# 3. Surgical care pathways

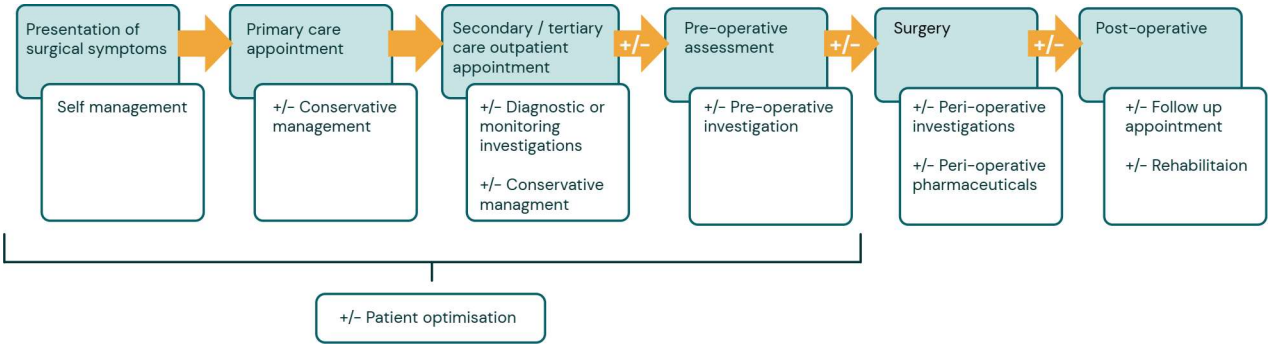
## Section key points

- The environmental impact of surgical patient care can be reduced by interventions throughout the surgical care pathway.
- Streamlining patient pathways includes reducing low-value steps and unnecessary consultations (including creating 'one-stop' clinics), and rationalising and eliminating unnecessary pre-operative investigations.
- Use of telehealth, digital patient management systems and centralised lean electronic medical records can reduce carbon impacts.
- Pre-operative optimisation can reduce complication rates, including smoking cessation, alcohol moderation, exercise, nutrition, and weight optimisation.
- Operations should be performed in a timely manner, and in ambulatory day-case or outpatient settings where clinically appropriate.
- In-hospital stay can be minimised, for example through enhanced recovery protocols and early discharge planning and virtual wards.
- Post-operative tests and imaging should not be performed where unnecessary.

# 3.1 Streamlining surgical patient care pathways

The environmental impact of surgical patient care extends beyond the operating theatre, and must be considered throughout the entire surgical care pathway (Figure 5). There are opportunities to mitigate these effects by applying the **reduction principle** to eliminate aspects of the peri-operative journey that do not add value to patient care, which is also likely to result in financial savings. An estimated 20% of total healthcare expenditures is deemed wasteful due to over-treatment, lack of coordination, and administrative complexity.[132]

**Figure 5: Surgical patient pathway**




A lean management tool to assist analysis is **value stream mapping**, which can be used to identify steps that do not add value in a given surgical patient pathway, bottlenecks, and unnecessary passing of patient data between individuals (risking errors). Applied in healthcare, this often improves service quality, patient satisfaction, and safety, while minimising financial and environmental costs.[133]

It is also important to encourage both patient and staff to use sustainable methods of travel throughout the surgical patient pathway, especially where this involves active transport (with co-benefits to the individual's health). This may be supported through provision of appropriate infrastructure including showers, changing rooms, protected bike storage, and bike rental schemes.

**CASE STUDY: Reducing same day surgery cancellations**

| | |
|---|---|
| **Setting** | Christie NHS Foundation Trust |
| **Patients** | Patients undergoing elective surgery |
| **Intervention** | Move bed planning and confirmation of bed spaces to the day before surgery, rather than on the morning of surgery |
| **Outcome** | Modelled 50% reduction in cancellations (previously 31 on the day cancellations/year), 20% reduction in over-runs |
| | ↓ 871 kg $CO_2$e / year |
| | ↓ £7,020 / year |
| | Reduce inconvenience to patients (e.g. time off work, unnecessary travel to hospital) |

*Source: Centre for Sustainable Healthcare*[98]

## 3.2 Outpatient consultation

There were over 20 million outpatient consultations for surgical specialties in the NHS in England in the 2021/22 financial year.[134] Reducing the number of consultations, or (where appropriate) offering remote consultations, are ways to reduce environmental impact.

Providing specialist advice and guidance to primary care doctors may reduce outpatient consultations (only around a third of patients referred for advice and guidance go on to have an outpatient consultation).[135]

Within consultations, investigations may be over-ordered. For example, an Italian study of outpatient imaging requests deemed 44% inappropriate.[136] Choice of imaging can also have an impact: the carbon footprint of a Magnetic Resonance Imaging (MRI) scan has been estimated at 17.5 kg $CO_2$e, a Computerised Tomography (CT) scan at 9.2 kg $CO_2$e, an ultrasound at 0.5 kg $CO_2$e, and a chest X-ray at 0.5 kg $CO_2$e.[137] A study of cardiac imaging found that $CO_2$ emissions were lowest for transthoracic echocardiography, tenfold higher for cardiac computed tomography angiography, and hundredfold higher for cardiac magnetic resonance.[138] Where there is no effect on clinical care, education of doctors on the indications and selection of investigations can help reduce carbon footprint.

Patient follow-up can be reduced, for example by writing to patients with results of investigations,[139] and providing plans to patients and their General Practitioner (GP) for continuing management of their disorder through self-care or primary care. Consultants are less likely to follow up with patients than trainee doctors, but with appropriate training and supervision, this difference can be reduced.[140] Where follow-up is deemed necessary, this should be patient-initiated or undertaken remotely (wherever clinically appropriate). Patient initiated follow-up contributes to reductions in follow-up appointments by 0.8-1.8 per patient.[141]

Remote consultation (or **telehealth**) reduces the carbon footprint associated with patient transportation,[142] and can improve access to care for traditionally under-served and rural populations. This can address health inequalities, and may lead to fewer missed days from work. The average patient travels for 48 minutes to attend a hospital appointment.[143] For instance, a study of virtual visits for renal transplant clinics demonstrated a reduction of 200,000 km in travel distance and 51 tonnes $CO_2$e over 263 telehealth encounters.[144] In another study switching from face-to-face to virtual fracture clinics saved patients an average of £8.96 in travel costs, and achieved equivalent levels of patient satisfaction.[145]

Digitally enabled self-care can also create financial savings. For example, after lower limb arthroplasty a virtual exercise rehabilitation program was associated with savings of US$2,745 per patient (compared with traditional care).[146] Use of a remote monitoring text and voice messaging service to monitor surgical site infections led to savings of US$153,800 per year (assuming 20 patients/week, and replacing nursing care costs).[147]

However, some caution is also appropriate. A study of remote consultation in Ear, Nose and Throat surgery (ENT) found that newly referred patients undergoing remote consultation were more likely to have follow-up or investigations than those seen face-to-face, which could potentially increase overall financial or carbon cost,[148] as well as result in sub-optimal care. There is also the risk that telehealth will widen inequalities, potentially disadvantaging those without access to (or lacking capability to operate) necessary digital technology, or those with sensory impairment. Increased use of telehealth may also necessitate training of staff to enhance computer literacy.

Where possible, health systems can support **digitisation of health records and patient management systems**. Compared to paper records, electronic medical records have been associated with reduced waste and GHG emissions (taking into account patient transportation, paper, and energy consumption, including that of associated computers and data centres).[149] Use of electronic medical records has also been linked to a 5-11% age-adjusted decrease in face-to-face visits (for specialty care versus primary care respectively) without evidence of effect on quality of care.[150]

There are wider opportunities for digital technologies to reduce environmental impact, including utilising virtual wards, which enable patients to be treated in the community.

Whilst productivity and efficiency gains associated with digital transformation may reduce environmental impact of services, analysis of such changes when compared to conventional modes of treatment delivery does not always account for hosting (for example data centres), networking, and end-user devices and services: impacts that should be measured. We are also conscious that expanding digital ecosystems may increase the environmental impact of surgical care, including increased capture and use of data, expansion of robotic surgery, and the application of artificial intelligence.

**CASE STUDY: Adopting digital care pathway programme for knee arthroplasty**

| | |
|---|---|
| **Setting** | Nottingham University Hospitals NHS Trust |
| **Patients** | Patients undergoing total knee arthroplasty |
| **Intervention** | Use of digital care pathway programme including patient education pack, online video streaming enabling self-management, accelerated physiotherapy, Enhanced Recovery after Surgery Protocols |
| **Outcome** | Reduced length of hospital stay |
| | ↓ 50 kg $CO_2$e / patient |

*Source: Sustainable Healthcare Coalition*[151]

# 3.3 Optimising pre-operative care

A co-ordinated peri-operative approach through patient optimisation and risk reduction can reduce length of hospital stay by 1-2 days, complications by 30-80%, and post-operative critical care admissions,[152] with likely reductions in associated environmental impact.

Surgery is a significant life event, and individuals are more likely to change their behaviour at moments of substantial change.[153] The pre-operative phase represents a 'teachable moment', where a patient may be receptive to suggestions from healthcare professionals which promote positive changes in **modifiable determinants of health** such as smoking cessation, alcohol moderation, increased exercise, and optimising nutrition (including weight loss for those overweight) (Table 2).[154] There may be other opportunities to optimise the patient, including improving glycaemic control, correcting anaemia, ensuring blood pressure is within target range, and psychologically preparing the patient for surgery. It may also be a chance to optimise and rationalise medication, minimising polypharmacy. Strong communication between the surgical team and primary care colleagues is important.

**CASE STUDY: Consolidating Admission Booklet**

| | |
|---|---|
| **Setting** | Ashford and St Peter's Hospital NHS Trust |
| **Patients** | Patients attending Surgical Assessment Unit ahead of short-stay admissions |
| **Intervention** | Review of admission booklet, shortened booklet from 27 pages to 6 pages |
| **Outcome** | Booklets previously took more time to go through with patients, shortening enabled nursing team to spend more time with patients |
| | ↓ 65.4 kg $CO_2$e / per year |
| | ↓ £4,793 per year |
| | Reduce information overload |

*Source: Centre for Sustainable Healthcare*[155]

**Table 2: Perioperative modifiable determinants of health**

| Perioperative modifiable factor | Potential impact | Suggested action to engage patients |
|---|---|---|
| **Smoking cessation** | Review found every tobacco-free week (after 4 weeks) reduces postoperative morbidity by 19%[156]<br><br>Smoking impacts on cardiovascular function, pulmonary function, bone and wound healing[157]<br><br>Smoking is associated with increased post-operative opiate analgesia requirements[158] | Formal pre-habilitation programmes may work, and simple messages given by a trusted source are effective<br><br>Programmes such as www.movingmedicine.ac.uk teach simple motivational interviewing to clinicians<br><br>Use of apps and digital technologies may be helpful<br><br>NHS Live Well provides a useful resource to support living[159] |
| **Alcohol moderation** | Review found pre-operative alcohol consumption associated with increased postoperative complications, including[160] general morbidity, infections, wound complications, pulmonary complications, length of hospital stay, and admission to intensive care unit | |
| **Exercise** | Varying evidence[152,161] that those who exercise have less post-operative pain, complications and length of stay, and better functional recovery and mobility | |
| **Optimising weight** | Reducing weight may be recommended to those undergoing knee or hip arthroplasty to reduce risk of complications[162]<br><br>Obesity has been associated with increased risk of wound infection, greater intraoperative blood loss, and longer operating times.[163] Conversely being underweight has been associated with increased risk of major post operative complications including mortality[163] | |
| **Nutrition** | Malnutrition and underfeeding risk complications,[164] including poor wound healing[165] | In line with Enhanced Recovery After Surgery[164]<br><br>• Avoid long periods of preoperative fasting<br><br>• Encourage carbohydrate loading up to 2 hours preoperatively<br><br>• Re-establish oral feeding as soon as possible post-operatively<br><br>• Nutritional therapy if at risk |

# 3.4 Appropriate pre-operative investigation

Eliminating unnecessary pre-operative investigations may reduce emissions and cost without negatively impacting patient care. Pre-operative testing can be useful to stratify risk with the aim of improving outcomes, however, many institutions perform routine testing for all patients regardless of health status or procedure, perhaps with the intention of increasing patient safety or decreasing medico-legal consequences of adverse events.[166]

Reviews have found routine pre-operative testing (blood tests and electrocardiogram, ECG) prior to cataract surgery did not reduce the risk of adverse perioperative events.[167] Another review found a lack of evidence to support routine pre-operative testing in elective (noncardiac) surgical patients.[168] Numerous studies and guidelines recommend against routine pre-operative testing for healthy patients undergoing low risk procedures, and instead suggest that investigations are targeted to patient comorbidities and risks of the surgical procedure.[169-174]

**CASE STUDY: Eliminating unnecessary pre-operative blood test**

| | |
|---|---|
| **Setting** | University Hospital Sussex NHS Foundation Trust |
| **Patients** | Patients undergoing laparoscopic cholecystectomies |
| **Intervention** | Streamlining pre-operative pathway for elective surgery by reducing number of Group and Save blood tests from two to one |
| **Outcome** | Low risk of significant perioperative bleed requiring urgent transfusion |
| | ↓ 2.5 tonnes $CO_2e$ / per year |
| | ↓ £3,000 per year |
| | Improved convenience for patients (↓ appointments and travel) |

In 2021, a team of clinicians led by Alyss Robinson, Shameen Jaunoo and Mansoor Khan at University Hospitals Sussex NHS Foundation Trust investigated the impact of eliminating one routine Group and Save (G&S) Test prior to laparoscopic cholecystectomy. On average 250-300 laparoscopic cholecystectomies are performed in the Trust per year. Patients who have day-case laparoscopic cholecystectomies (LC) were required (as per Trust guidelines) to have two separate G&S blood tests (taken on different days), to facilitate urgent perioperative transfusions, if needed. However the procedure has a low risk of bleeding.

Through a literature search and audit of current practice, the team concluded that eliminating the second G&S test from the preoperative workup for laparoscopic cholecystectomies is a safe intervention, resulting in carbon savings of 2.5 tonnes $CO_2e$/ year (equivalent of driving 7,200 miles in an average car) and cost savings of £3,000/year. This simple intervention could be applicable to a variety of surgical procedures.

*Source: Centre for Sustainable Healthcare Green Surgery Challenge 2021*[186]

Other examples of unnecessary pre-operative investigation include blood tests (full blood count, coagulation testing, serum biochemistry, or routine group and save for surgery such as laparoscopic cholecystectomy), resting ECG for asymptomatic patients undergoing low-risk surgery,[175-177] and radiological investigations that rarely contribute to clinical management, for example lumbar spine, or knee radiographs.[178] Such investigations incur financial, carbon and time costs for the test itself, and the patient journey to perform the test. An Australian study estimated GHG emissions from common tests, including a full blood count (117 g $CO_2$e), urea plus electrolytes (274 g $CO_2$e), coagulation profile (233 g $CO_2$e), and urinalysis (538 g $CO_2$e).[179]

Where tests are necessary, they should be **streamlined** into a **'one-stop' clinic.** With this model, investigations, diagnoses, and integrated multidisciplinary care plans are provided in one visit thereby reducing delays in patient care, patient anxiety, and financial and carbon costs.[180-182] Previous studies of one-stop clinics have shown an increase in department capacity of 15%, and a 95% patient preference compared to the conventional siloed approach.[174] One-stop clinics also improve access for those in rural and remote regions; locations where populations may have inequitable and worse health outcomes compared to urban centres.[183-185]

## 3.5 Perioperative factors, including operative location and approach

Decisions relating to location, timing, and modality of treating surgical disease should be driven by patient care, but also be sensitive to environmental impact.

Surgical procedures are typically undertaken in the surgical operating theatre, outpatient clinic, clinical wards, or emergency departments. Decisions about where a procedure takes place will depend on a number of factors, including:

- Clinical considerations
- Patient preference and compliance
- Theatre availability
- Surgeon preference
- Cultures of practice

Undertaking **surgical procedures outside of the operating theatre** for selected patients (where clinically appropriate) may be more convenient and preferable for patients, well-tolerated by patients, and cost-effective. Feasibility of clinic-based procedures has been demonstrated for example for sialendoscopy,[187] carpal tunnel decompression,[188] grommet insertion,[189] and transperineal prostate biopsy.[190] Some key factors relating to the location of surgical operations which may influence environmental impact are considered in Table 3. Even in hospitals where reusable instruments and access to sterile services may be available within operating theatres, arrangements are not always in place to facilitate treatment in alternative settings (e.g. clinic, Accident and Emergency); it is important to address this gap. Conversely, once a procedure is deemed a 'surgical procedure' there can be a tendency towards over-materialisation. For example, it is commonplace for superficial traumatic wounds in emergency departments to be cleaned with sterile saline, when there is evidence to support cleaning with tap water.[191]

The choice of surgical approach is a clinical decision, influenced by individual patient and healthcare provider capabilities (surgical skill set and availability of equipment and facilities), but the approach can also determine the environmental impact. For example, the carbon footprint

of abdominal or vaginal approaches to hysterectomy have been estimated at around 2% that of robotic approaches, with laparoscopic approaches intermediate between the two.[192] This is predominantly driven by the voluminous consumption of single-use equipment in the robotic or laparoscopic approaches. Opting for **reusable equipment** wherever possible, and encouraging industry to develop reusable equipment would reduce environmental impact (reusable medical products typically have a third to a half less carbon).[193] Similar findings were seen in an evaluation of surgery for staging of endometrial cancer.[194] While both these studies did not account for factors beyond the operating theatre, it can be inferred that these minimally invasive procedures can reduce length of hospital stay (sometimes enabling day-case surgery), and rates of complication, including atelectasis and respiratory compromise, wound complications, hernias and small bowel obstruction (the management of which would associate with further carbon burden). There will be differences in financial cost of alternative approaches also, for example a study of carpal tunnel decompression found that when these were undertaken using an open technique (rather than endoscopic) and under local anaesthetic (rather than regional or general), this would save US$3.6 billion per decade in the USA.[195]

**Table 3: Environmental impacts of setting of surgical procedures**

| | **Operating theatre** | **Non- operating theatre setting** eg. outpatient setting, clinical ward, emergency department |
|---|---|---|
| **Energy** | High energy consumption (3-6 times more than rest of hospital)[42] | Lower energy consumption |
| **Anaesthesia** | Any anaesthetic modality. There may be tendency to opt for general anaesthesia in the operating theatre even where unnecessary | Procedures under local (or no) anaesthesia |
| **Products** | Reusable products more likely available | Option of reusables not always available |
| | Tendency to use sterile equipment even if not necessary | |
| **Healthcare staff** | Likely to be more healthcare professionals involved (increasing personal protective equipment, staff travel etc.) | Likely to be fewer healthcare professionals involved |
| **Time** | Longer wait for operating theatre availability, increased time in the operating theatre department and increased length of stay | Faster process due to immediate availability, fewer resources and staff needed, shorter length of stay |

*For each row, factors which have greater environmental impact (between the two scenario columns) are indicated in orange, whilst green indicates those with lower environmental impact*

The number of post-operative visits can also be reduced by opting for absorbable (rather than non-absorbable) sutures, or in appropriate cases, asking patients to remove their own sutures. Studies on closure of traumatic wounds found a reduced number of post-operative visits with absorbable sutures and no difference in wound infection or healing;[197] and where non-absorbable sutures were used, over 90% of patients were able to remove these themselves.[198] Adopting such practices to elective and non-elective settings will reduce the environmental impact of

associated patient travel and outpatient appointment for suture removal, where this is the primary function of the appointment.

During operations, teams can **rationalise** routine histological examination where this is unlikely to alter management. For example, a study of 1,452 routine gall bladder histology specimens found 4 cases of malignancy, in all of which there was a high index of suspicion either pre- or intra-operatively.[199]

The environmental impact of medications administered perioperatively can be optimised by opting for oral routes where clinically appropriate. For example, the carbon footprint of oral paracetamol is 1/68th of that of intravenous paracetamol.[200] This may also apply to antimicrobials and antiemetics, although research is required to quantify this.

**CASE STUDY: Undertaking carpal tunnel decompression in the procedure room**

| | |
|---|---|
| **Setting** | Betsi Cadwaladr University Health Board |
| **Patients** | Patients undergoing carpal tunnel decompression |
| **Interventions** | • Undertaking operation in procedure room instead of the operating theatre<br>• Replace single-use plastic pots and bowls with reusable equivalents<br>• Reduce size of drapes<br>• Reduce number of instruments in set to extent could be housed in smaller tray |
| **Outcome** | ↓ length of hospital stay<br>↓ theatre list and surgical wait times<br>↓ number of staff required per procedure<br>↓ 11.6 tonnes $CO_2e$ / year<br>↓ £12,641 per year<br>Reduces risk of cancellations |

In 2021, a multi-disciplinary surgical team led by Prash Jesudason and Preetham Kodumuri at Wrexham Maelor and Ysbyty Gwynedd Hospitals, undertook a sustainable quality improvement project on the care pathway of carpal tunnel release surgery.

The team audited the consumables used and the volume of clinical waste generated during the procedure and used this to create a new procedure pack that involved the changes listed above. They gained approval to carry out carpal tunnel release surgery in a procedure room rather than theatres and for patients to bypass ward admission and come straight to the procedure room.

The project has forecast annual cost savings of £12,641 and carbon savings of 11.6 tonnes $CO_2e$/year (based on 75% applicability), equivalent to driving 33,285 miles in an average car.

*Source: Centre for Sustainable Healthcare Green Surgery Challenge 2021*[196]

# 3.6 Post-operative care

Opportunities to further streamline patient care are also available in the post-operative period, of which the most important is minimising inpatient stay, through maximising day-case surgery, employing enhanced recovery after surgery where appropriate, and using community-based support services to enable early discharge. GHGs attributed to general inpatient hospitalisation are estimated at 38 kg $CO_2$e (UK)[201] to 45 kg $CO_2$e (USA)[202] per day, with associated waste generation at 3 kg (UK) to 6 kg (USA) per day.[201,202] This is three times higher in critical care settings (103 kg $CO_2$e-138 kg $CO_2$e per day in the UK and the USA respectively[201,202]), and so initiatives targeted at avoiding or minimising the need for intensive care post-operatively are likely to be associated with environmental savings.

Day-case surgery can be maximised through adoption of minimally invasive techniques, which are continually expanding (for example laparoscopic appendectomy for uncomplicated acute appendicitis)[203] and use of local or regional anaesthetic techniques (for example day-case total joint arthroplasties under spinal anaesthesia in select cases).[204,205] **Day-case surgery** is preferable from a cost as well as an environmental perspective. For example, in an international review of shoulder arthroplasty, opting for day-case over inpatient treatment was associated with cost savings of £529 with no adverse events or re-admissions,[206] and in France savings of €3,921 per laparoscopic fundoplication, with comparable functional outcomes and improvements in quality of life.[207] Elective ambulatory day-case carpal tunnel decompression under local anaesthetic only was associated with savings of £688 per case (compared with local and general anaesthetic mixed list), alongside reduced waiting times (from 36 weeks to 12 weeks).[208] Enabling patients to recover after surgery in their own homes is often preferred by patients themselves, and associated with high levels of satisfaction, for example for elective craniotomy,[209] and parent satisfaction for paediatric tonsillectomy.[210]

**CASE STUDY: Early mobilisation in a Cardiac Intensive Care Unit**

| | |
|---|---|
| **Setting** | University Hospital Southampton NHS Foundation Trust 24 month period |
| **Patients** | 238 patients admitted to cardiac intensive care unit post cardiac surgery |
| **Intervention** | Early mobilisation programme, including use of equipment for passive exercise |
| **Outcome** | ↓ ventilation days by a mean of 4 days<br>↓ cardiac intensive care stay by a mean of 6 days |
| | ↓ 48.5 tonnes $CO_2$e / 24 months |
| | ↓ £1,266,327 / 24 months |
| | Enables patients to have more autonomy during their hospital stay and may improve the patients' sense of self-efficacy. |

*Source: Centre for Sustainable Healthcare*[215]

When a person requires a procedure that will necessitate admission, effective implementation of **enhanced recovery protocols** (ERPs) may be used, and are associated with 2.5 days shorter stay after major abdominal surgery,[211] decreased readmission rates, and lower post-operative morbidity and complications.[212] An enhanced perioperative care program for major spine surgery

found savings of over US$9,000 per year.[213] Many practices encouraged through ERPs, such as reduced intravenous fluids, early extubation, and avoidance of nasogastric tubes, also lead to overall reduced resource utilisation. There is also evidence that recovering with a view through a window overlooking natural scenery reduces length of hospital stay and analgesic requirements.[214]

**Early discharge planning** can contribute both to decreased length of stay and readmission rates.[216,217] Some components of patient care, such as physical therapy, could be performed in an outpatient setting to reduce hospitalisation or inpatient rehabilitation, although the frequency of follow-up required and requirement for patient travel to appointments should be considered.

**Minimising unnecessary tests and imaging** for inpatients is also important. A study of acute general surgical patients (including acute uncomplicated appendicitis, acute uncomplicated cholecystitis, choledocholithiasis, gallstone pancreatitis and non-operative adhesive small bowel obstruction) in Canada found 76% have unnecessary blood tests, with an estimated carbon footprint of 974 g $CO_2$e per patient and financial cost of CA$63 per patient.[218]

**Routine follow-up may not be necessary** after certain procedures, a concept explored as early as 25 years ago[219] and particularly suitable for low morbidity surgery such as carpal tunnel release, cholecystectomy, and inguinal hernia repair.[219–221] However, systems should be implemented to ensure patients are able to access good information, and which trigger appropriate follow up when needed. Remote follow up may also be possible, and there is no evidence of increased emergency department visits, re-admissions, re-operations, or mortality from such strategies,[222,223] with patient satisfaction similar to in-person encounters.[224,225] Advances in technology such as at-home vital sign monitoring and photography of surgical wounds,[226] support remote post-operative monitoring. The reduction in carbon emissions with reduced transport to hospital and potential earlier hospital discharge significantly outweigh technology emissions.[227–230] Simple tasks such as routine dressing care and suture removal may also be taught to patients or caretakers to perform at home.[231]

## Section recommendations

| Recommendation | Short term | Long term | Stakeholders |
|---|---|---|---|
| **R3.1**<br><br>Streamline surgical patient pathways e.g. reducing low-value steps and unnecessary consultations; rationalising unnecessary investigations (pre-, intra-, or post-operative); creating 'one-stop' clinics | Have conversations with colleagues about areas of patient journeys which do not add value, and brainstorm areas for improvement[a] | Design, implement, and evaluate interventions to streamline patient pathways where clinically appropriate[a,b]<br><br>Develop outpatient department treatment rooms and increase day case lists where appropriate[b]<br><br>Optimise and rationalise medication, minimising polypharmacy[a,c]<br><br>Standardise and consolidate peri-operative investigations[a,d] | Surgical and anaesthetic team members[a]<br><br>Healthcare provider management teams[b]<br><br>Pharmacy team[c]<br><br>Diagnostic services teams[d] |
| **R3.2**<br><br>Optimise patients pre-operatively (e.g. smoking cessation, alcohol moderation, exercise, nutrition, optimise weight) | During pre-operative consultations identify modifiable risk factors, and point patients in the direction of support and resources[a,b] | Design population level interventions around health optimisation, targeted at high risk groups[d] | Surgical and anaesthetic team members[a]<br><br>Patients[b]<br><br>Public health colleagues[d] |
| **R3.3**<br><br>Minimise length of hospital stay | Use enhanced recovery after surgery protocols and early discharge planning where appropriate[d,e] | Identify opportunities for surgery to be undertaken in ambulatory day-case theatre lists or outpatient settings[e], and develop infrastructure change to support this[b] | Surgical team[e]<br><br>Healthcare provider management teams[b] |