should be in a format that will ultimately be of value to the research community)	Original uncertainty	Evidence (reference, and weblink where available, to the most recent relevant systematic review identified by the PSP, plus a maximum of 2 other systematic reviews, including protocols for future systematic reviews, that the PSP considers relevant.)	Source of Uncertainty (if there are multiple sources, a PSP may wish to show them e.g. 1 x patient, 19 x clinician, 4 x research recommendations)
Q51	What are the benefits of heart surgery in older patients?	<i>What are the benefits of heart surgery in older (&gt;80) patients? Is there a socioeconomic benefit to operating on patients ≥75 years old. Are we improving quality of life? What is the impact of cardiac surgery on quality of life and life expectancy in elderly patients?</i>	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 of Systematic Reviews. 2018(1); Sousa-Uva M, Neumann FJ, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. Eur J Cardiothorac Surg. 2019;55(1):4-90.; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64.	17 (1 x patient; 16 x healthcare professional)
Q52	How can we address frailty and improve the management of frail patients in heart surgery?	<i>Does frailty has implications for heart surgery patient and how it can help patient to choose treatment options? How to address and quantify frailty in heart surgery patients? What is the long term benefit of complex surgery in frail patients with multiple co-morbidities?</i>	<a href="https://www.sign.ac.uk/sign-147-management-of-chronic-heart-failure.html">https://www.sign.ac.uk/sign-147-management-of-chronic-heart-failure.html</a> ; Sousa-Uva M, Neumann FJ, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. Eur J Cardiothorac Surg. 2019;55(1):4-90.; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64.	15 (14 x healthcare professional, 1 x others)
Q53	How can we improve the outcomes of heart surgery patients with chronic conditions (obesity, diabetes, hypertension, renal failure, auto-immune diseases etc.)?	<i>If co-morbidities (hypertension, diabetes) are well managed long term by the patient, does it change the risk profile in major cardiovascular surgery/anaesthesia? Does having an autoimmune disease increase the risk of complications during cardiac surgery? Does preoperative anaemia affect outcome from heart surgery? Effect of obesity on outcomes of cardiac surgery? Effect of</i>	Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. Eur J Cardiothorac Surg. 2018;53(1):5-33; Zacharias M, Mugawar M, Herbison GP, Walker RJ, Hovhannisyan K, Sivalingam P, et al. Interventions for protecting renal function in the perioperative period. Cochrane Database of Systematic Reviews. 2013(9). Poirier P, Alpert MA, Fleisher LA, Thompson	18 (2 x patient, 2x carer, 12 x healthcare professional, 2 x others)
Q54	What patient factors (ethnicity, underlying conditions, biomarkers, genetics etc.) affect/predict heart surgery outcomes?	<i>How can scoring systems be developed to better predict outcomes for cardiac surgery? What are the factors that increase/decrease patient's survival? What predicts poor outcome after cardiac surgery that impacts quality of life? What pre-op functional assessments predict outcomes?</i>	Musunuru K, Ingelsson E, Fornage M, Liu P, Murphy AM, Newby LK, et al. The Expressed Genome in Cardiovascular Diseases and Stroke: Refinement, Diagnosis, and Prediction: A Scientific Statement From the American Heart Association. Circulation Cardiovascular genetics. 2017;10(4); Sluijter JPG, Condorelli G, Davidson SM, Engel FB, Ferdinandy P, Hausenloy DJ, et al. Novel therapeutic strategies for cardioprotection. Pharmacology & therapeutics. 2014;144(1):60-70.	21 (2 x carers, 18 x healthcare professional, 1 x others)
Q5a	For which patients is heart surgery suitable or not suitable (in terms of patients' heart conditions and their other chronic conditions)?	<i>Patient selection - who should and who should not be offered surgery? Should morbid obesity be an exclusion factor? Is CABG warranted in dialysis patients?</i>	Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP, Guyton RA, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Journal of the American College of Cardiology. 2014;63(22):2438-88.; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64.	14 (3 x patient, 8 x healthcare professional, 3 x others)
Q91	What can patients do (in terms of their lifestyle choices - exercise, diet, smoking, well-being etc.) before and after heart surgery to improve outcomes?	<i>Is there anything patients can do to prior to heart surgery to help their survival rate? Before a heart operation what lifestyle has to be adopted? Will exercise before surgery improve outcomes? Does improving nutritional status positively impact functional outcomes?</i>	Katsura M, Kuriyama A, Takeshima T, Fukuhara S, Furukawa TA. Preoperative inspiratory muscle training for postoperative pulmonary complications in adults undergoing cardiac and major abdominal surgery. Cochrane Database of Systematic Reviews. 2015(10); Ziehm S, Rosendahl J, Barth J, Strauss BM, Mehnert A, Koranyi S. Psychological interventions for acute pain after open heart surgery. Cochrane Database of Systematic Reviews. 2017(7); Egholm JWM, Pedersen B, Møller AM, Adami J, Juhl CB, Tønnesen H. Perioperative alcohol cessation intervention for postoperative complications. Cochrane Database of Systematic Reviews. 2018(11).	48 (15 x patient, 9 x carers, 19 x healthcare professional, 5 x others)

Q92	Does prehabilitation (a programme of nutritional, exercise and psychological interventions before surgery) benefit heart surgery patients?	<i>Does prehabilitation benefit cardiac patients? Does prehabilitation improve outcomes in frail patients? Is there any effective prehabilitation for cardiac surgery?</i>	Katsura M, Kuriyama A, Takeshima T, Fukuhara S, Furukawa TA. Preoperative inspiratory muscle training for postoperative pulmonary complications in adults undergoing cardiac and major abdominal surgery. Cochrane Database of Systematic Reviews. 2015(10);	24 (21 x healthcare professional, 3 x others)
Q93	Does improving Vitamin D level before surgery improve the outcomes of heart surgery?	<i>Can improving Vitamin D status in pre surgery patients reduce length of stay and infection rates post operatively? The impact of low pre-operative Vitamin D levels on outcomes following cardiac surgery.</i>	Talasz AH, Daei MD, Karimi AK. Potential role of vitamin D supplementation in the prevention of atrial fibrillation after coronary artery bypass grafting in vitamin D deficient patients. European heart journal Conference: european society of cardiology, ESC congress 2017 Spain. 2017;38(Supplement 1):579-80; Van Cleemput J, Daenen W, Geusens P, Dequeker P, Van De Werf F, VanHaecke J. Prevention of bone loss in cardiac transplant recipients. A comparison of bisphosphonates and vitamin D. Transplantation. 1996;61(10):1495-9.	3 healthcare professional
Q94	How can we improve the communication between the medical team and patients/carers regarding the risks and benefits of heart surgery?	<i>How could heart surgery procedures be better explained to patients and their family? How will the research ensure patients and their families are fully informed of all risks associated? Will including patients live or on video chat affect outcomes of multidisciplinary team?</i>	Anderson L, Brown JPR, Clark AM, Dalal H, Rossau HKK, Bridges C, et al. Patient education in the management of coronary heart disease. Cochrane Database of Systematic Reviews. 2017(6).; Flodgren G, Rachas A, Farmer AJ, Inzitari M, Shepperd S. Interactive telemedicine: effects on professional practice and	21 (8 x patient, 6 x carers, 5 x healthcare professional, 2 others)
Q9a	What are the mental health issues of heart surgery patients and how to manage them?	<i>What is the emotional / psychological impact of heart surgery? How is the mental health issue dealt within heart surgery? Is there any counselling or therapy available for patients and their families?</i>	Powell R, Scott NW, Manyande A, Bruce J, Vögele C, Byrne Davis LMT, et al. Psychological preparation and postoperative outcomes for adults undergoing surgery under general anaesthesia. Cochrane Database of Systematic Reviews. 2016(5); Siddiqi N, Harrison JK, Clegg A, Teale EA, Young J, Taylor J, et al. <a href="https://doi.org/10.1002/14651914.CD010311">https://doi.org/10.1002/14651914.CD010311</a> .	12 (5 x patient, 1 x carer, 4 x healthcare professional, 2 x others)
Q11	Does ERAS (Enhanced Recovery After Surgery) improve outcomes in heart surgery?	<i>Does Enhanced Recovery after Surgery (ERAS®) improve clinical outcomes after cardiac surgery? Which is the best timing to awake the patient after the surgery? Does HFNO (High-flow nasal oxygen) in patients with increased risk have any effect pre-op?</i>	Preoperative carbohydrate treatment for enhancing recovery after elective surgery. Cochrane Database of Systematic Reviews. 2014(8); Wong WT, Lai VKW, Chee YE, Lee A. Fast track cardiac care for adult cardiac surgical patients. Cochrane Database of Systematic Reviews. 2016(9).	27 (4 x patient, 3 x carer, 17 x healthcare professional, 3 x others)
Q12	Is restricted or liberal fluid management better for heart surgery?	<i>The best postoperative fluid management after cardiac surgery? Why does heart surgery need so much fluid post op? Is fluid restriction strategy benefited to outcome?</i>	Zacharias M, Mugawar M, Herbison GP, Walker RJ, Hovhannisyann K, Sivalingam P, et al. Interventions for protecting renal function in the perioperative period. Cochrane Database of Systematic Reviews. 2013(9); Bamooe S, Odor PM, Dushianthan A.	5 healthcare professional (4 x doctor, 1 nurse)
Q13	How does different anaesthetic management (choice of anaesthetic drugs, use of steroid at induction, mode of delivery intravenous vs volatile) affect outcomes of heart surgery?	<i>Does mode of anaesthesia (TIVA VS VOLATILE) effect long term outcome? Impact of anaesthetic agents on outcome? What is the best combination anaesthetic drugs for perioperative myocardial protection?</i>	Boonmak P, Boonmak S, Pattanittum P. High initial concentration versus low initial concentration sevoflurane for inhalational induction of anaesthesia. Cochrane Database of Systematic Reviews. 2016(6); Sun R, Jia WQ, Zhang P, Yang K, Tian JH, Ma	18 (17 x healthcare professional, 1 others)
Q31	What is the best strategy for patient blood management in heart surgery?	<i>What is the best way to manage bleeding in cardiac surgery? Liberal vs restricted blood transfusion; whether routine TEG use is cost effective in cardiac surgery? whether factor concentrates reduce the risk of bleeding in high risk procedures vs standard care?</i>	Carson JL, Stanworth SJ, Roubinian N, Fergusson DA, Triulzi D, Doree C, et al. Transfusion thresholds and other strategies for guiding allogeneic red blood cell transfusion. Cochrane Database of Systematic Reviews. 2016(10); Wikkelsø A, Lunde J, Johansen M, Steinhilber J, Wattersley J, Møller AM, et al. Fibrinogen	38 (37 x healthcare professional, 1 others)
Q32	What is the best way of measuring the pumping function of the heart (cardiac output) during and after heart surgery?	<i>Does cardiac output monitoring improve long term outcome? What is the best hemodynamic measure (echo vs PAC vs other cardiac output monitor) to utilise for intraoperative management of patients undergoing</i>	Hage FG, Nanda NC, American Society of Echocardiography's G, Standards C, American College of C, American Heart A, et al. Guidelines for the evaluation of prosthetic valves with echocardiography and Doppler ultrasound: value and limitations	6 healthcare professional (5 doctors, nurse)
Q33	How does minimally-invasive heart surgery compare to traditional open surgery?	<i>Will minimally invasive techniques make real difference to patients? Is endoscopic vein harvesting better than open? Is Minimally Invasive Direct Coronary Artery Bypass (MIDCAB) better than open heart surgery? Can heart valve replacement surgery be carried out with minimally invasive surgery as opposed to standard 'open chest' method? What are the risks/benefits of robotic procedures; given the longer operating times?</i>	Kirmani BH, Jones SG, Malaisrie SC, Chung DA, Williams R. Limited versus full sternotomy for aortic valve replacement. Cochrane Database of Systematic Reviews. 2017(4); Abraha I, Romagnoli C, Montedori A, Cirocchi R. Thoracic stent graft versus surgery for thoracic aneurysm. Cochrane Database of Systematic Reviews. 2016(6);	57 (8 x patient, 7 x carer, 38 x healthcare professionals, 4 x others)

Q8a	How do we choose between mechanical and biological valves for heart valve surgery?	<i>Biological valve or mechanical valve? Can we design silent mechanical heart valves? Is there a durable biological valve which lasts more than 20 years?</i>	Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP, Guyton RA, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Journal of the American College of Cardiology. 2014;63(22):2438-88; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64.	16 (5 x patient, 11 x healthcare professional)
Q8b	What are the outcomes of valve repair (aortic valve and mitral valve) vs replacement?	<i>What are the medium and long term outcomes of valve repair versus replacement?</i>	Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP, Guyton RA, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Journal of the American College of Cardiology. 2014;63(22):2438-88; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64.	8 (3 x patient, 5 x healthcare professional)
Q81	What is the best choice of heart valve replacement in young adults?	<i>Ross procedure vs. valve replacement for young adults</i>	Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64.	5 healthcare professional (4 doctors, 1 nurse)
Q82	How do transcatheter techniques for heart valve surgery compare to traditional open surgery (TAVI vs AVR)?	<i>Can catheter based valve insertion be routinely utilized in other positions (i.e mitral or tricuspid) with acceptable long term results? What are the long term outcomes of TAVI vs AVR? Should all patients over 65 be offered TAVI routinely?</i>	Holmes DR, Mack MJ, Kaul S, Agnihotri A, Alexander KP, Bailey SR, et al. 2012 ACCF/AATS/SCAI/STS expert consensus document on transcatheter aortic valve replacement: developed in collaboration with the American Heart Association, American Society of Echocardiography, European Association for Cardio-Thoracic Surgery, Heart Failure Society of America, Mended Hearts, Society of Cardiovascular Anesthesiologists, Society of Cardiovascular Computed Tomography, and Society for Cardiovascular Magnetic Resonance. The Annals of thoracic surgery. 2012;93(4):1340-95; Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP, Guyton RA, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Journal of the American College of Cardiology. 2014;63(22):2438-88; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64.	20 (19 x healthcare professional, 1 others)

Q83	What is the best way to manage infective endocarditis (infection in the heart valve)?	<i>When is surgery necessary in infective endocarditis? Are oral antibiotics as safe and effective as intravenous antibiotics in the treatment of Infective Endocarditis?</i>	Habib G, Lancellotti P, Antunes MJ, Bongiorno MG, Casalta JP, Del Zotti F, et al. 2015 ESC Guidelines for the management of infective endocarditis: The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC). Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM). Eur Heart J. 2015;36(44):3075-128; Wilson W, Taubert KA, Gewitz M, Lockhart PB, Baddour LM, Levison M, et al. Prevention of infective endocarditis: guidelines from the American Heart Association: a guideline from the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. Circulation. 2007;116(15):1736-54; Martí Carvajal AJ, Dayer M, Conterno LO, Gonzalez Garay AG, Martí Amarista CE, Simancas Racines D. A comparison of different antibiotic regimens for the treatment of infective endocarditis. Cochrane Database of Systematic Reviews. 2016(4).	6 (1x carer, 5 x healthcare professional)
Q84	When should heart valve intervention occur for patients without symptoms?	<i>Would long term survival following aortic valve replacement for aortic valve stenosis be improved if surgery was undertaken before the onset of symptoms? Are tricuspid valve repairs indicated for annulus diameter &gt;35mm?</i>	Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP, Guyton RA, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Journal of the American College of Cardiology. 2014;63(22):2438-88; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64.	12 (1x patient, 11 x healthcare professional)
Q21	What are the best blood vessels to use for bypass grafts in heart surgery?	<i>Are there any survival benefits in total arterial versus vein grafting in CABG surgery? What is the best solution to test and preserve conduit harvested for CABG surgery?</i>	Sousa-Uva M, Neumann FJ, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. Eur J Cardiothorac Surg. 2019;55(1):4-90; Aldea CC, Bekker FC, Bell J, Ferrero S, Head SJ, Schikl J, et al. The	20 (2 x patient, 16 x healthcare professional, 2 others)
Q22	Is it possible to develop effective artificial vein grafts for coronary bypass surgery?	<i>Why can't we use synthetic vein grafts for CABG?</i>	No reference identified	4 healthcare professional (3 doctors, 1 allied health)
Q23	Does beating heart surgery have better outcomes than conventional bypass surgery?	<i>Is beating heart surgery better than conventional bypass surgery? Quality of life after on pump vs off pump CABG?</i>	Sousa-Uva M, Neumann FJ, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. Eur J Cardiothorac Surg. 2019;55(1):4-90;	6 (2 x patient, 4 x healthcare professional)
Q24	How are patients selected for PCI (coronary stenting) or coronary bypass surgery?	<i>Stents versus graft; Should we implement CT-scan in preoperative workout of CABG patients to adequately select the patients benefiting of CABG vs PTCA? Appropriateness of surgical/cardiological procedures in the more frail/elderly patients?</i>	Sousa-Uva M, Neumann FJ, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. Eur J Cardiothorac Surg. 2019;55(1):4-90;	18 (5 x patient, 1 x carer, 11 x healthcare professional, 1 others)
Q61	What are the best cardiovascular medications for management in heart surgery (e.g. ACE-inhibitors, antiplatelet, anticoagulant)?	<i>Determine optimal perioperative management of cardiovascular medications (e.g. ACE-inhibitors, antiplatelet agents...); Should all patients receive dual antiplatelet agents post CABG if no contra-indications? Is there an alternative to warfarin?</i>	Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. Eur J Cardiothorac Surg. 2018;53(1):5-33; Andras A, Stansby G, Hansrani M. Homocysteine lowering interventions for peripheral arterial disease and bypass grafts. Cochrane Database of Systematic Reviews. 2013(7); Lewicki M, Ng I, Schneider AG. HMG CoA reductase inhibitors (statins) for preventing acute kidney injury after surgical procedures requiring cardiac bypass. Cochrane Database of Systematic Reviews. 2015(3).	17 (3 x patient, 12 x healthcare professional, 2 others)

Q62	What is the impact of prolonged artificial ventilation after heart surgery?	<i>What is the best ventilation technique post routine heart surgery? What is the impact of delayed extubation?</i>	Blackwood B, Murray M, Chisakuta A, Cardwell CR, O'Halloran P. Protocolized versus non protocolized weaning for reducing the duration of invasive mechanical ventilation in critically ill paediatric patients. Cochrane Database of Systematic Reviews. 2013(7); Rose L, Schultz MJ, Cardwell CR, Jouvett P, McAuley DF, Blackwood B. Automated versus non automated weaning for reducing the duration of mechanical ventilation for critically ill adults and children. Cochrane Database of Systematic Reviews. 2014(6).	2 healthcare professional (1 doctor, 1 nurse)
Q63	What is the best time for removing temporary pacing wires following heart surgery? What are the complications associating with pacing wires?	<i>What is the optimum length of time for pacing wire removal following cardiac surgery? What are the complications of cutting pacing wires? Why can't you discharge a patient on the day of removing bicardial pacing wires?</i>	No reference identified	10 (1 x patient, 1 x carer, 7 x healthcare professional, 1 others)
Q64	What are the most effective ways of preventing and treating post-operative atrial fibrillation (AF)?	<i>What is the best option for management of postoperative AF? Use of NOACs for post op AF rather than warfarin? How can atrial fibrillation occurrence be minimised/prevented post operatively?</i>	Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. Eur J Cardiothorac Surg. 2018;53(1):5-33; Huffman MD, Karmali KN, Berendsen MA, Andrei AC, Kruse J, McCarthy PM, et al. Concomitant atrial fibrillation surgery for people undergoing cardiac surgery. Cochrane Database of Systematic Reviews. 2016(8);	15 (1 x patient, 1 x carer, 13 x healthcare professional)
Q65	What is the best way to prevent deep vein thrombosis (DVT) after heart surgery (TED stockings, low molecular weight heparin)?	<i>Do TED stockings help in VTE prevention following cardiac surgery? Should low molecular weight heparin (LMWH) be continued on discharge?</i>	Llaur JV, Kamphuisen P, Albaladejo P. European guidelines on perioperative venous thromboembolism prophylaxis: Chronic treatments with antiplatelet agents. Eur J Anaesthesiol. 2018;35(2):139-41; Kozek-Langenecker S, Fenger-Eriksen C, Thienpont E, Barauskas G. European guidelines on perioperative venous thromboembolism prophylaxis: Surgery in the elderly. Eur J Anaesthesiol. 2018;35(2):116-22; Ahmed AB, Koster A, Lance M, Faraoni D. European guidelines on perioperative venous thromboembolism prophylaxis: Cardiovascular and thoracic surgery. Eur J Anaesthesiol. 2018;35(2):84-9.	3 healthcare professional
Q66	What is the best way to prevent and manage pain after heart surgery? What is the best way to manage pain in drug-dependent patients?	<i>What is the best analgesic regimen post heart surgery-least complications, evidence of least chronic post surgical chest pain? Is IV methadone safe for post op pain? How to best manage pain in drug dependant patients?</i>	Doleman B, Leonardi Bee J, Heinink TP, Bhattacharjee D, Lund JN, Williams JP. Pre emptive and preventive opioids for postoperative pain in adults undergoing all types of surgery. Cochrane Database of Systematic Reviews. 2018(12); Ziehm S, Rosendahl J, Barth J, Strauss BM, Mehnert A, Koranyi S. Psychological interventions for acute pain after open heart surgery. Cochrane Database of Systematic Reviews. 2017(7); Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. Eur J Cardiothorac Surg. 2018;53(1):5-33.	12 (1 x patient, 10 x healthcare professional, 1 others)
Q67	How do we minimise damage to organs from heart-lung machine/heart surgery (heart, kidney, lung, brain and gut)?	<i>What research is being done to help reduce the risk of major organ failure following heart surgery? How do myocardial protection techniques impact on long-term PROMs? Are there any improvements in cardiopulmonary bypass (CPB) that can be made to prevent inflammatory aspects of heart surgery? Has the routine use of cerebral oximetry during CPB reduced creatinine rise/ARF (acute renal failure) in cardiac surgical patients? Can stroke be prevented post-surgery?</i>	Yu Y, Zhang K, Zhang L, Zong H, Meng L, Han R., Cerebral near infrared spectroscopy (NIRS) for perioperative monitoring of brain oxygenation in children and adults. Cochrane Database of Systematic Reviews. 2018(1); Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. Eur J Cardiothorac Surg. 2018;53(1):5-33.	102 (8 x patient, 8 x carer, 79 x healthcare professional, 7 x others)
Q68	How do we reduce and manage infections after heart surgery including surgical site/sternal wound infection and pneumonia?	<i>How surgical site infection being prevented on all cardiac surgery? How can we reduce the likelihood of post-surgery infection (e.g. pneumonia)? What is the best management for sternal wound infection?</i>	Dumville JC, McFarlane E, Edwards P, Lipp A, Holmes A, Liu Z. Preoperative skin antiseptics for preventing surgical wound infections after clean surgery. Cochrane Database of Systematic Reviews. 2015(4).; Liu Z, Dumville JC, Norman G, Westby MJ, Blazeby J, McFarlane E, et al. Intraoperative interventions for preventing surgical site infection: an overview of Cochrane Reviews. Cochrane Database of Systematic Reviews. 2018(2); (NICE) NifHaCE. Surgical site infections: prevention and treatment : guidance (CG74). 2008.	22 (2 x patient, 2 x carer, 17 x healthcare professional, 1 others)

Q41	How does a patient's quality of life (QOL) change (e.g. disability-free survival) due to heart surgery and what factors are associated with this?	<i>How to improve quality of life? What predicts poor outcome after cardiac surgery that impacts quality of life? What interventions can improve disability-free survival in the longer term?</i>	Anderson L, Taylor RS. Cardiac rehabilitation for people with heart disease: an overview of Cochrane systematic reviews. Cochrane Database of Systematic Reviews. 2014(12); Pogossova N, Saner H, Pedersen SS, Cupples ME, McGee H, Höfer S, et al. Psychosocial aspects in cardiac rehabilitation: From theory to practice. A position paper from the Cardiac Rehabilitation Section of the European Association of Cardiovascular Prevention and Rehabilitation of the European Society of Cardiology. European journal of preventive cardiology. 2015;22(10):1290-306.	29 (1 x patient, 28 x healthcare professional)
Q42	What are the long-term outcomes, including life expectancy, after heart surgery?	<i>After bypass surgery, what is my life expectancy? What are the factors that increase/decrease patient's survival? Research into elderly/ multiple comorbidity patients undergoing cardiac surgery regarding longevity and quality of life following surgery.</i>	Sousa-Uva M, Neumann FJ, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. Eur J Cardiothorac Surg. 2019;55(1):4-90; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. Eur J Cardiothorac Surg. 2017;52(4):616-64; Erbel R, Aboyans V, Boileau C, Bossone E, Bartolomeo RD, Eggebrecht H, et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). Eur Heart J. 2014;35(41):2873-926.	22 (2 x patient, 2 x carer, 17 x healthcare professional, 1 others)
Q71	How best to clinically manage heart failure patients before heart surgery?	<i>Pre-operative hemodynamic optimization with levosimendan for patients with low ejection fraction.</i>	Scottish Intercollegiate Guidelines Network. Management of chronic heart failure - SIGN Guideline. 2016; Konstam MA, Kiernan MS, Bernstein D, Bozkurt B, Jacob M, Kapur NK, et al. Evaluation and Management of Right-Sided Heart Failure: A Scientific Statement From the American Heart Association. Circulation. 2018;137(20):e578;	4 (1 x patient, 3 x healthcare professional)
Q75	What is the best strategy for managing acute heart failure after heart surgery (inotropic drug, mechanical support or intravascular devices)?	<i>What is the best inotrope for heart failure? Intra-Aortic Balloon Pump (IABP) in patients after cardiac surgery with low cardiac output syndrome (LCOS); IMPELLA in patients after cardiac surgery with LCOS</i>	Rihal CS, Naidu SS, Givertz MM, Szeto WY, Burke JA, Kapur NK, et al. 2015 SCAI/ACC/HFSA/STS Clinical Expert Consensus Statement on the Use of Percutaneous Mechanical Circulatory Support Devices in Cardiovascular Care (Endorsed by the American Heart Association, the Cardiological Society of India, and Sociedad Latino Americana de Cardiologia Intervencion; Affirmation of Value by the Canadian Association of Interventional Cardiology-Association Canadienne de Cardiologie D'intervention). Catheter Cardiovasc Interv. 2015;85(7):E175-96; Sousa-Uva M, Head SJ, Milojevic M, Collet JP, Landoni G, Castella M, et al. 2017 EACTS Guidelines on perioperative medication in adult cardiac surgery. Eur J Cardiothorac Surg. 2018;53(1):5-33.	21 (19 x healthcare professional, 2 others)
Q72	Does Left Atrial Appendage Occlusion (LAAO) device reduce the risk of stroke after heart surgery?	<i>Should all patients with atrial fibrillation have closure of their left atrial appendage? Left atrial appendage occlusion (LAAO) successful rates</i>	Badhwar V, Rankin JS, Damiano RJ, Jr., Gillinov AM, Bakaeen FG, Edgerton JR, et al. The Society of Thoracic Surgeons 2017 Clinical Practice Guidelines for the Surgical Treatment of Atrial Fibrillation. Ann Thorac Surg. 2017;103(1):329-41; Kirchhof P, Benussi S, Kotecha D, Ahlsson A, Atar D, Casadei B, et al. 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. Eur J Cardiothorac Surg. 2016;50(5):e1-e88.	5 healthcare professional (4 x doctor, 1 nurse)

Q73	What are the best ways to prevent, diagnose and treat patients with acute aortic dissection (including long-term management)?	<i>Raising awareness - what can we do to improve early diagnosis of aortic dissection? How to improve Aortic Dissection Emergency treatment? At what measurements should aortic repair be considered with aortic aneurysms? Research into aortic dissection, detection, aftercare, new procedures and improved outcomes</i>	Erbel R, Aboyans V, Boileau C, Bossone E, Bartolomeo RD, Eggebrecht H, et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). Eur Heart J. 2014;35(41):2873-926; L. F. Hiratzka, G. L. Bakris, J. A. Beckman, R. M. Bersin, V. F. Carr, D. E. Casey, K. A. Eagle, L. K. Hermann, E. M. Isselbacher, E. A. Kazerooni, N. T. Kouchoukos, B. W. Lytle, D. M. Milewicz, D. L. Reich, S. Sen, J. A. Shinn, L. G. Svensson, D. M. Williams, G. American College of Cardiology Foundation/American Heart Association Task Force on Practice, S. American Association for Thoracic, R. American College of, A. American Stroke, A. Society of Cardiovascular, A. Society for Cardiovascular, Interventions, R. Society of Interventional, S. Society of Thoracic and M. Society for Vascular ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the diagnosis and management of patients with thoracic aortic disease. A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine.	69 (43 x patient, 11 x carer, 15 x healthcare professional)
Q74	Are percutaneous stents better than traditional open surgery for diseases of the thoracic aorta?	<i>Open descending aortic surgery vs Thoracic Endovascular Aortic Repair (TEVAR), what are the outcome and benefits?</i>	Pang D, Hildebrand D, Bachoo P. Thoracic endovascular repair (TEVAR) versus open surgery for blunt traumatic thoracic aortic injury. Cochrane Database of Systematic Reviews. 2015(9); Hajibandeh S, Hajibandeh S, Antoniou SA, Torella F, Antoniou GA. Revascularisation of the left subclavian artery for thoracic endovascular aortic repair. Cochrane Database of Systematic Reviews. 2016(4); Abraha I, Romagnoli C, Montedori A, Cirocchi R. Thoracic stent graft versus surgery for thoracic aneurysm. Cochrane Database of Systematic Reviews. 2016(6).	3 healthcare professional (3 doctor)
Q101	Can we use 3D bioprinting or stem cell technology to create living tissues (heart valves/heart) and repair failing hearts (myocardial regeneration)?	<i>Can stem cell therapy be of any use in heart surgery? Can stem cells be used to create transplantable components (i.e. valves) rather than use mechanical or pig or cow tissue? Is 3D printing of valves and solid hearts realistic or does it bring false hope?</i>	Fisher SA, Zhang H, Doree C, Mathur A, Martin-Rendon E. Stem cell treatment for acute myocardial infarction. Cochrane Database Syst Rev. 2015(9):CD006536; Fisher SA, Doree C, Mathur A, Taggart DP, Martin Rendon E. Stem cell therapy for chronic ischaemic heart disease and congestive heart failure. Cochrane Database of Systematic Reviews. 2016(12); Moazzami K, Roohi A, Moazzami B. Granulocyte colony stimulating factor therapy for acute myocardial infarction. Cochrane Database Syst Rev. 2013(5):CD008844.	14 (1 x carer, 12 x healthcare professional, 1 others)
Q102	Can we use Big Data (artificial intelligence, computer simulation etc.) to help predict and plan treatment in heart surgery patients?	<i>Potential ways of using data science to help patient selection/timing of surgery? Is there a role for artificial intelligence / automation in Cardiac Surgery?</i>	No reference identified	5 healthcare professional (4 doctor, 1 allied health)
Q103	Does having access to specialist cardiac nurses or consultants by electronic methods improve outcomes for heart surgery patients?	<i>Does having access to specialist cardiac nurses or consultants by electronic means improve outcomes?</i>	Flodgren G, Rachas A, Farmer AJ, Inzitari M, Shepperd S. Interactive telemedicine: effects on professional practice and health care outcomes. Cochrane Database Syst Rev. 2015(9):CD002098.	1 researcher
Q104	Do outcomes of heart surgery and follow-up time vary by postcode/location and how to reduce the variation?	<i>Are postcodes indicative of outcomes in cardiac surgical procedures? Why does the follow-up periods vary so much, district to district? Is there any way to narrow the variation in outcomes across units?</i>	No reference identified	4 (1 x patient, 2 x healthcare professional, 1 others)
Q105	Is there association of time spent on waiting list with the outcomes of heart surgery? Does cancellation of heart surgery affect outcomes?	<i>What is psychological effect of being on a waiting list for surgery and does the length of time on waiting list effect outcome? Does cancellation of heart surgery affect post-operative outcome? What are the physical and psychological effects of cancellation - do patients have a worse outcome? prolonged recovery?</i>	No reference identified	6 (1 x patient, 5x healthcare professional)

Q106	What level of heart surgeon's caseload maximises safety and successful surgical outcomes?	<i>What degree (volume/outcomes) of current (within 24 months) procedure-specific experience by the surgeon maximises successful surgical outcomes? The threshold lifetime and annual volume for surgeons and institutes for different sorts of cardiac surgery that determine safety, particularly for mitral valve work and acute/elective aorta work.</i>	Pagano D, Kappetein AP, Sousa-Uva M, Beyersdorf F, Klautz R, Mohr F, et al. EACTS clinical statement: guidance for the provision of adult cardiac surgery. <i>Eur J Cardiothorac Surg.</i> 2016;50(6):1006-9; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. <i>Eur J Cardiothorac Surg.</i> 2017;52(4):616-64; Erbel R, Aboyans V, Boileau C, Bossone E, Bartolomeo RD, Eggebrecht H, et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). <i>Eur Heart J.</i> 2014;35(41):2873-926.	4 healthcare professional (all doctors)
Q107	Does publication of surgeon-specific outcome data influence patient selection for heart surgery?	<i>Impact of surgeon number publication on patient selection and outcomes</i>	Henderson A, Henderson S. Provision of a surgeon's performance c	1 healthcare professional (doctor)
Q108	What is the impact of intra-hospital transfer of critically-ill heart patients on the outcomes of surgery?	<i>The question of intra-hospital transfer of critically ill heart patients</i>	No reference identified	2 healthcare professional (all doctors)
Q10a	Do multidisciplinary teams (including cardiovascular surgeon and cardiologist) deliver better outcomes in heart surgery?	<i>Do multidisciplinary teams deliver better outcomes in aortic surgery in the short and longer term? How can Cardiothoracic and Vascular surgeons collaborate most effectively to deliver better surgical care for the whole aorta in aortic dissection patients? How can cardiologists and cardiac surgeons work more effectively to decide how to manage patients with ischaemic heart disease?</i>	Sousa-Uva M, Neumann FJ, Ahlsson A, Alfonso F, Banning AP, Benedetto U, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. <i>Eur J Cardiothorac Surg.</i> 2019;55(1):4-90; Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP, Guyton RA, et al. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. <i>Journal of the American College of Cardiology.</i> 2014;63(22):2438-88; Falk V, Baumgartner H, Bax JJ, De Bonis M, Hamm C, Holm PJ, et al. 2017 ESC/EACTS Guidelines for the management of valvular heart disease. <i>Eur J Cardiothorac Surg.</i> 2017;52(4):616-64.	7 (2 x patient, 5x healthcare professional)