Commentary

Perioperative Medicine for Older People

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Abstract

Global demographic changes have resulted in an older, frailer surgical population with significant multimorbidity causing higher frequency of adverse postoperative outcomes. The need for restructuring of perioperative care pathways to address this issue has been recognised. Comprehensive geriatric assessment (CGA) and optimisation are emerging as innovative perioperative pathways. This paper describes one centre's approach in applying CGA in the surgical setting and presents the evidence in support of this. Similar models are being established in Singapore in hip fracture, colorectal and vascular populations. The challenges in the widespread adoption of such models of care are similar across settings. The global nature of translation is also discussed in this paper.

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Introduction

The global challenges of an ageing population are well known. Economic growth and advances in medical treatments have brought about a 2-decade increase in worldwide life expectancy at birth since 1960.[1] This extension of the "third age" results in a higher comorbidity burden in the context of age-related physiological changes, and people often live with health-related issues in these additional years. Many later-life diseases are amenable to surgery, and yet the perioperative risks attributed to the associated comorbidity in older people make risk-benefit assessment for surgery complex. While surgical complication rates remain comparable across age groups, the incidence of medical complications increases with advancing age.[2] This results in higher rates of functional decline, institutionalisation, length of hospital stay, overall care cost burden and mortality.[3–5]

Despite this, there are benefits of surgery in the older population, including symptom control and improved longevity. This raises the question of how to design perioperative pathways of care to maximise benefits and minimise adverse outcomes in older patients. In recent years, comprehensive geriatric assessment (CGA) has emerged as a framework to underpin this pathway. This paper describes an example of a CGA-based collaborative perioperative service for older people undergoing surgery at a United Kingdom (UK) teaching hospital and the evidence for its benefits. Similar models are being established in Singapore across the different surgical subspecialties—with hip fracture being the most embedded and colorectal and

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vascular models as emerging. Significantly, the benefits of CGA in the perioperative setting are not unique to any surgical subspecialty or nation, making CGA-based models of care translatable worldwide.

Traditional Model

The traditional model of perioperative care does not adequately address the needs of older surgical patients.[6] Traditional preoperative assessment focuses primarily on risk assessment and triaging patients as "fit" or "unfit" for surgery, with less focus on preoperative modification of identified risk. When optimisation is attempted, this often results in multiple referrals to organ-specific specialties, causing delays in the pathway. In addition, behavioural modification, environmental and rehabilitation needs are not routinely addressed. Geriatricians' training in general medicine and CGA equips them with a skillset that is directly applicable to the needs of older people undergoing surgery. This has been recognised in national reports that describe the benefits of multidisciplinary collaboration and strongly advocate the involvement of geriatricians throughout the perioperative pathway.[7,8]

CGA

The risk factors for adverse postoperative outcome are age-related physiological changes, multimorbidity and geriatric syndromes such as frailty.[9,10] Many of these factors are modifiable through thorough assessment and optimisation including lifestyle and behavioural modification, medical optimisation, and pre-emptive multidisciplinary planning. However, delivery of a multicomponent intervention such as this requires a systematic approach. CGA is a process developed by geriatricians to facilitate the delivery of multidomain multidisciplinary care to complex older people, and is well validated in community and medical inpatient settings.[11–13] The key components of CGA are shown in Table 1. Evidence for the utility of CGA in the surgical patient population is emerging.[14,15] There are many theoretical benefits of a CGA approach in this setting. It can be used to assess known pathology and identify undiagnosed comorbidity, modify perioperative risks through evidence-based multidisciplinary optimisation of pathophysiology, facilitate shared decision-making and plan for the perioperative period with a focus on longer term outcomes. However, translating this evidence base and embedding CGA into routine perioperative care can be challenging. This article summarises a UK centre's approach to addressing these challenges via an incorporation of geriatric, general and perioperative medicine principles with prehabilitation to provide holistic care to older patients throughout the perioperative pathway.

Table 1. Components of Comprehensive Geriatric Assessment

Domain	Items to Be Assessed and Optimised
Medical	• Diagnosis of previously unrecognised conditions • Assessment and optimisation of: - Comorbidities - Medications - Nutrition
Mental health	• Assessment and optimisation of: - Cognition - Mood and anxiety - Fears
Functional capacity	• Assessment and optimisation of: - Basic activities of daily living - Instrumental activities of daily living - Gait and balance - Activity/exercise status
Social circumstances	• Assessment and optimisation of: - Informal support from family or friends - Social network such as visitors or daytime activities - Formal care provision (including assessment for funded care) - Lifestyle choices (smoking, exercise, etc.)
Environment	• Assessment and optimisation of: - Home situation, facilities and safety - Use of telehealth technology - Accessibility to local resources

Perioperative Medicine for Older People Undergoing Surgery

The Proactive Care of Older People Undergoing Surgery (POPS) service was launched at an inner London teaching hospital following a 2003 pilot study[16] investigating the impact of CGA on postoperative outcomes in older surgical patients. A preliminary observational study in elective orthopaedics showed high rates of modifiable preoperative risk factors, delayed surgery, postoperative complications and prolonged hospital stays. High-risk patients were invited to attend a CGA-based preoperative clinic run by a geriatrician-led multidisciplinary team. Preoperative interventions included identification and optimisation of long-term medical conditions, therapy home visits, and where necessary, the institution of a pre-emptive social care package or intermediate care arrangements. Postoperative input consisted of proactive case review and management by the geriatrician and nurse specialist, and staff education on postoperative medical complications as well as rehabilitation, nutrition and discharge issues. Patients were signposted to existing community services for ongoing care needs. Results from the pre- and postintervention evaluation showed an improvement in postoperative medical outcomes including pneumonia (20% vs 4%, $P = 0.008$) and delirium (19% vs 6%, $P = 0.036$%) and a mean reduction in length of hospital stay by 4.5 days.

Based on the results of the pilot study, the POPS service was substantively funded by the hospital and has subsequently evolved. It now comprises a team of 4 consultants, 4 specialist registrars, 11 Foundation trainees (doctors in the first and second postgraduate training years), 5 clinical nurse specialists, an occupational therapist, an administrator and a secretary. The POPS team provides input to all surgical subspecialties including cardiac surgery, trauma and orthopaedics, vascular, gastrointestinal, gynaecology, urology, plastics, head and neck and ophthalmology. The service delivers elective care (preoperative clinic with postoperative follow-through) in the surgical ward to 1400–1600 patients annually. In addition, the POPS team screens and reviews all emergency admissions across the specialties of approximately 1000–1500 patients annually. While differences exist in applying CGA to different surgical subspecialties, the similar benefits of reducing length of stay and medical complications were achieved by applying the underlying evidence-based principles in different clinical areas.

Preoperative elective care is now delivered through the POPS clinic—a one-stop CGA and optimisation-based service. Patients are referred based on multimorbidity (>2 comorbid conditions), geriatric syndromes (e.g. frailty), functional limitation, difficult decision-making or complex surgery (e.g. cystectomy, open aortic aneurysm repair). All cancer patients are seen and optimised within 2 weeks from decision for surgery to intervention. Less urgent surgical patients (e.g. joint arthroplasty or transurethral resection of prostate) are managed within the 18-week pathways. Patients are not delayed on the pathways unless proceeding with surgery is unsafe (e.g. decompensated cardiac failure, acute stroke). Using CGA, the multidisciplinary team identifies and optimises known and previously unrecognised disease, assess and modify perioperative risks, and advise on lifestyle modifications. This process informs shared decision-making between all relevant professionals, patients and carers. The referral criteria are shown in Figure 1. Examples of issues identified and optimised in the POPS clinic are shown in Table 2.

Patients seen in the POPS clinic are discussed in a weekly multidisciplinary meeting (MDM) that is attended by doctors, nurse specialists and an occupational therapist. This is sometimes supported by virtual MDM—email conversations between all parties involved which may include surgeons, anaesthetists, organ-specific physicians, nurse specialists and therapists—to establish a collaborative perioperative plan of care. Finally, the customised perioperative management plan is documented in letter format and proactively communicated to all involved parties, which include the above as well as patients and general practitioners. The clinic letter becomes the reference point for the patient, carers and healthcare professionals involved in the pathway and is available in the hospital electronic systems.

Emergency surgical admissions requiring POPS input are identified by proactively screening admissions, facilitated through board rounds, ward rounds and multidisciplinary team meetings. Patients are identified based on multimorbidity, frailty (using tools such as the Clinical Frailty Score), cognitive impairment (using tools such as the 4AT or the Montreal Cognitive Assessment), functional limitation and complexity of decision-making. The patients are then assessed and optimised according to CGA principles within the timeframe dictated by the acuity of the index pathology. Risk management may include optimisation of comorbidities and geriatric syndromes, and escalation to level 2/3 care. Decisions on preoperative diagnostic testing and timing of surgery are made collaboratively with the surgical and anaesthetics teams.

Postoperative care in the ward is provided by the POPS team to both elective and emergency patients for management of acute medical complications, direction of rehabilitation goals and facilitation of a safe and effective discharge. The postoperative collaborative model varies between surgical departments according to their respective working practices and patient population. The team employs a combination of joint medical/surgical ward rounds, POPS team ward rounds and case management, ward-based multidisciplinary rehabilitation/discharge meetings,

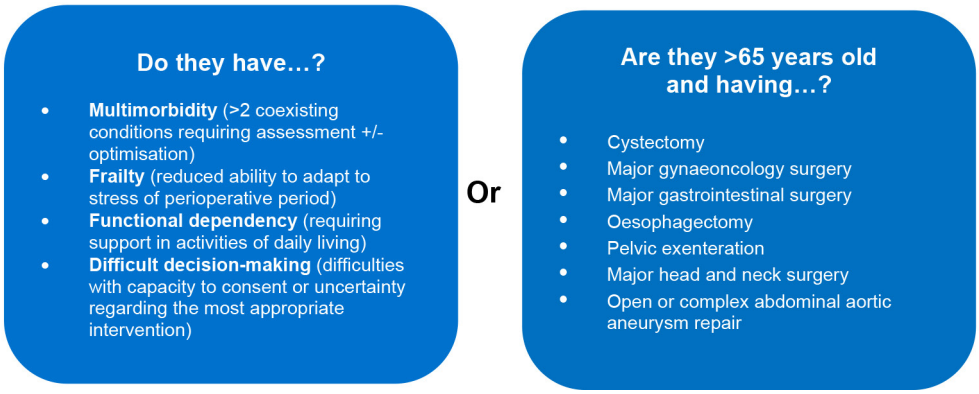

Fig. 1. Criteria for referral to POPS clinic. POPS: Proactive Care of Older People Undergoing Surgery

Table 2. Examples of Issues Identified and Optimised in POPS Clinic

Issue	Screening/diagnosis	Optimisation	Perioperative Planning	Longer Term Management
Atrial fibrillation	- Electrocardiogram	- Rate control with beta blockade and/or digoxin	- Electrolyte control - Adjustment of rate control medications, as needed	- Echocardiogram - Rhythm control, if indicated - CHA_2DS_2-VASc score - Anticoagulation
Cognitive impairment	- History - Cognitive testing	- Excluding non-dementia causes - Occupational therapy review - Patient and carer education	- Assessment of capacity to consent - Shared decision-making - Discuss Lasting Power of Attorney - Advice on delirium risk and prevention	- Memory clinic - Cognitive enhancers
Smoking	- History - Cardiovascular disease/risk	- Smoking cessation	- Nicotine replacement therapy	- Communication to general practitioner to support smoking cessation - Manage cardiovascular risk factors
Parkinson's disease	- Medical history - Medication list - Screening for associated symptoms	- Titration of Parkinson's disease medications - Therapies assessment/ interventions to minimise falls risk - Proactive optimisation of non-motor issues (e.g. constipation, postural hypotension)	- Educate staff on medication timing - Plan procedure to ensure timely medication administration - Avoid antidopaminergics - Early rehabilitation	- Link back to regular Parkinson's disease follow-up

POPS: Proactive Care of Older People Undergoing Surgery

communication with patients/relatives and referral to relevant community services postdischarge.

The team conducts regular multidisciplinary governance meetings to identify areas for improvement and attends joint surgical/anaesthetics audit meetings. They have developed trust guidelines for a variety of perioperative medical issues including diabetes management, in collaboration with specialty colleagues. In addition, the team collaborates with and contributes data to national quality improvement programmes such as the National Hip Fracture database and National Emergency Laparotomy Audit. A Patient and Public Engagement liaison group has been set up to garner public opinion on service development.

Emerging Evidence for CGA in the Perioperative Pathway

Evidence in support of perioperative CGA has been emerging for several years. A systematic review and narrative synthesis in 2013 identified 5 papers evaluating preoperative CGA and concluded that while CGA is likely to have a positive impact on improving postoperative outcomes, more research was necessary.[15] Following this, a Cochrane review[14] evaluated preoperative CGA and concluded that in a predominantly hip fracture population (7 studies of patients undergoing hip fracture surgery and 1 study of patients undergoing elective cancer resection), CGA reduced mortality rates, new institutionalisation and financial cost. Since these reviews, a single-site randomised controlled trial[17] evaluated the effectiveness of POPS preoperative CGA assessment and optimisation on postoperative outcomes in patients undergoing major vascular surgery (elective abdominal aortic aneurysm repair or lower limb arterial surgery). The intervention group (n = 104) received preoperative CGA and optimisation while the control group (n = 105) received standard preoperative care. Both groups received standard postoperative care by the vascular surgery team. The intervention resulted in a 40% reduction in length of hospital stay (P <0.001), lower incidence of medical complications and fewer delayed hospital discharges.

However, a Norwegian randomised controlled trial[18](published in 2017 but undertaken in 2011/2012) allocated 122 patients to either preoperative geriatric assessment and tailored intervention or usual care. No statistically significant difference in the rate of postoperative complications was found between the 2 groups. However, this study was compromised by under-recruitment such that the study was underpowered. Furthermore, the intervention was performed very late in the surgical pathway (median, 6 days preoperatively), reducing time for optimisation and planning, and was not truly multidisciplinary, lacking physiotherapy and occupational therapy input and thus not adhering to the evidence-based process of CGA.

Another work has used quality improvement methodology to translate the results of these studies into clinical practice. A study in gastrointestinal surgery[19] evaluated the impact of a preoperative CGA clinic for elective cases, postoperative liaison for both emergency and elective surgical patients, twice-weekly multidisciplinary discharge planning meetings and an inpatient subacute care/rehabilitation service on postoperative length of hospital stay. Two-hundred-and-three preintervention and 479 postintervention patients were recruited. The intervention resulted in a reduction in length of hospital stay of 3.1 days (95% [confidence interval] CI, 0.7–5.5; $P = 0.007$) in the elective group, and 4.4 days (95% CI, 1.5–7.2; $P = 0.005$) in the emergency surgery subgroup. This study suggests that the mean length of stay reduction per case may be associated with a significant per annum cost saving, justifying an investment of geriatric medicine consultant time. Similar results were seen in the vascular POPS trial, but formal health economic analysis is awaited.

Furthermore, big data studies are now being published from national audits. The UK National Emergency Laparotomy Audit[20] describes outcomes from 39,903 patients undergoing emergency laparotomy surgery at 185 hospital sites. In units where perioperative care pathways units are established, 30- and 90-day mortality rates were lower (odds ratio [OR], 0.86; 95% CI, 0.76–0.96, and OR, 0.89; 95% CI, 0.81–0.99, respectively). In addition, units providing postoperative review by geriatricians reported lower mortality rates in older (≥70 years) patients (OR, 0.35; 95% CI, 0.29–0.42, and OR, 0.64; 95% CI, 0.55–0.73, respectively).

In summary, these varied studies present a convincing body of evidence supporting the use of CGA in the perioperative pathway in achieving reductions in length of hospital stay, postoperative complication rates and mortality. The negative findings in one trial highlight the importance of adhering to CGA methodology when applying it in clinical practice.

The Future

With emerging evidence supporting collaborative models of care and with national bodies advocating such interventions, there has been an increase in geriatrician-led/delivered services in the UK. This is reflected in data from 2 national surveys undertaken in 2013 and 2017 showing an increase in geriatrician-led input into the care of older surgical patients.[21,22] However, translation has been affected by the lack of staff and inadequate funding. To develop the staff, a number of initiatives are underway. For medical professionals, a Foundation training programme in perioperative medicine for older people[23] and a clinical fellowship[24] are available. These are underpinned by national curricula and supported through educational opportunities including the annual national POPS conference, e-learning modules (via the British Geriatrics Society) and higher degrees (Master of Science at University College London) and the establishment of a national network of POPS-type services. Despite this, the shortfall in doctors also requires the development of a training programme for allied health professionals. The POPS team at Guy's and St Thomas' NHS Foundation Trust has authored a nursing curriculum and capability framework that are supported through e-learning modules. To address inadequate funding, the network has enabled sharing of business plans resulting in an increasing number of surgically-funded geriatrician-led perioperative medicine services.[21,22]

Translation

There is emerging evidence that the POPS model of perioperative care improves outcomes for older multimorbid surgical patients undergoing surgery in the UK. The model is gaining traction in the UK despite challenges from inadequate funding and staff.

These challenges are also likely to exist in Singapore with additional issues related to the culture of collaboration and models of healthcare funding. However, the demographics and medical needs of the population in Singapore is no different from that in the UK suggesting that the POPS model may provide a framework for the development of perioperative medicine services.

REFERENCES

1. The World Bank. Data, 2018. Available at: https://data.worldbank.org/indicator/SP.DYN.LE00.IN. Accessed on 3 November 2018.
2. Patel SA, Zenilman ME. Outcomes in older people undergoing operative intervention for colorectal cancer. J Am Geriatr Soc 2001;49:1561–4.
3. Khuri SF, Henderson WG, DePalma RG, Mosca C, Healey NA, Kumbhani DJ, et al. Determinants of long-term survival after major surgery and the adverse effect of postoperative complications. Ann Surg 2005;242:326–41;discussion 341–3.
4. Hamel MB, Henderson WG, Khuri SF, Daley J. Surgical outcomes for patients aged 80 and older: morbidity and mortality from major noncardiac surgery. J Am Geriatr Soc 2005;53:424–9.
5. Lawrence VA, Hazuda HP, Cornell JE, Pederson T, Bradshaw PT, Mulrow CD, et al. Functional independence after major abdominal surgery in the elderly. J Am Coll Surg 2004;199:762–72.
6. Royal College of Anaesthetists. Perioperative Medicine: The Pathway to Better Surgical Care. Available at: https://www.rcoa.ac.uk/sites/default/files/documents/2019-08/Perioperative%20Medicine%20-%20The%20Pathway%20to%20Better%20Care.pdf. Accessed on 7 November 2018.
7. National Confidential Enquiry into Patient Outcome and Death (NCEPOD). An Age Old Problem: A Review of the Care Received by Elderly Patients Undergoing Surgery, 2010. Available at: http://www.ncepod.org.uk/2010report3/downloads/EESE_fullReport.pdf. Accessed on 7 November 2018.

8. Royal College of Surgeons of England. Access All ages: Assessing the Impact of Ages on Access to Surgical Treatment, 2012. Available at: https://www.rcseng.ac.uk/-/media/files/rcs/about-rcs/government-relations-consultation/access_all_ages-(1).pdf. Accessed on 7 November 2018.
9. Lin HS, Watts JN, Peel NM, Hubbard RE. Frailty and post-operative outcomes in older surgical patients: a systematic review. BMC Geriatr 2016;16:157.
10. Liu LL, Leung JM. Predicting adverse postoperative outcomes in patients aged 80 years or older. J Am Geriatr Soc 2000;48:405–12.
11. Ellis G, Langhorne P. Comprehensive geriatric assessment for older hospital patients. Br Med Bull 2005;71:45–59.
12. Stuck AE, Siu AL, Wieland GD, Adams J, Rubenstein LZ. Comprehensive geriatric assessment: a meta-analysis of controlled trials. Lancet 1993;342:1032–6.
13. Ellis G, Whitehead MA, O'Neill D, Langhorne P, Robinson D. Comprehensive geriatric assessment for older adults admitted to hospital. Cochrane Database Syst Rev 2011;7:CD006211.
14. Eamer G, Taheri A, Chen SS, Daviduck Q, Chambers T, Shi X, et al. Comprehensive geriatric assessment for older people admitted to a surgical service. Cochrane Database Syst Rev 2018;1:CD012485.
15. Partridge JS, Harari D, Martin FC, Dhesi JK. The impact of pre-operative comprehensive geriatric assessment on postoperative outcomes in older patients undergoing scheduled surgery: a systematic review. Anaesthesia 2014;69 Suppl 1:8–16.
16. Harari D, Hopper A, Dhesi J, Babic-Illman G, Lockwood L, Martin F. Proactive care of older people undergoing surgery ('POPS'): designing, embedding, evaluating and funding a comprehensive geriatric assessment service for older elective surgical patients. Age Ageing 2007;36:190–6.
17. Partridge JS, Harari D, Martin FC, Peacock JL, Bell R, Mohammed A, Dhesi JK. Randomized clinical trial of comprehensive geriatric assessment and optimization in vascular surgery. Br J Surg 2017;104:679–87.
18. Ommundsen N, Wyller TB, Nesbakken A, Bakka AO, Jordhøy MS, Skovlund E, et al. Preoperative geriatric assessment and tailored interventions in frail older patients with colorectal cancer: a randomized controlled trial. Colorectal Dis 2018;20:16–25.
19. Shipway D, Koizia L, Winterhorn N, Fertleman M, Ziprin P, Moorthy K. Embedded geriatric surgical liaison is associated with reduced inpatient length of stay in older patients admitted for gastrointestinal surgery. Future Hosp J 2018;5:108–16.
20. Oliver CM, Bassett MG, Poulton TE, Anderson ID, Murray DM, Grocott MP, et al. Organisational factors and mortality after an emergency laparotomy: multilevel analysis of 39903 National Emergency Laparotomy Audit patients. Br J Anaesth 2018;121:1346–56.
21. Partridge JS, Collingridge G, Gordon AL, Martin FC, Harari D, Dhesi JK. Where are we in perioperative medicine for older surgical patients? A UK survey of geriatric medicine delivered services in surgery. Age Ageing 2014;43:721–4.
22. Joughin AL, Partridge JSL, O'Halloran T, Dhesi JK. Where are we now in perioperative medicine? Results from a repeated UK survey of geriatric medicine delivered services for older people. Age Ageing 2019;48:458–62.
23. Rogerson A, Partridge JS, Dhesi JK. A Foundation Programme educational placement in peri-operative medicine for older people: mixed methods evaluation. Anaesthesia 2018;73:1392–9.
24. Braude P, Partridge JS, Hardwick J, Shipway DJ, Dhesi JK. Geriatricians in perioperative medicine: developing subspecialty training. Br J Anaesth 2016;116:4–6.