

## Review Article

# The older surgical patient – to operate or not? A state of the art review

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## Summary

The increasing age and subsequent medical complexity of patients presenting for surgery grants the opportunity to examine the processes and delivery of peri-operative care. There is a need to redesign peri-operative pathways allowing room for shared decision making and personalised, evidence-based care. In times of financial constraint, this is no easy task. However, neglecting to transform services now may lead to challenges in the sustainability of the provision of peri-operative care in the long-term. Challenges in redesigning peri-operative care pathways include identification and optimisation of those at highest peri-operative risk to inform the difficult conversations surrounding the appropriateness of surgery. The moral burden of these conversations on patient and professionals alike is increasingly recognised and managing this issue requires innovative models of collaborative, multidisciplinary and interprofessional working. To operate or not can be a challenging question to answer with a number of different perspectives to consider; not least that of the patient.

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## Introduction

The baseline characteristics of the surgical population are changing. Between 1999 and 2015, the number of patients aged over 75 years undergoing surgery nearly doubled. Future projections predict that, by 2030, one-fifth of surgical procedures will be conducted in this age cohort [1]. In addition to their index surgical pathology, older patients are more likely to present with co-existent age-related physiological decline, multimorbidity and geriatric syndromes such as frailty. This presents challenges when considering whether to operate or not. Surgery initiates a systemic inflammatory response, similar to that seen in

sepsis or trauma, with effects on the immune, metabolic, endocrine and cardiovascular systems [2]. Predicting the impact of this on physiological reserve or chronic comorbidities is a challenge. Although advances such as minimally invasive surgical techniques, haemodynamic modulation, optimisation and prehabilitation may mitigate some adverse effects of surgery, the broader question remains; is surgery appropriate? Answering this question requires collaboration between specialities and disciplines throughout the peri-operative period, from contemplation of surgery to full recovery, with the patient at the centre. This approach has led to the emergence of a new speciality,

peri-operative medicine. The vision for peri-operative medicine incorporates a call to remove the silos of traditional speciality practice, instead employing a collaborative and multidisciplinary pathway of care. In the UK, the recently established Centre for Peri-operative Care (CPOC) aims to promote, advance and develop peri-operative care acting as a conduit for shared learning [3]. The term 'Peri-operative Care', as opposed to anaesthetic, surgical or medical care, was chosen purposefully to give a clear message; shared and holistic care of the patient undergoing surgery is key, as opposed to which speciality is delivering that care. Supported by the relevant Royal Colleges and allied organisations, the establishment of CPOC signals a changing approach to the roles of surgeons, anaesthetists, geriatricians and general practitioners in the management of the older surgical patient. Although this constitutes a positive step forward, effective implementation will require a disruption of ingrained practices which needs a focus on identifying and overcoming potential barriers including psychological safety, human factors, communication difficulties and managing uncertainty.

### **Crystal ball gazing: what do we know about peri-operative outcomes?**

Clinician-reported peri-operative outcomes in older surgical patients have been reported for more than 20 years [4]. Across surgical specialities, higher 30-day and longer term mortality rates and postoperative complications are consistently described in older patients, compared with younger counterparts [5]. As age increases, the rates of surgical complication remain fairly static, whereas medical complications are more frequently observed. These medical complications include organ-specific pathology, such as acute kidney injury, hospital-acquired pneumonia or atrial fibrillation, and geriatric syndromes including delirium, oropharyngeal dysphagia, falls and hospital-acquired deconditioning [6]. This combination of organ-specific medical complications and geriatric syndromes can have a resultant impact on functional deterioration with potential change in discharge destination or level of care required [7]. It is, therefore, no surprise that older surgical patients predominantly constitute a 'high-risk population' as described by several national reports [8–10]. Less is known about patient-reported outcomes in older surgical patients. These include measures of longer term functional status and return to usual activities, quality of life, cognitive recovery and satisfaction scores [11]. Despite the importance of these measures for the shared decision-making process, relatively little has been published on this [7, 12]. Recognition of this omission is being addressed through national audit and

quality improvement programmes such as the National Hip Fracture Database and the Peri-operative Quality Improvement Programme [13, 14]. In addition to clinician and patient-reported outcomes, the inclusion of process measures in peri-operative service evaluation is paramount. Older patients are more likely to develop medical complications, spend longer in hospital and leave at a higher level of dependency, all of which incur greater expense [1]. Incorporating these three measures, clinician-reported, patient-reported and process outcomes, into ongoing audit, quality improvement and research will be essential to drive forward quality, patient-centred care.

### **Risk assessment: a science or an art?**

Older patients presenting for surgery frequently have co-existing age-related physiological change, multimorbidity and geriatric syndromes including frailty. These are all independent predictors of adverse postoperative outcome. Addressing pre-operative risk assessment in such complex patients requires a multicomponent approach, such as comprehensive geriatric assessment and optimisation coupled with an estimation of functional capacity and objective risk scoring [15–17]. Comprehensive geriatric assessment and optimisation methodology has an established evidence base in community and medical inpatient settings where, at up to 18 months, patients who have undergone comprehensive geriatric assessment are more likely to be alive and living in their own homes [18]. It involves a multidomain, multidisciplinary assessment using objective tools to identify both recognised and previously unrecognised issues employing an evidence-based, individualised plan for investigation and optimisation. In the surgical setting, comprehensive geriatric assessment, as an underpinning methodology to improve postoperative outcomes, has an emerging evidence base [19–22].

Table 1 shows how comprehensive geriatric assessment and optimisation can be used in the pre-operative setting. The benefits of this methodology include a one-stop approach and the use of objective scores prompting a tailored approach to optimisation. This facilitates individualised information provision regarding the risk of postoperative medical and functional complications. Although this methodology involves objective measures it remains difficult to predict how a patient will respond to the physiological stress of surgery. For this reason, the need for careful pre-operative planning is imperative. For example, grading the severity of aortic stenosis can guide the need for early vasopressors, intra-operative invasive monitoring and considerations for

coronary blood flow. This acknowledged difficulty in predicting the intra-operative and early postoperative response to surgery in multimorbid and frail patients has led to the development of additional methods of appraising physiological status. Cardiopulmonary exercise testing (CPET) is growing in popularity as a surrogate to estimate the ability of a patient to increase oxygen delivery in the context of surgical stress. Cardiopulmonary exercise testing may also be used for diagnostic purposes, for example, where the underlying diagnosis of dyspnoea is unknown [23] or in order to assess the effect of therapies such as neoadjuvant chemotherapy on cardiorespiratory reserve [24]. An international consensus statement on CPET testing provides guidance on indications for CPET alongside information on conducting and interpreting the results [25].

Similarly, validated risk models including Surgical Outcome Risk Tool, Portsmouth Physiological and Operative Severity Score and ASA are now in routine clinical use. Surgical Outcome Risk Tool has the advantage of validation based on the National Confidential Enquiry into Patient Outcome and Death and uses only known variables, rather than imputed values [15]. The utility of these scores is two-fold. First, to provide a common and universally understood language enabling interprofessional discussion and shared decision-making with the patient. Second, to allow planning of the peri-operative period in terms of resource use such as level 2/3 care targeted at patients defined as 'high risk' based on a 30-day mortality prediction of greater than 5%.

Risk assessment informs shared decision-making, which requires clinicians to have a broad understanding of the potential benefits, risks and alternatives to surgery, including other treatments such as chemoradiotherapy and the option of no intervention. Discussing the option of no treatment relies on a knowledge of surgical disease progression if surgery is not undertaken, for example, projected annual rupture rates from aortic aneurysm, metastatic spread from cancer or the natural history of prosthetic joint infections. An awareness of how these eventualities can be managed is critical to an informed discussion, so that details of expected symptoms, potential mode of death and palliative management options are included. In addition, the consideration of surgical disease progression needs to be balanced against the estimated prognosis from coexistent multimorbidity and frailty, which can confer a shorter life expectancy than the pathology for which surgery is being considered. Ensuring transparency through such shared decision-making discussions can facilitate instigation of appropriate ceilings of care and advanced care planning where appropriate. This onward

care can occur irrespective of whether the decision is made to operate or manage conservatively through alternative treatments [26]. Key to shared decision-making is also a discussion around patient-reported quantity of life. Clinicians involved in peri-operative shared decision making should be skilled in facilitating initiation of these conversations balancing quantity versus quality of life.

Balancing the interplay between the science of objective evaluation and risk assessment, with the art of incorporating patient values and beliefs into shared decision-making, requires a specific skill set [27–29]. Furthermore, assimilating complex information can pose a challenge for patients regardless of age. In the older population, cognitive and sensory impairments are more common and health literacy is more likely to be limited, with less frequent access to digital resources. Health care professionals require specific communication skills to overcome these challenges with pathways designed to promote repeated opportunity for shared decision-making. The joint American College of Surgeons and American Geriatrics Society "*Optimal Peri-operative Management of the Geriatric Patient: A Best Practices Guideline*" published in 2016 [30], emphasised the importance of collaborative interspeciality working and provides a checklist covering necessary components of pre-, intra- and postoperative care designed to deliver quality care for geriatric surgical patients. A combined approach using comprehensive geriatric assessment, physiological testing through CPET, where appropriate, and risk assessment scoring, alongside an understanding of available treatment options, provides a framework to implement the recommendations from these guidelines throughout the whole peri-operative pathway. Clearly this approach has face validity and, in light of the growing evidence base, an expansion of comprehensive geriatric assessment and high-risk anaesthesia pre-operative services have been observed internationally [19, 22, 31–33]. Challenges going forward include funding such services, an available workforce and the education and training gap.

### **Risk modification: physiological, pharmacological and psychological**

Surgery presents an opportunity for prehabilitation, defined as "*the process of enhancing an individual's functional capacity before scheduled surgery, aimed at improving the patients' tolerance to upcoming physiological stress*" [34]. It comprises a multimodal approach inclusive of medical optimisation, pre-operative physiological optimisation such as exercise training, nutritional support, lifestyle modification and management of stress and anxiety [35].

**Table 1** Using pre-operative comprehensive geriatric assessment.

Domain	Issue	History/examination	Screening or diagnostic tools	Investigation	Optimisation
Medical	Multimorbidity, for example, Parkinson's disease	Known history Reported 'slowing, falls, tremor, rigidity etc.' Pro-active assessment for non-motor symptoms if Parkinson's disease likely Physical examination	Unified Parkinson's Disease Rating Scale	Dopamine transporter single photon emission computerised tomography scan (does not necessarily need to be pre-operative)	In established cases – proactive plan for administration of medications when fasting Pre-emptive advice to ward teams about non-motor complications likely at time of surgery (constipation, delirium, falls) In newly identified cases, consider starting medications pre-operatively
	Chronic obstructive pulmonary disease	Smoking history but no known chronic lung disease Exertional dyspnoea and daily cough	Medical Research Council breathlessness scale 6-min walk test	Spirometry Chest radiograph	Smoking cessation advice Flu vaccination Inhaled therapy according to National Institute for Health and Care Excellence/British Thoracic Society guidelines Pulmonary rehabilitation according to local guidelines
	Cardiac	Peripheral oedema and mild exertional dyspnoea Physical examination	NT pro brain natriuretic peptide	Echocardiography	Diuresis using loop diuretics Longer-term management using beta blockade, angiotensin-converting enzyme inhibition, cardiac rehabilitation Link to community services for follow-up
Geriatric syndromes	Falls	Previous history History of 'near misses' Bone health screening	Gait speed Timed up and go FRAX score	Bone profile Vitamin D measurement Suggestion to general practitioner about bone density scan and follow-up	Medical management of bone health (e.g. bisphosphonate, calcium/vitamin D supplementation) Medical falls review Strength and balance training referral
	Cognitive impairment	Self-reported history of cognitive issues Collateral history from relative/carer	4AT Montreal Cognitive Assessment	Cerebral imaging	Delirium risk assessment and optimisation, for example, cessation of anti-cholinergic drugs, ensuring normal plasma electrolytes Preparation for standardised postoperative management of delirium Communication with patient and relatives Long-term vascular risk factor management Referral to a memory service/memory clinic for long-term follow-up
Psychological	Anxiety and depression	Self-reported history Collateral from family/carer Symptoms	Hospital anxiety and depression score Geriatric depression scale	For example, thyroid function Exclusion of cognitive impairment	Referral for psychological support (talking services) Consider pharmacological treatment

(continued)

Although the longer term effects of prehabilitation remain unclear, in the short term there is emerging evidence for a reduction in postoperative morbidity [36]. In the interim, the benefits of pre-operative exercise training have been shown in surgery for oncological diagnoses inclusive of

oesophageal, colorectal and thoracic cancer [34, 37, 38]. The increasing recognition of the role of prehabilitation in the physiological and psychological preparation of patients undergoing major cancer surgery has led to the development of the joint guidance collaborative report

**Table 1** (continued)

Domain	Issue	History/examination	Screening or diagnostic tools	Investigation	Optimisation
Functional and social	Functional dependency	Self-reported concerns Collateral from family/carer Symptoms	Barthel Nottingham extended activities of daily living score	Physical examination and investigation of pathology causing disability, for example, proximal myopathy secondary to vitamin D deficiency Prescribe analgesia for osteoarthritis	Pre-operative physiotherapy Occupational therapy intervention (e.g. home adaptations) Social worker intervention to proactively identify barriers to discharge Pro-active communication regarding anticipated length of stay and access to rehabilitation or care at discharge Instigation of advanced care planning and ceilings of care if appropriate
	Non-adherence to prescribed medications	Self or family-reported concerns Clinical evidence of non-adherence	STOPP/START	Assessment of cognition and understanding of medications	Liaising with community pharmacist to assist with dosette box and with care services or telecare to prompt medication
Lifestyle modification	Limited mobility	Explore underlying medical or surgical reason Debulk myths, for example, 'can't exercise due to the aneurysm'	Standardised questionnaire, for example, Duke Activity Status Index		Individualised exercise programme Therapy advice Written or other information

4AT, 4 A's test (rapid screening test for delirium); STOPP/START, screening tool of older people's prescriptions and screening tool to alert to right treatment; FRAX score, fracture risk assessment tool.

between Royal College of Anaesthetists, Macmillan Cancer Support and the National Institute for Health Research Cancer and Nutrition Collaboration [39]. Published research for this approach is sparse in the older population, and although it is known that prehabilitation is safe, a focus on appraising acceptability to older frailer patients is required [40, 41].

In addition to allowing physiological preparation, the pre-operative period provides an opportunity for medical optimisation of chronic comorbidities. For example, anaemia is common in the older patient, with acknowledged increased risk of mortality and wound infections [42]. While debate about treatment triggers continues, identification and tailored treatment of iron deficiency together with assessment and replacement of micronutrients can improve red cell indices [43] with a potential improvement in clinical outcomes with studies ongoing [44]. Furthermore, the pre-operative visit allows for optimisation of chronic comorbidities, such as diabetes, cardiac failure and ischaemic heart disease, which may prove beneficial in the immediate postoperative period, as well as in terms of longer term prognosis.

Structured psychological preparation for surgery, while in its relative infancy, shows promise especially as anxiety and depression are common in the older population. The

establishment of one-off surgery schools and formal preparation for surgery programmes is increasingly prevalent [45–48]. Alongside the educational and peer-to-peer support benefits for patients, a blend of behavioural, cognitive and relaxation techniques before surgery alongside expectation management and social support planning for the recovery phase may improve patient experience.

**It's not all science**

Underpinning informed decision-making in the peri-operative period requires a collaborative working relationship between surgery, anaesthesia, geriatric medicine and general practice operating as a multispecialty, interdisciplinary team alongside allied health professionals and patients. This cannot be overstated; camaraderie, clear and respectful communication alongside an understanding of the perspective of each speciality, is key to optimal patient experience, safety and improved outcomes. With these common goals, peri-operative care offers a mandate to disperse the tribalism of silo speciality working, instead working towards an appreciation of a transformative model of care centred around patients. Excellence in leadership is an understated prerequisite to such transformation. Leaders need honesty

in acknowledging deficiencies in current models of care, vision to effect change, humility that one's perspective may not be complete, diplomacy in breaking boundaries in interprofessional working and compassion in placing the patient at the centre of new models of care. Attitude and behaviour are key; expert knowledge and skills are of little value in the face of poor working relationships.

Healthcare transformation often comes as a result of a necessity when challenges are viewed as opportunity for change. In the UK, fiscal austerity has raised the need to provide sustainable and transformative care higher up the agenda. Within peri-operative care, the additional influence of changes in the process of informed consent has also prompted reflection. The Montgomery case, 2015, has moved UK law away from the historical Bolam principle, towards one where professionals seeking informed consent from patients will instead be judged according to explanation of 'material risks' and all available options [49, 50]. The complexities of this in peri-operative practice are significant and include consideration of who takes ultimate responsibility for the decision to operate or not and the quality of information provision in support of informed consent. Getting this right should provide transparency and open conversation between interspeciality teams and meaningful involvement of patients and carers in surgical decision making. This is one of the aims of the Academy of Medical Royal Colleges bringing together relevant Royal Colleges, legal experts and patient representatives to coproduce change in this area. In addition, in the context of a perceived power imbalance between health professionals and patients, coproduction in new ways of working should integrate patient empowerment throughout the care pathway ensuring that individual patient goals, beliefs and wishes are voiced and heard. [51, 52].

Furthermore, the concept of 'moral injury' is increasingly recognised as a contributor to burnout in health professionals. Simply put, harm caused by professionals acting against their moral conscience, especially in a high-stakes environment such as peri-operative care, is burdensome emotionally and in terms of mental health [53]. Here, collaborative working becomes even more important, with the recognition that discordant behaviours can impact negatively on patient outcomes [54]. Joined up interspeciality and multidisciplinary working can create psychological safety where vulnerability for professionals and patients in complex decision-making is acknowledged, thus facilitating transparent informed discussion. The challenge is delivering such joint working in

times of austerity when healthcare professionals already face multiple conflicting priorities. Effectively addressing these challenges requires engagement of all stakeholders embracing joined up education and training to upskill professionals in shared decision making processes, thus resulting in more efficient patient-centred care.

## Discussion

Increasing life expectancy and peri-operative innovation has outstripped the evolution of models of care for older surgical patients. The advent of peri-operative care as a speciality offers an opportunity to pool expertise in the pathophysiology of ageing in the context of surgical stress, management of multimorbidity, technical considerations, postoperative outcomes and communication strategies that facilitate shared decision making. The goal is co-designing multidisciplinary pathways of care for this patient group and is the focus of a number of current initiatives both in the UK and internationally [27, 55–58]. Supported by the CPOC, this collaborative approach should incorporate clear leadership, respectful communication, delineation of roles and pathway redesign allowing patients and carers to address a bigger question than whether or not to operate. Instead, the question is; how can professionals and patients work together to produce peri-operative pathways of care that are fit for purpose in terms of shared decision making and upskilling an adequately trained workforce to deliver care? Despite the challenges inherent in this process, getting it right should achieve improved clinician-reported, patient-reported and process outcomes following surgery.

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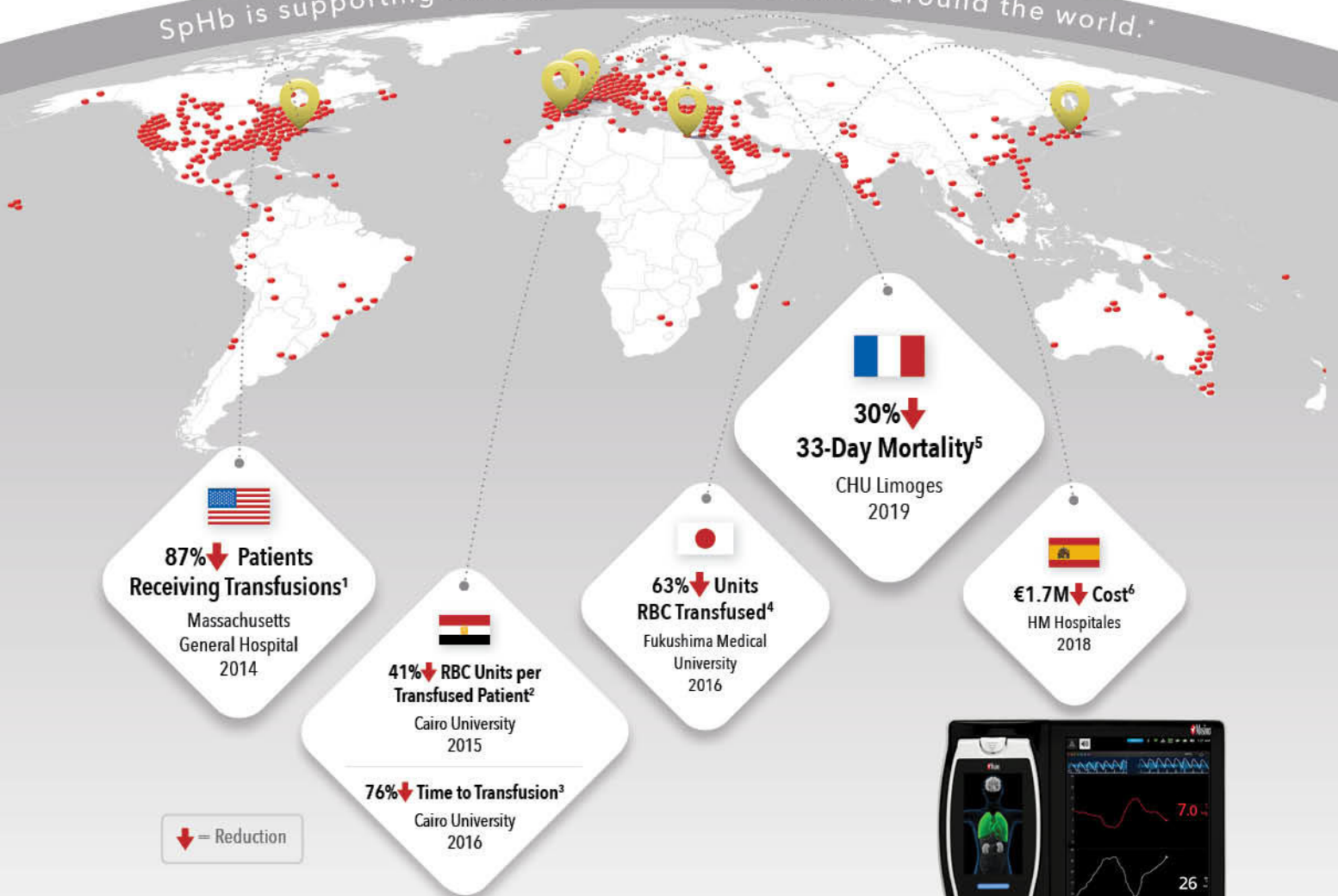
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Clinical decisions regarding red blood cell transfusions should be based on the clinician's judgment considering among other factors: patient condition, continuous SpHb monitoring, and laboratory diagnostic tests using blood samples. SpHb monitoring is not intended to replace laboratory blood testing. Blood samples should be analysed by laboratory instruments prior to clinical decision making.

<sup>1</sup>Ehrenfeld et al. *J Blood Disorders Transf.* 2014; 5:9. <sup>2</sup>Awada WN et al. *J Clin Monit Comput.* DOI 10.1007/s10877-015-9660-4. Study Protocol: In each group, if researchers noted SpHb trended downward below 10 g/dL, a red blood cell transfusion was started and continued until SpHb trended upward above 10 g/dL. The transfusion threshold of 10 g/dL was predetermined by the study protocol and may not be appropriate for all patients. Blood sampling was the same for the control and test group. Arterial blood was drawn from a 20 gauge radial artery cannula into 2 mL EDTA collection tubes, mixed and sent for analysis by a Coulter GEN-S Hematology Analyzer. <sup>3</sup>Kamal A, et al. *Open J of Anesth.* 2016 Mar; 6, 13-19. <sup>4</sup>Imaizumi et al. *Proceedings from the 16<sup>th</sup> World Congress of Anaesthesiologists* Hong Kong, Abstract #PR607. <sup>5</sup>Cros et al. *J Clin Monit Comput.* Aug 2019; 1-9. Study utilised a goal directed fluid therapy protocol with PVF<sup>2</sup> in conjunction with a blood transfusion protocol based on SpHb. <sup>6</sup>Ribed-Sánchez B, et al. *Sensors (Basel).* 2018 Apr 27;18(5). pii: E1367. Estimated national savings derived from hospital savings extrapolated nationwide. \* Data on file.