

Perioperative medicine for Older People undergoing Surgery (POPS):

A guide to designing, developing and embedding POPS services



Contents

1.0	Aims of document	4
2.0	Why are POPS services needed?	4
3.0	POPS at Guy's and St Thomas' NHS Foundation Trust (POPS@GSTT)	5
3.1	Evolution of the service at GSTT	5
3.2	The current service at GSTT	5
3.2.1	Members of the team	5
3.2.2	Surgical subspecialties covered by POPS	5
3.2.3	Elective and emergency pathways	5
3.2.4	Education, training and capacity building	7
3.2.5	Clinical Governance	7
3.3	The evidence for the POPS service	8
3.4	Patient story from POPS@GSTT	11
4.0	Translating POPS@GSTT to Dartford and Gravesham Trust (POPS@DGT)	12
4.1	The opportunity for translation of POPS@GSTT	12
4.2	The need for POPS@DGT	12
4.2.1	Understanding the current service at DGT	12
4.2.2	Understanding the potential impact of POPS@DGT	12
4.3	Steps to identify and engage local stakeholders at DGT	13
4.4	Developing the pilot service at DGT	13
4.4.1	What?	14
4.4.2	Who?	14
4.4.3	When?	14
4.4.4	How?	15
4.5	Implementing the pilot service at DGT	15
4.5.1	Steps in implementing a new preoperative CGA and optimisation clinic	15
4.5.2	Steps in implementing a new postoperative POPS service	15
4.5.3	Steps in implementing an education programme	15
4.6	Developing a successful business plan for POPS@DGT	15
4.7	Ensuring successful and sustainable implementation of POPS@DGT	16
4.7.1	Identifying springboards	16
4.7.2	Publicising and disseminating the service	16
4.7.3	Evaluating the service	16
4.8	The collaborative POPS model	16
4.8.1	Management structure	16
4.8.2	Financial structure	17
4.9	Patient stories from POPS@DGT	17
5.0	The national scale up of POPS	18

Glossary of acronyms

BGS	British Geriatrics Society
CGA	Comprehensive Geriatric Assessment
CLAHRC	Collaboration for Leadership in Applied Health Research and Care
CNS	Clinical Nurse Specialist
COPD	Chronic Obstructive Pulmonary Disease
DGT	Dartford and Gravesham NHS Trust
DNA	Did Not Attend
FY	Foundation Year
GP	General Practitioner
GSTT	Guy's and St Thomas NHS Foundation Trust
IV	Intravenous
LOS	Length of stay
MDM	Multi-Disciplinary Team Meeting
MDT	Multi-Disciplinary Team
NIHR	National Institute for Health Research
OOPE/T	Out of Programme Experience/Training
OT	Occupational Therapist
PA	Programmed Activity
POPS	Perioperative medicine for Older People undergoing Surgery
RCT	Randomised Controlled Trial
SHO	Senior House Officer
SpR	Specialist Registrar
WTE	Whole Time Equivalent

Authors

Jugdeep Dhesi and Judith Partridge are consultant geriatricians at GSTT.

Catherine Meilak and Anna Whittle are consultant geriatricians at DGT.

Ruth de Las Casas is a Darzi fellow funded by the Darzi Programme and Guy's and St Thomas' NHS Foundation Trust

Nick Sevdalis, Professor of Implementation Science & Patient Safety at King's College London and Dr Euan Sadler, Senior Postdoctoral Research Fellow in Implementation Science at King's College London contributed to this guide. Both are supported by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care South London (NIHR CLAHRC South London) at King's College Hospital NHS Foundation Trust.



1.0 Aims of Document

This reference guide has been developed as a result of the 2016-18 Vanguard Programme between Guy's and St Thomas' NHS Foundation Trust (GSTT) and Dartford and Gravesham NHS Trust (DGT). One of the key outcomes of the Vanguard Programme was adoption of the GSTT POPS model of care by DGT. POPS stands for Perioperative medicine for Older People undergoing Surgery. It is a geriatrician led perioperative service evidenced to improve outcomes for older surgical patients.

The aims of this document are to:

- 1) Describe the evolution of POPS@GSTT
- 2) Outline the process of designing, developing and embedding a POPS service at DGT
- 3) Provide an evidence-based and practical resource for NHS Trusts describing how to successfully establish POPS services appropriate to the local context



2.0 Why are POPS services needed?

Increasing numbers of older people are undergoing elective and emergency surgery. This is related not only to changing demographics, but also to advances in surgical and anaesthetic techniques, changing patient expectations, and changing healthcare professionals' attitudes and behaviours. The overall impact is that rates of surgical procedures in older people are now significantly higher than in any other age group.

Whilst it is clear that older people have much to gain from surgery in terms of symptom control and improved life expectancy, they remain at higher risk of adverse postoperative outcomes. This is true across clinician-reported, patient-reported and process-related measures. The literature provides evidence that older people are more likely than younger patients to experience postoperative medical complications, functional deterioration and consequently a longer length of stay. These adverse outcomes are not a consequence of age alone, but instead due to factors associated with ageing: poor physiological status, multimorbidity and geriatric syndromes such as cognitive impairment and frailty.

This understanding has led to the recognition of the need for geriatricians in the care of complex older patients undergoing surgery. The National Confidential Enquiry into Patient Outcome and Death report, *An Age Old Problem*, noted widespread deficiencies in care received by older surgical patients and recommended routine daily input from geriatricians. Key care pathways, such as those developed through the National Hip Fracture Database and the National Emergency Laparotomy Audit, list access to specialist geriatric care as a national standard. This is in keeping with the Royal College of Anaesthetists' perioperative medicine vision which advocates the involvement of the relevant expert at the right time for the right patient. These principles are echoed by the Royal College of Surgeons and the British Geriatrics Society, all advocating the development of collaborative models of care.

The POPS model is a widely recognised and award-winning example of such collaborative care. The POPS team at GSTT is an established multidisciplinary geriatrician led team delivering pre and postoperative care to complex older patients using Comprehensive Geriatric Assessment (CGA) methodology, and has been shown to reduce length of stay and postoperative complications with improvements in patient safety and experience. Furthermore the POPS model has wider-reaching benefits in terms of promoting education and training in issues pertinent to complex older patients and in developing the research agenda in this field.

3.0 POPS at Guy's and St Thomas' NHS Foundation Trust (POPS@GSTT)

3.1 Evolution of the service at GSTT

The POPS programme at GSTT started in 2003, when geriatricians Danielle Harari and Jugdeep Dhese received a GSTT Charity grant to test the hypothesis that preoperative CGA and optimisation would reduce postoperative complications and hence length of stay in older people undergoing elective orthopaedic surgery.

The Medical Research Council *Framework for Complex Intervention* informed the initial development and evaluation of the POPS service. Broadly, this fell into three phases:

- Development phase, during which a literature review confirmed a theoretical basis for the intervention and survey data from staff and patients identified a clinical and service need
- Modelling phase, during which the 'what', 'who', 'how' and 'when' of the POPS intervention was developed
- Exploratory phase, using a 'before and after' quality improvement study to evaluate the impact of the POPS intervention on clinical and process outcomes in a cohort of elective orthopaedic patients. The evaluation demonstrated that preoperative CGA and optimisation resulted in a significant reduction in both medical and multidisciplinary postoperative complications, and a shorter length of stay

This developmental and evaluative work supported the writing of a business case, following which mainstream funding for the initial POPS service was granted by GSTT in 2005.

The service has continued to expand and develop over the period 2005-2018, as presented below and in figure 2. It is worth noting that expansion has required:

- The submission of several business plans
- Creative use of funding to ensure that the service responds to the needs of the patient population and takes into account the available workforce and expertise
- Funding from different directorates and other sources (e.g. research grants, deanery)

3.2 The current service at GSTT

Fifteen years after starting, POPS@GSTT can now be described as a mature clinical service. POPS now has 25 staff members, and provides pre and postoperative input in the majority of surgical subspecialties delivering patient care across two acute sites (Guy's and St Thomas' hospitals) and one community site (Amputee Rehabilitation Unit). This section will describe the current clinical service.

3.2.1 Members of the team

- 4.4 consultant geriatricians (3.3 WTE in post at present)
- 5 clinical nurse specialists
- 1 occupational therapist
- 3 OOPE/T specialist registrars
- 11 foundation year doctors (6 FY1s 5 FY2s)
- 1 administrator
- 1 secretary (funded from Department of Ageing and Health secretarial pool)

3.2.2 Surgical subspecialties covered by POPS

POPS has expanded into different surgical subspecialties in response to clinical need as identified and defined through research and clinical governance work. These clinical needs have been different in each surgical subspecialty. For example:

Elective orthopaedics: length of stay and medical complications

General surgery: complex discharges and concern about consistency of medical input on surgical wards

Urology: late cancellations and functional deterioration

Vascular: length of stay and medical morbidity

Gynaecology: capacity, consent and delirium

POPS currently provides:

Pre and postoperative input in elective and emergency patients undergoing: Orthopaedic surgery, General surgery, Urology, Vascular surgery, and Gynaecological surgery.

Preoperative input in elective patients undergoing: Breast surgery, Head and Neck surgery, Ophthalmic surgery, Plastic surgery, and Special care dentistry.

An expansion into cardiac surgery is currently under consideration.

3.2.3 Elective and emergency patient pathways

The patient pathways for elective and emergency surgery and the interface with the POPS service is presented in Figure 3.

Preoperative elective care

POPS receives electronic referrals from surgeons, anaesthetists, preoperative assessment clinic nurses, and occasionally from general practitioners. Triggers for referral include multi-morbidity, geriatric syndromes, and concerns about functional status or difficult decision making about whether surgery is the right option. In addition older patients undergoing specific major surgical procedures are

routinely referred (e.g. cystectomy, open abdominal aortic aneurysm repair). No fixed referral criteria or screening tool is used to gate-keep referrals which are instead made at the discretion of the referrer. This has occurred in the absence of definitive evidence to support the use of any one screening tool and reflects the 15 year evolution of the service. Approximately 1300-1500 new patients are seen in the POPS clinic annually.

Patients are preoperatively evaluated using CGA and optimisation. CGA is an established and evidence based method for evaluating and optimising physical, psychological, functional and social issues in older patients using validated screening methods and tools. Using this methodology in the preoperative setting facilitates a systematic approach to:

Assessment and optimisation across medical, functional, social and psychological domains:

- Assessment of known comorbidity and optimisation according to evidence based guidelines (e.g. optimisation of decompensated cardiac failure using diuretics for symptoms, and beta blockade and angiotensin converting enzyme inhibition for longer term cardiac remodelling)
- Use of screening tools to identify and apply evidence based guidelines to optimise previously unrecognised disease (e.g. new diagnosis of Chronic Obstructive Pulmonary Disease in long-term smokers, described using Medical Research Council breathlessness scale and spirometry, and optimised using pulmonary rehabilitation, smoking cessation, flu vaccination and prescription of inhaled therapy)
- Assessment and optimisation of functional and psychosocial status using multidisciplinary interventions (e.g. occupational therapy home adaptations and referral to counselling services for patients with cancer)

Evaluation and mitigation of perioperative risk in terms of:

- Organ specific complications (e.g. risk of acute kidney injury prompting risk modification including cessation of non-steroidal anti-inflammatories and unnecessary thiazide diuretics, and clear postoperative instructions to ward team)
- Postoperative cognitive disorders (e.g. risk of delirium evaluated and managed using multicomponent strategies as detailed in National Institute for Health and Care Excellence guidance)
- Functional decline and change in care needs at hospital discharge (e.g. prompting pre-emptive referral to social services in order that care needs are met)
- Overall risk of perioperative morbidity and mortality using tools such as the Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity (POSSuM)

Promotion of shared decision making:

- Assessment of cognition and capacity to consent to the surgical intervention
- Discussion of risk-benefit ratio of surgery in relation to other treatment options (with surgeon, anaesthetist, and patient)

Provision of an individually tailored perioperative management plan:

- Management plans and goals are agreed with the patient, and disseminated in the form of a letter within maximum five days of clinic appointment to all relevant providers, for example the GP, the surgeon, the anaesthetist and ward team.
- Proactive communication with key stakeholders, including patients, relatives, surgeons, anaesthetists, ward teams, GPs and other primary care staff

Preoperative emergency care

In order to ensure that emergency surgical patients are directed to the appropriate teams and settings in a timely fashion, a combination of approaches are used for patient entry into the POPS service. These include early warning scores, frailty assessment scores, delirium risk assessments, and mortality scores. This allows early Level 2 or 3 care for the very unwell patient, and proactive involvement from POPS for patients with geriatric syndromes and multi-morbidity. Preoperative assessment and optimisation is tailored to the acuity of the surgical intervention.

Postoperative care (elective and emergency)

The POPS team provide ongoing care for elective and emergency patients, with a focus on preventing and managing medical complications and functional deterioration and ensuring proactive rehabilitation and discharge planning. This care is provided through:

- Joint POPS-surgical ward rounds
- Case management on surgical wards
- Regular medical POPS ward rounds on surgical wards
- Ward based multidisciplinary team meetings to set rehabilitation goals and ensure proactive discharge planning (weekly formal meeting or daily board round)
- Proactive POPS team led communication between healthcare professionals, patients, and carers
- Onward referral to appropriate services after hospital discharge

Primary care / community links

The surgical episode represents a discreet episode of care in the longer term management of patients with chronic conditions. Such long-term conditions are primarily managed by general practitioners and therefore communication of the CGA and optimisation plan in addition to details of the hospital stay is paramount. The current POPS service copies all preoperative clinic letters to the GP and patient, and inputs details of inpatient medical management into the hospital discharge summaries.

In addition, POPS provides medical and rehabilitation care to patients following major amputation managed in a 12 bedded community unit. This constitutes three visits per week for medical care and face-to-face leadership at a weekly multidisciplinary team meeting where rehabilitation goals and discharge planning are discussed. POPS also provide the clinical governance lead at the amputee rehabilitation unit.

Furthermore, the POPS team interface in person and virtually with a wider variety of community services including early supported discharge teams, falls exercise and balance groups, integrated telemedicine services and memory clinics.

3.2.4 Education, training and capacity building

POPS has invested in education and training activities, both locally and nationally, with the aim of improving care for older surgical patients. The POPS vision is to develop capacity (in the form of knowledge, skills and attitudes) for ongoing delivery of sustainable services.

Local initiatives include:

- Trust-wide nurse education on issues pertinent to older surgical patients (e.g. delirium, falls, medicines management)
- Contribution to nursing Masters modules within the trust (e.g. vascular clinical nurse specialist)
- Development of POPS clinical nurse specialist role (physical examination skills, nurse prescribing)
- Establishment of a foundation doctor programme in perioperative medicine for older people
- Development of year-long OOPE/T specialist registrar programme to train the subspecialist in perioperative medicine for older people
- Cross disciplinary education and training programme for anaesthetic staff (e.g. final year anaesthetic SpRs attending POPS clinics and ward rounds)
- Programme of visits to the service which include three hours of informal teaching and questions with the service lead, in addition to observation of in- and out-patient POPS services across different surgical subspecialties

National initiatives include:

- Development of a curriculum in perioperative medicine for the older patient for geriatric medicine specialist registrar trainees (endorsed by the Royal College of Physicians/BGS)
- Establishment of a national two day conference under the aegis of the BGS POPS Specialist Interest Group attended by geriatricians, anaesthetists and surgeons, and covering aspects of perioperative medicine and implementation science principles for those interested in integrating POPS services into their trusts
- Authorship of a module on perioperative medicine for older patients as part of an MSc programme
- Authorship of BGS e-learning module in perioperative medicine for the older patient

3.2.5 Clinical Governance

POPS have embedded a clinical governance programme into the culture of the multidisciplinary team both at the acute hospital sites and the amputee rehabilitation unit. This has allowed a focus on continuous outcome measurement, and quality improvement work such that the clinical service is continuously adapted to the needs of the patient population. Examples of quality improvement work include:

- Regular POPS team clinical governance meetings to identify and develop a quality improvement programme
- Regular attendance and presentation at surgical and anaesthetic audit meetings
- Development and implementation of cross-speciality clinical guidelines, e.g. perioperative management of diabetes, preoperative management of pacemakers
- POPS involvement in trust-wide initiatives, e.g. promotion of screening, identification, and management of delirium
- Refining processes and pathways using co-production with both patients and healthcare professionals (e.g. redesign of research studies enabling same day recruitment based on feedback from potential patient participants)
- Evaluation of patient experience of POPS service (e.g. clinic and amputee rehabilitation unit)
- Evaluation of stakeholder experience of POPS service, e.g. survey of use and satisfaction with POPS clinic letters showing that multiple users (surgeons, anaesthetists, primary care, therapies, pharmacy, podiatry, coding etc) find letters helpful but providing constructive feedback informing continual improvement (e.g. advice to GPs now highlighted in a specific format at the beginning of the letter)

Examples of the outcomes that the team has focused on include:

- Reducing preoperative hospital attendances (e.g. numerous organ specialist clinics)
- Preventing late cancellations on day of surgery
- Promoting standardised management of anticipated postoperative complications
- Reducing referrals to on-call medical registrar for surgical patients
- Reducing length of hospital stay
- Improving quality of communication with patients and families on the ward
- Improving quality of coding with associated cost saving
- Upskilling nursing, therapy and pharmacy staff in issues pertinent to older patients

3.3 The evidence for the POPS service

Clinical evidence

A ‘before and after’ quality improvement study and a randomized controlled trial have both demonstrated that the POPS service improves outcomes for older surgical patients.

The ‘before and after’ study was conducted at GSTT in elective orthopedic patients aged over 65 years. The outcomes for a cohort of 54 consecutive patients managed using standard care pathways were compared with 54 patients after implementation of the POPS service. The intervention group who received preoperative CGA and optimisation had fewer medical and multidisciplinary complications and a 4.5 day reduction in length of stay despite a higher number of baseline comorbidities (table 1).

In a recent RCT elective vascular surgical patients were randomised to either preoperative CGA and optimisation clinic or routine preoperative care. 176 patients were included in the final analysis. The intervention (POPS) group had significantly fewer medical complications, fewer delays related to discharge and a 40% reduction in length of stay (5.5 days versus 3.3 days (p<0.05) (figure 1).

Table 1. Postoperative outcomes according to study cohort ‘Pre’ POPS versus ‘Post’ POPS

	“Pre” Routine preoperative care	“Post” CGA and optimisation	P Value
Pneumonia	20%	4%	0.008
Delirium	19%	6%	0.036
Pressure sore	19%	4%	0.028
Delayed mobilization	28%	9%	0.012
Length of stay (median)	14.5 days	10 days	< 0.05

Figure 1: Percentage of patients with complications and delayed discharge according to trial arm

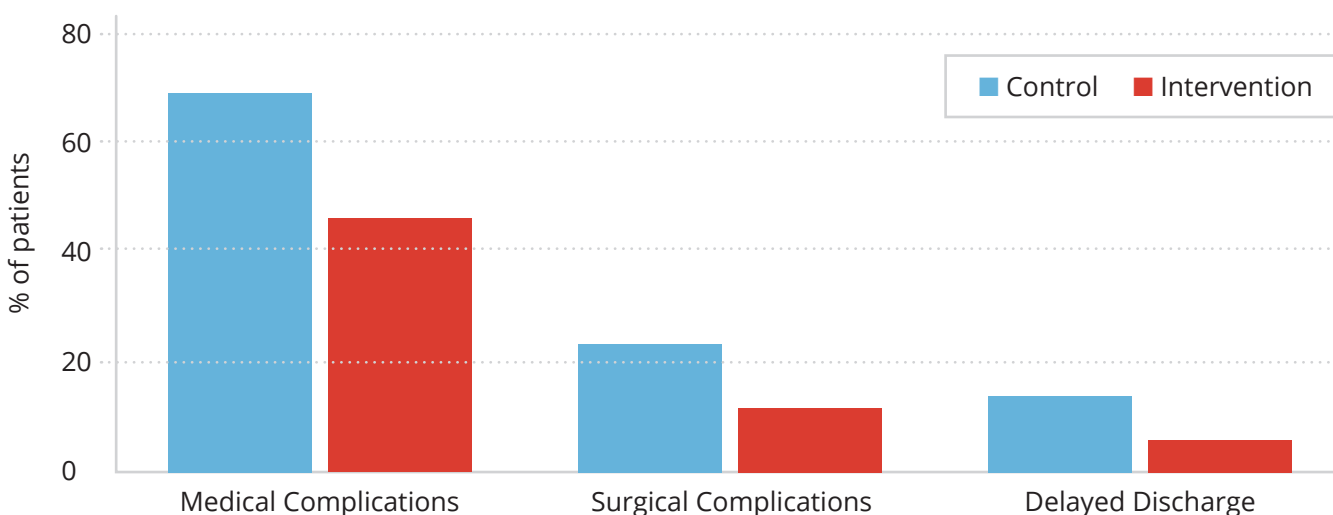
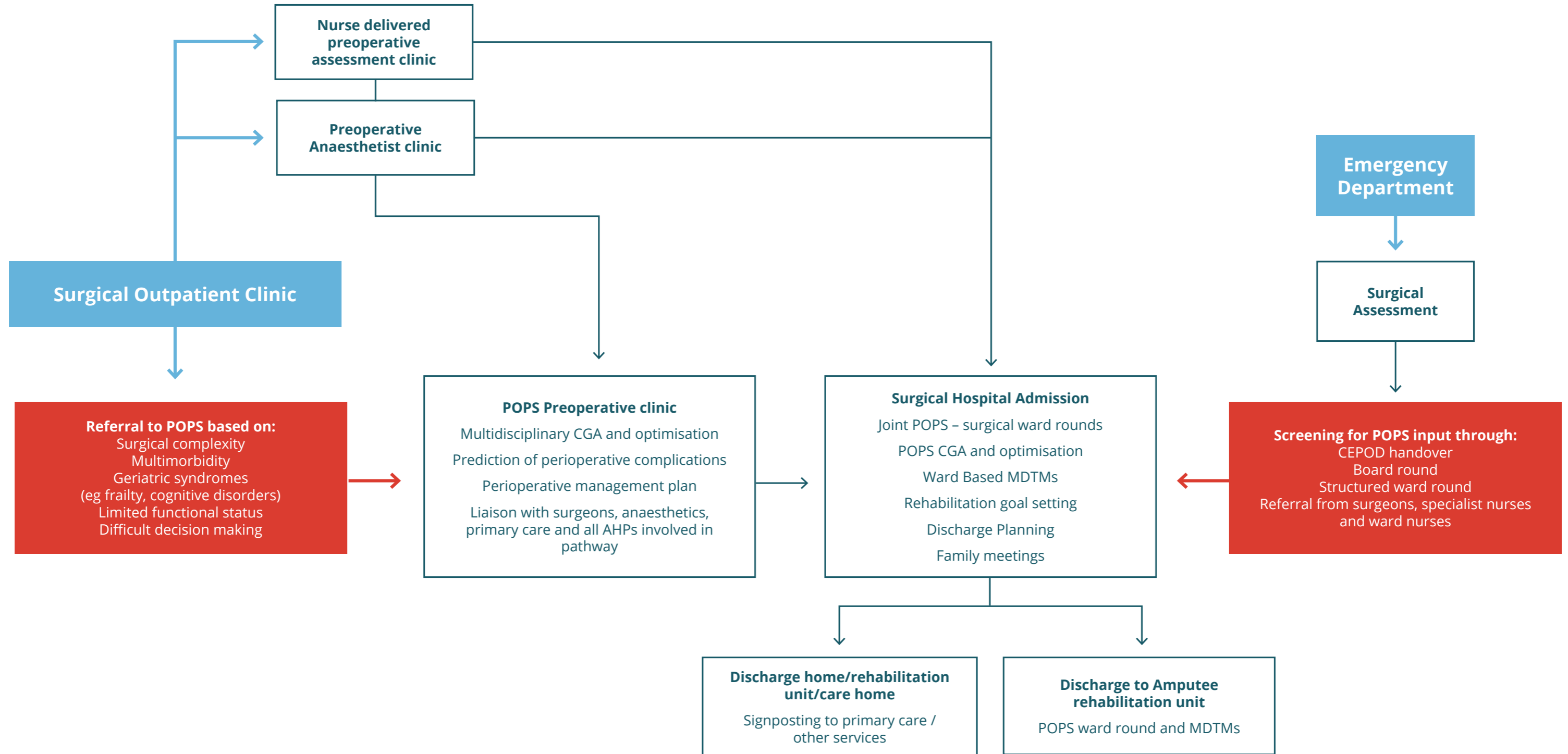


Figure 2. Chronology of POPS service development from inception to date



Figure 3. The patient pathway for elective and emergency surgery and the interface with POPS@GSTT



A patient and public engagement and involvement group has been established to continually inform service development and research.

Patient and stakeholder feedback

Further to the clinical evidence that underpins the POPS model, the team have been collecting testimonials and views directly from patients who received care from the POPS service as part of their surgical pathway.

“ I’m sure you will have success with POPS; such a good idea for the elderly so I hope it carries on the good work, makes us feel we are wanted and not too much of a burden to people”.

Mrs T, 74 year old lady undergoing elective urological surgery

“ The...team explained everything to me in full, from what was going to happen in the operation, to the special shoes I would need to wear and the exercises I needed to do to build up my strength. Most of all, I’m thankful to the team for making sure I was free of any infection so that I could have the operation in the first place”.

Mrs B, 81 year old lady undergoing elective orthopaedic surgery

“ The POPS team not only helped me with my bad back and lowering my blood pressure so that my operation wasn’t delayed any longer, they also helped to take away the worry of going into hospital”.

Mr G, 82 year old man undergoing colorectal surgery

“ Strong medical management of surgical patients with in-depth reviews and consistent plans that are clear”.

Mrs B, ward sister, upper and lower gastrointestinal surgical unit

“ Improves patient centred approach to patient care”.

Miss T, urology surgeon

“ The POPS team is a great asset to our surgical service and you are delivering world class care”.

Mr B, vascular surgeon

3.4 Patient story from POPS@GSTT

The patient story in Box 1 demonstrates how the POPS service inputs into the care of older surgical patients

Box 1 - Case Study 1

A 74 year old man was assessed in POPS preoperative CGA and optimisation clinic prior to planned nephrectomy for chronic sepsis. Recurrent septic episodes due to the infected kidney had resulted in several admissions to the local hospital in the preceding 12 months with resultant hospital acquired deconditioning. Following the last hospitalisation he had been discharged to his daughter’s home where he was sleeping on the sofa without a formal package of care and with very limited mobility. CGA and optimisation by the POPS team resulted in:

- New diagnosis of decompensated ischaemic cardiac failure investigated with transthoracic echocardiogram and treated using loop diuretics and evidence based secondary prevention for long term remodelling benefit
- New diagnosis of iron and folate deficiency anaemia secondary to chronic sepsis and poor diet managed with intravenous iron, oral folic acid and instigation of dietary support using domiciliary delivery of meals arranged by OT
- Supplementation of low vitamin D in view of falls risk
- Assessment of cognition using short cognitive assessment tool in order to define perioperative delirium risk and modification (thiazide diuretic stopped, encouraged to wear hearing aids when admitted)
- OT assessment of home situation with planned move back to own flat from daughter’s home supported by new package of social care established before planned surgical admission to ensure easy discharge following nephrectomy
- Urgent referral for domiciliary physiotherapy to improve functional status following hospital acquired deconditioning

4.0 Translating POPS@GSTT to Dartford and Gravesham Trust (POPS@DGT)

4.1 The opportunity for translation of POPS@GSTT

In 2015 an Acute Care Collaboration Vanguard was awarded by NHS England to GSTT and DGT. Darent Valley Hospital is a district general hospital and serves a growing population of 340,000. The Trust is anticipating a significant increase in activity due to new housing developments such as the Ebbsfleet Garden City. Population projections from 2015-2025 indicate that over these ten years the number of local residents aged 60-79 years will increase by 38%, and the number aged over 80 years will increase by 45%.

Three main work-streams were identified on which the Vanguard programme would focus. Vascular surgery was one of these work-streams. All vascular surgery within the area is performed at the tertiary centre, GSTT, which previously necessitated preoperative assessment and optimisation by POPS@GSTT. The Vanguard status between GSTT and DGT facilitated scoping work involving a series of surveys and meetings with all stakeholders (patients and families, surgeons, anaesthetists, managers) demonstrating that a local preoperative vascular POPS service at DGT might improve service-accessibility and user-experience. It was therefore hypothesised that implementing POPS@DGT would improve patient, clinician, and process-reported outcomes.

Using pump-prime funding from the Vanguard programme, a pilot POPS@DGT clinic was commenced for elective vascular patients. Ward-based POPS medical input was also provided for in-patients @DGT undergoing conservative management of vascular issues. Interest from other surgical specialties quickly became apparent, and as the data below demonstrate, a need for POPS within general surgery was identified.

4.2 The need for POPS@DGT

4.2.1 Understanding the current service at DGT

Before pilot work began, the following steps were taken to establish a good understanding of the existing service provision and requirements at DGT:

- Characterisation of the DGT surgical population. Snapshot data collections described demographic and clinical characteristics; the majority of surgical inpatients were older, multimorbid, emergency admissions and had no geriatrician involvement
- Description of the DGT clinical surgical service. Process mapping, internal data collection (length of stay, day of surgery cancellations and readmissions) and external data evaluation (e.g. National Emergency Laparotomy Audit) were undertaken

- Identification of stakeholders. Teams and individuals who could assist with service implementation were identified, and involved in service design, with the aim being to complement existing services and use pre-existing team members where possible (e.g. using existing enhanced recovery programme nurse to help identify patients who may benefit from POPS)

4.2.2 Understanding the potential impact of POPS@DGT

Scoping work described the potential impact of POPS@DGT.

The POPS service was likely to introduce the following improvements for patients:

- Provision of local preoperative and inpatient Comprehensive Geriatric Assessment: an intervention that is evidenced to increase the number of people remaining in their own home at one year
- Standardised, effective, and specialist care for older people undergoing elective and emergency general surgery at DGT
- Thorough assessment of 'fitness' for surgery reducing late cancellations known to provoke patient distress and anxiety
- Early safe repatriation of patients from GSTT to DGT for postoperative care and rehabilitation, ensuring 'local' care
- Effective utilisation of community services facilitating safe and timely discharge home

The likely impact of POPS@DGT service on clinical staff was anticipated in:

Education

- Establishment of cross disciplinary education for surgical and anaesthetic staff, including structured educational opportunities for junior doctors
- Establishment of education and training sessions for nursing staff and allied health professionals
- Collaborative introduction of trust wide perioperative guidelines e.g. perioperative management of diabetes, hypertension, cardiac devices
- Support in quality improvement projects, attracting undergraduate medical students and postgraduate trainees

Workforce satisfaction

- Improved quality of care and provision of structured education and training lead to improved workforce satisfaction and may impact positively on staff retention
- Enhancement of the multi-disciplinary approach to care, which is central to POPS, similarly improves satisfaction and learning

Workforce development

- Delivering a recognised POPS service at DGT will attract SpRs from geriatric medicine and anaesthetics (who wish to become perioperative medicine specialists)
- Similarly POPS@DGT will attract nurses who wish to develop as Advanced Nurse Practitioners (with prescribing and examination skills)

Readmissions

- Readmissions of elective and emergency vascular patients at GSTT would not be expected to be affected as these patients are already reviewed and optimised by POPS@GSTT
- Approximately 90 elective and emergency patients aged over 65 years of age were readmitted within 3 months at DGT. POPS anticipated reducing this by 20%, preventing approximately 18 readmissions annually

Improvement in quality of coding

- Projects from both GSTT and other units who are implementing POPS type services (e.g. Salford General) demonstrate that coding for comorbidities and postoperative complications is improved through better diagnosis and documentation by the POPS team. This results in increased remuneration for the trust

Areas for cost savings were identified:

Length of stay (LOS)

- There were approximately 440 emergency general surgical admissions aged over 65 years annually. Median LOS was 7 days at DGT compared with 5 days at GSTT. An anticipated reduction in LOS of 1 day therefore equated to 440 bed days saved. There were approximately 240 elective general surgical patients aged over 65 years of age admitted to DGT annually. Again assuming a reduction in LOS of 1 day, this equates to 240 bed days saved

Cancellations

- Cancellations of elective vascular patients at GSTT would not be expected to be affected as this cohort of patients are already reviewed and optimised preoperatively by POPS@GSTT
- Approximately 60 elective general surgical patients aged over 65 years are cancelled annually at DGT due to being unfit on the day of surgery. POPS expected to reduce this cancellation rate by 20%, avoiding 12 unnecessary cancellations per year

4.3 Steps to identify and engage local stakeholders at DGT

In parallel with the scoping work, a stakeholder analysis was undertaken to understand the need for, the support for and the potential resistance to the service from different perspectives. The POPS team understood that, whilst fidelity to the GSTT POPS service should be maintained, it required adaptation to the local context, to facilitate initial acceptability and feasibility and lead to longer term sustainability.

Stakeholders were engaged through a range of different fora: education sessions, audit meetings, grand round presentations, individual meetings, coffee mornings, and questionnaires. All stakeholders were asked to comment on their top three 'wants' of a POPS service.

Groups identified as key stakeholders and engaged in the POPS introduction process were:

- Management: Trust Board and Departmental Management (Medicine, Surgery, Anaesthetics)
- Clinical: Surgery, Medicine, Anaesthetics, Critical Care, Allied Health/Therapies, Pre-assessment services, Pharmacy
- CCG and local general practitioners
- Patient and carer groups

4.4 Developing the pilot service at DGT

Having established the need for the service and the projected achievable outcomes, a phased implementation was undertaken. A pilot service was designed first.

4.4.1 What?

The pilot service aimed to provide:

- Two clinics per week for preoperative CGA assessment and optimisation of elective patients (general surgery and vascular)
- Daily consultant geriatrician presence and input for general surgical and vascular elective and emergency patients, with review of all emergency laparotomy patients aged over 65 years
- Twice weekly consultant geriatrician-led ward multidisciplinary meetings undertaken with therapy and ward staff to guide and coordinate discharge planning
- An educational programme for junior doctors and multidisciplinary team
- Development and implementation of pathways and guidelines for emergency and elective patients to improve and standardise patient care

4.4.2 Who?

The above service was to be provided by 1.0 WTE consultant geriatricians, integrated within the surgical directorate. The POPS consultant would work collaboratively with the junior surgical doctors, vascular CNS and enhanced recovery CNS.

In the current economic climate staff recruitment is a concern. In the case of DGT, two geriatricians who had undertaken part of their training with the POPS team at GSTT were keen to undertake a job-share Consultant POPS post at DGT. This facilitated the early pilot implementation of the POPS service.

4.4.3 When?

The timetable (table 2) outlines the proposed weekly job plan for the POPS Consultant at DGT.

Table 2: Proposed weekly timetable for POPS Consultant at DGT

Day	Location	Type of Work	Start/Finish
Mon	DVH	Ward reviews/new admissions (all surgical wards)	0900-1300
		CME: Junior Dr teaching/clinical governance	1300-1400
		MDM Ward 1	1400-1500
		Work relating to <ul style="list-style-type: none"> • Job planning • Developing educational programme and educational supervision 	1500-1700
Tue	DVH	POPS clinic: 5 new, 1 Follow up	0900-1300
		MDM Ward 2	1300-1400
		Ward reviews/new admissions (all surgical wards)	1400-1500
		Quality improvement projects	1500-1600
		Patient related administration	1600-1700
Wed	GSTT	Multi disciplinary team at GSTT to discuss new patients	0900-1300
	DVH	Professional development/Ageing and Health	1300-1400
		Ward reviews/new admissions (all surgical wards)	1400-1700
Thurs	DVH	POPS clinic: 5 new, 1 follow up	0900-1300
		Medical Grand Round	1300-1400
		Ward reviews/family meetings	1400-1500
		Quality improvement project	1500-1600
		Clinic Administration	1600-1700
Fri	DVH	Vascular and General Surgery Ward round / family meetings	0900-1200
		Clinic Administration	1200-1300
		Surgical MDM Wards 1 and 2	1300-1500
		Work relating to <ul style="list-style-type: none"> • Job planning • Developing educational programme and educational supervision 	1500-1700

4.4.4 How?

Based on scoping work at DGT, the workload was quantified as follows:

- Inpatient workload 15-20 patients per week
- Outpatient workload: 5 new patients requiring CGA and optimisation and 1 follow up per week
- Continued professional development: through close collaboration with POPS@GSTT, and internal and external educational meetings
- Contribution to service evaluation and improvement
- Education of junior doctors, nursing staff and allied health professionals

4.5 Implementing the pilot service at DGT

Consideration of the following steps helped in the implementation of the service.

4.5.1 Steps in implementing a new preoperative CGA and optimisation clinic

- Establish referral criteria (e.g. screening tools, clinical discretion) and process of referral (e.g. electronic referral/letter/tick box form)
- Obtain necessary resources
 - » clinic space
 - » staff (e.g. nursing associate to perform ECGs)
 - » supporting information technology
 - » equipment (e.g. bladder scanner, 24 tape recorders)
- Ensure fidelity to POPS model and efficiency in setup through utilising/adapting existing resources and materials from the lead POPS site (e.g. POPS@GSTT clerking proforma, clinic letter and guidelines)

4.5.2 Steps in implementing a new postoperative POPS service

- Establish ward level multidisciplinary meetings or board rounds (MDT virtual ward round) to promote case finding and management, collaborative working and education and training
- Use existing staff through effective engagement of junior doctors and therapists
- Establish a structure for improving ward level communication with patients and families (e.g. relatives clinic)

4.5.3 Steps in implementing an education programme

- Ensure multidisciplinary education through engagement with educational leads
- Use existing educational resources from POPS@GSTT (e.g. slidesets, handouts, case studies)
- Ensure continual improvement through reflection and feedback

4.6 Developing a successful business plan for POPS@DGT

Vanguard funding offered a set time-period of 18 months during which POPS@DGT could be scoped and piloted. As illustrated above the team identified that establishing POPS@DGT would improve clinician, patient, and process related outcomes. Based on these outcomes a business plan was written to ensure substantive funding to continue the service at the end of the Vanguard programme i.e. allowing sustained implementation.

In order to deliver a comprehensive and sustainable service, the business plan incorporated a POPS consultant post (accredited by the Royal College of Physicians), POPS clinical nurse specialist post, and 0.3 WTE POPS occupational therapist. POPS@GSTT business plans were used as templates for a successful application.

Engagement with the Finance Department was crucial in allowing calculation of costings and cost savings relevant to the local Trust. In addition the Finance Department advised on the layout and content of the business plan ensuring it was in keeping with local practice at DGT.

4.7 Ensuring successful and sustainable implementation of POPS@DGT

Following acceptance of the business plan (14 months after initial Vanguard funding began), POPS@DGT worked on embedding the service into routine practice with a focus on ensuring sustainability. The following steps were useful.

4.7.1 Identifying springboards

Identify any springboards or initiatives that may aid implementation. Examples from the DGT experience include:

- Using funding opportunities: The NHS England Vanguard Programme funding had offered an opportunity to scope and trial the pilot service. Charitable funding may be available from many Trusts
- Using staffing opportunities: GSTT and DGT successfully applied for a joint Darzi Fellow, who was able to assist in the implementation and evaluation of the service in its first year

4.7.2 Publicising and disseminating the service

- Publicise the service throughout the implementation process, to ensure visibility. For example presenting at grand rounds, attending audit meetings within the medical, surgical and anaesthetic departments, developing POPS@DGT webpage for staff and patients, and producing articles for Trust newsletters, screen savers and posters for the wards
- Engagement with stakeholders not originally involved. For example working clinically on the wards at DGT identified the need to engage with critical care outreach teams, dieticians, and acute pain services. Presentation at their governance meetings ensured collaboration
- Use existing resources to maximise efficiency. For example the DGT team used slide sets and patient stories from GSTT to illustrate the service when presenting at departmental audit and governance meetings

4.7.3 Evaluating the service

Based on the GSTT experience it was important to establish a robust clinical governance structure from the start. Mixed methods data collection was necessary to ensure the needs of all stakeholders were appraised

- Clinical outcomes. Morbidity and mortality data was presented at clinical audit meetings, submitted to national audit e.g. National Emergency Laparotomy Audit (NELA) and used in quality improvement programmes to continually refine processes
- Patient reported outcomes. Vanguard funding enabled patient coffee mornings to ensure co-design and production of the POPS@DGT service
- Process outcomes. Run charts on length of stay data, outpatient clinic attendances, Did Not Attend (DNA rates) per outpatient clinic were used to maximise efficiency and feedback to management

Ensuring that the data collected is in line with the Trust priorities is an effective implementation strategy in enabling 'quick wins' and enhancing the case for sustained funding within the Trust.

4.8 The collaborative POPS model: a supportive infrastructure for POPS implementation and scale up

The collaboration between POPS@GSTT and POPS@DGT has been the key facilitator in progressing from recognition of need for the service, to a functioning and substantively funded service, within 18 months.

4.8.1 Management structure

POPS is a new but rapidly developing specialist field of medicine. Ensuring the support and mentorship of the more established POPS team was integral to success at DGT. In keeping with Vanguard principles this relationship between trusts was less about mergers and acquisitions and more about fostering shared learning. Furthermore these therapeutic relationships can be used to establish wider networks of excellence in perioperative medicine for older people throughout the UK.

POPS@GSTT provided clinical mentorship and professional development support for POPS@DGT practitioners through the following mechanisms:

- Peer-review of outpatient cases at weekly MDT meetings held at GSTT
- Regular review and editing of POPS@DGT outpatient letters by POPS@GSTT consultants
- Sharing of clinical resources such as guidelines and letter templates as detailed previously

Implementation of services, which may be a new skill for clinicians, requires support from departments experienced in underpinning service development with 'real life' data collection and analysis. The strong links between the POPS@GSTT team and the Centre for Implementation Science at King's College London affords access to implementation and scale up expertise. This can be accessed through attending the annual POPS conference which includes a session on implementation science, site visits POPS@GSTT, written materials such as this guide and slide sets. Sites keen to establish POPS services should investigate potential local partners such as universities, innovation units and CLAHRCs all available on the website.

4.8.2 Financial structure

The Vanguard Programme provided joint financial support to GSTT and DGT for service development. This constituted 0.4 WTE clinical fellow used at the DGT site and 0.1 WTE consultant geriatrician support from the POPS clinical lead at GSTT. Such a financial structure allowed a clear, controlled and fixed-term resource plan to demonstrate the value of the service as a proof of concept. This financial management framework defined the delivery period as well as the triggers to develop the business case for moving the service from 'proof of concept' to mainstream funded clinical service.

It was identified that the savings proposed by the POPS service business plan would benefit surgical departments and hence the business plan was successfully submitted to the surgical directorate. This novel approach meant that the POPS consultant physician post was situated within surgery but with appraisal and governance provided from the POPS team at GSTT.

4.9 Patient stories from POPS@DGT

The patient stories in Box 2 and 3 demonstrate how POPS@DGT has positively impacted on patient care.

Box 2 - Case study 2

A 91-year-old man with a necrotic toe was seen in September 2016 by a vascular surgeon, who made a plan for conservative management of peripheral vascular disease. However, two months later the patient was admitted as an emergency to DGT, with sepsis secondary to the necrotic toe. The ward team were planning to transfer the patient to GSTT for inpatient surgical intervention. Prior to the transfer however he was seen by the POPS team who communicated first-hand with the GSTT surgeon, discussing the clinical progression in light of medical multimorbidity, frailty and cognitive impairment and sharing photographs. The vascular surgical team confirmed he would not benefit from surgical management, and the joint decision was made to continue conservative management at DVH.

This POPS review involving clear definition of medical issues and appraisal of frailty and cognition resulted in:

- Avoidance of unnecessary transfer to GSTT
- Advanced care plan discussion with patient and family, facilitated by POPS
- Good end of life care on the ward at DVH, delivered at the local centre allowing close proximity to his family
- Positive feedback from the patient and his family with regards to the clear communication from the POPS team throughout the pathway of care

Box 3 - Case study 3

An 84-year-old retired merchant naval officer presented to vascular surgery with peripheral arterial disease requiring open revascularisation. He was reviewed preoperatively by POPS@DGT. Multiple medical issues were identified and managed, the most critical of which was the identification of a previously unrecognised lung nodule on an old CT scan. He was further investigated and ultimately found to have a lung cancer, for which he underwent a curative lobectomy. He recovered from his lung cancer surgery and subsequently underwent on to have a femoral-femoral cross over graft to treat the limb ischaemia. He experienced no postoperative complications and was discharged home after a five day length of stay.

The preoperative POPS CGA and optimisation prior to elective surgery resulted in:

- A new diagnosis of lung cancer, which was successfully managed
- Proactive identification and management of medical co-morbidities, which unmanaged may have prolonged the hospital length of stay (i.e. COPD, visual impairment)
- Provision of all care (excepting surgery) locally, which was important for him due to limited mobility secondary to peripheral arterial disease, visual impairment, and no social support
- Preoperative OT review and proactive optimisation of his home enabling rapid hospital discharge once recovery from surgery complete

5.0 The national scale up of POPS

The POPS service is well-established and well-evidenced within GSTT. Following the successful introduction of the pilot service at DGT, POPS has now been substantively funded at this district general trust. Two months into its early implementation it has been enthusiastically received by patients and staff, and initial results are promising.

There is an increasing national appetite for the dissemination and scale up of POPS services. This is evidenced by 10-20 sites visiting POPS@GSTT annually, and a fully-booked annual POPS conference hosted collaboratively with the BGS to provide education and support to individuals and trusts interested in adopting the POPS model locally.

The logic model (table 3) defines the core components of a POPS service, the mechanism of change (process changes), contextual factors (relevant to the local climate) and short and long-term measurable outcomes. Adherence to these core components when implementing POPS in other settings will ensure fidelity to the evidence-based POPS model of care such that the intended clinician reported, patient reported and process outcomes can be successfully achieved.

POPS@GSTT are freely making all supporting documentation, tools, proformas, curricula and teaching programmes (with slidesets) available to centres wishing to establish POPS services. In the interests of ensuring standardised quality care and facilitating navigation of the healthcare system for patients, carers and all staff, we advocate consistency in the naming of perioperative medical services specifically for older or multimorbid patients using the nomenclature POPS@new centre. This will further enable a network of POPS@ services to develop, allowing sharing of resources and best practice, avoidance of duplication, establishment of a joined up national education, training and research programme and promotion of consistent standardised clinical care to all, regardless of geography.

For further information
Please visit the POPS team website
at www.popsteam.co.uk

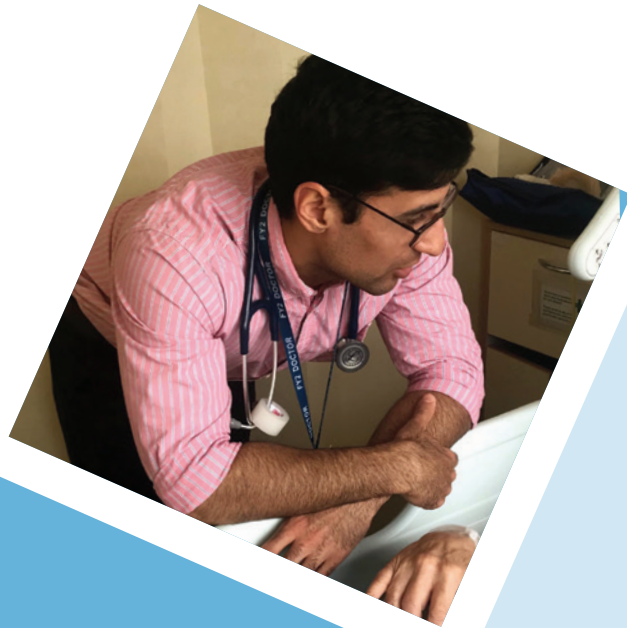


Table 3: POPS logic model

Inputs	Core components	Mechanism (process changes)	Contextual factors (which enable or hinder implementation)	Short Term Outcomes	Long Term Outcomes	Long Term impacts of POPS service
<p>MDT POPS team</p> <p>Consultant with expertise in CGA in perioperative setting</p> <p>CNS</p> <p>OT</p> <p>Administrator</p> <p>Other key stakeholders</p> <p>Trust executive / board</p> <p>Surgeons</p> <p>Anaesthetists</p> <p>Other AHPs</p> <p>Surgical pathway coordinators</p> <p>Evaluator</p> <p>Patients and relatives</p> <p>Resources</p> <p>Funding</p> <p>Clinic Space</p> <p>Office space</p> <p>Equipment</p> <p>Supporting proformas (in paper or electronic format)</p> <p>Clinical reference guide</p> <p>Clinical guidelines/protocols</p> <p>Education resources</p> <p>Doctor/CNS curriculum/competency framework</p> <p>Teaching schedules</p> <p>Teaching materials (e.g. slide-packs)</p>	<p>Deliver preoperative CGA and optimisation through multidisciplinary working</p>	<p>Preoperative CGA and optimisation outpatient clinic</p> <p>Effective screening and referral criteria</p> <p>Evidence based perioperative medicine</p> <p>'Hands on' delivery of clinical optimisation plan</p>	<p>Buy in' from board, surgeons, anaesthetists and other key stakeholders</p> <p>Skills and engagement of medical and AHP staff equipped to deliver CGA and optimisation in the perioperative period</p> <p>IT infrastructure, technical support and physical space</p> <p>Funding</p>	<p>Improved quantification of perioperative risk</p> <p>Improved shared decision-making</p> <p>Improved identification of underlying medical issues</p> <p>Improved medical optimisation</p> <p>Improved identification and management of barriers to early discharge</p> <p>Reduced variation in patient care</p>	<p>Patient outcomes:</p> <p>Embedding of multi-disciplinary and patient-centred shared decision-making in clinical practice</p> <p>Provision of timely surgical care</p> <p>Avoidance of inappropriate procedures</p> <p>Reduced postoperative morbidity and harm</p> <p>Improved patient reported outcomes (short and long term)</p> <p>Service outcomes:</p> <p>Improved quality of care</p> <p>Reduced length of stay</p> <p>Reduced same day cancellation of surgery</p> <p>Reduced readmissions</p> <p>Reduced financial cost</p> <p>Implementation outcomes:</p> <p>Acceptability of service to providers, patients, and carers</p> <p>Maintenance of fidelity whilst adapting service to the local context</p> <p>Development of 'big data' through collation of audit and quality improvement work at POPS sites</p> <p>Development of a workforce equipped to deliver perioperative medicine services for complex older patients</p>	<p>Improved health literacy with consequent improved patient navigation of health services</p> <p>Integrated health care</p> <p>Improved health outcomes</p> <p>Development of evidence base in perioperative medicine through big data</p> <p>Influence on policy and funding streams for perioperative medicine services</p>
	<p>Provide postoperative CGA on the surgical ward</p>	<p>CGA and optimisation conducted using scheduled ward rounds, board rounds, multidisciplinary team meetings</p> <p>Proactive communication between healthcare professionals, patients and families</p>	<p>'Buy in' from ward teams</p> <p>Staff attitudes and behaviours</p> <p>Skills and engagement of medical and AHP staff equipped to deliver CGA and optimisation in the perioperative period</p> <p>IT infrastructure, technical support and physical space</p> <p>Funding</p>	<p>Fewer acute postoperative complications</p> <p>Improved early identification of postoperative complications with standardised management</p> <p>Safe and effective discharge planning</p>		
	<p>Ensure ownership of patient care</p>	<p>Fostering an environment that promotes shared-decision making with the patient at the centre</p>	<p>Professional jurisdictions, norms and codes of behaviour</p> <p>Readiness for change within the clinical team and the organisation (open to new ways of delivering collaborative patient-centred care)</p>	<p>Reduced number of specialist referrals</p> <p>Single point of access: improved communication with patient and primary care to facilitate patient navigation of perioperative pathway</p> <p>Improved shared decision-making</p> <p>Improved delivery of holistic care, with focus on perioperative and longer-term outcomes</p>		
	<p>Facilitate proactive liaison with other teams</p>	<p>Joint ward rounds, board rounds, clinic consults between surgery, medicine and anaesthetics</p> <p>Joint audit meetings/teaching sessions between surgery, medicine and anaesthetics</p>	<p>Buy-in from all stakeholders</p> <p>Promotion of collaborative working (on individual, team, organisational level)</p> <p>Trusted informal and formal peer review and accountability with willingness to engage with feedback processes</p> <p>Avoidance of silo working and poor communication (whether due to IT or other systems)</p>	<p>Informed and therefore improved clinical-decision making</p> <p>Reduced silo culture</p> <p>Positive influence on behaviours and attitudes of junior medical and nursing staff</p>		
	<p>Provide education and training to POPS team and key stakeholders</p>	<p>Predefined curriculum</p> <p>Structured teaching programme</p>	<p>Scheduled protected teaching sessions</p>	<p>An 'upskilled' workforce able to provide care for complex older patients</p> <p>Improved knowledge and skills in perioperative medicine (doctors and AHPs)</p> <p>Creation of teaching and mentoring opportunities</p>		
<p>Establish governance structure and evaluation processes</p>	<p>Structured quality improvement programme underpinned by robust clinical governance meetings</p>	<p>Support from informatics</p> <p>Access to expertise in quality improvement</p>	<p>Ensure fidelity to the POPS model of care</p> <p>Reduced unwarranted variation in patient care</p> <p>Improved quality of care</p> <p>Development of an evidence base in issues relevant to complex older surgical patients</p>			

References

- Braude P, Partridge JSL, Shipway DJH, Martin FC, Dhesei JK. Perioperative medicine for older patients; how do we deliver quality care? *Future Hospital Journal* 2016; 3: 33-6.
- Campbell NC, Murray E, Darbyshire J, Emery J, Farmer A, Griffiths F, Guthrie F, Guthrie B, Lester H, Wilson P, Kinmonth AL. Designing and Evaluating Complex Interventions to Improve Health Care. Ellis G, Whitehead MA, O'Neill D, Langhorne P, Robinson. Comprehensive geriatric assessment for older adults admitted to hospital. *Cochrane Database Systematic Review*. 2011;issue 7. Art no. CD006211. DOI 10.1002/14651858.CD006211.pub.2
- Etzioni DA, Liu JH, Maggard MA, Ko CY. The aging population and its impact on the surgery workforce. *Annals of Surgery*. 2003 Aug;238(2):170-7
- Harari D, Hopper A, Dhesei 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 and Ageing* 2007;36: 190-196
- Hamel MB, Henderson WG, Khuri SF, Daley J. Surgical outcomes for patients aged 80 and older: morbidity and mortality from major non-cardiac surgery. *Journal of the American Geriatrics Society*. 2005;53:424-9
- Lin HS, Watts JN, Peel NM, Hubbard RE. Frailty and postoperative outcomes in older surgical patients: a systematic review. *BMC Geriatrics*. 2016 August 31;16(1):157
- National Confidential Enquiry into Patient Outcome and Death (2010). An Age Old Problem: A review of the care received by elderly patients undergoing surgery. [online] Available at http://www.ncepod.org.uk/2010report3/downloads/EESE_fullReport.pdf (accessed on 7th Feb 2018)
- Oliver CM, Walker E, Giannaris S, Grocott MPW, Moonesinghe R. Risk assessment tools validated for patients undergoing emergency laparotomy: a systematic review. *British Journal of Anaesthesia*. 2015 December;115(6): 849-60
- Partridge JSL, Collingridge G, Gordon AL, Martin FC, Harari D, Dhesei JK. Where are we in perioperative medicine for older surgical patients? A UK survey of geriatric medicine delivered services in surgery. *Age and Ageing* 2014; 0: 1-4
- Partridge JSL, Harari D, Martin FC, Dhesei JK. The impact of preoperative comprehensive geriatric assessment on postoperative outcomes in older patients undergoing scheduled surgery: a systematic review. *Anaesthesia*. 2014;69 (Suppl. 1), 8-16
- Partridge JSL, Harari D, Martin F, Peacock JL, Bell R, Mohammed A, Dhesei JK. Randomised clinical trial of comprehensive geriatric assessment and optimisation in vascular surgery. *British Journal of Surgery*. 2017;104: 679-687
- Partridge J, Sbai M, Dhesei J. Proactive care of Older People undergoing Surgery. *Aging Clin Exp Res* 2018 doi: 10.1007/s40520-017-0879-4. [epub ahead of print]
- Polanczyk CA, Marcantonio E, Goldman L, Rohde LE, Orav J, Mangione CM, Lee TH. Impact of age on perioperative complications and length of stay in patients undergoing noncardiac surgery. *Annals of Internal Medicine*. 2001 April 17;134(8):637-43
- Royal College of Anaesthetists. National Emergency Laparotomy Audit. [online] Available at https://nela.org.uk/NELA_home (accessed on 7th Feb 2018)
- Royal College of Anaesthetists. Perioperative Medicine: The pathway to better surgical care. [online] Available at <https://www.rcoa.ac.uk/perioperativemedicine> (accessed on 7th Feb 2018)
- Royal College of Physicians. The National Hip Fracture Database. [online] Available at <https://www.nhfd.co.uk/20/hipfractureR.nsf/> (accessed on 7th Feb 2018)
- Royal College of Surgeons / Department of Health. The higher risk general surgical patient: towards improved care for a better group. RCOSENG – Professional Standards and Regulation. 2011
- Shipway DJH, Partridge JSL, Foxton CR, Modarai B, Gossage JA, Challacombe BJ, Marks C, Dhesei JK. Do Surgical Trainees Believe They Are Adequately Trained to Manage the Ageing Population? A UK Survey of Knowledge and Beliefs in Surgical Trainees. *J Surgical Education* 2015: 72: 641-7.

