

Aminah N. Ahmad and Fahd Khan

---

## Introduction

Surgery is a stressful event for patients, both physically and psychologically. Effective post-operative care should minimise these stresses, together with pain and recovery time, to produce the best possible patient outcome.

Post-operative care encompasses several aspects and this chapter aims to outline important principles, including recovery, ward care, post-operative analgesia, fluid management, nutrition, wound healing, and common complications in routine and critically-ill surgical patients.

---

## The Recovery Room

Post-operative care begins immediately after a surgical procedure in the recovery room. Vital signs (heart rate, blood pressure, oxygen saturation, urine output) should be monitored with vigilance for any signs of immediate post-operative complications including [6]: airway obstruction, hypoxia, haemorrhage, hypo/hypertension, pain,

shivering/other signs of hypothermia, and vomiting/aspiration.

Patients may be discharged from recovery when the following conditions are met [5]:

- Full consciousness and response to voice/light touch
- Clear airway and normal cough reflex
- Satisfactory respiratory rate (10–20 breaths/min) and oxygen saturation (>92%)
- Pulse and blood pressure approximated to the pre-operative values
- No unexplained cardiac irregularity or persistent bleeding
- Pain and nausea controlled with suitable analgesia and anti-emetics
- Temperature >36 °C
- Adequate oxygen and fluid therapy when required

Once deemed fit to leave the recovery room, the patient should be discharged to the appropriate level of care (described in Table 10.1 below) with orders to control [6]: vital signs, pain, administration of IV fluid and medications, urine output, and any required laboratory investigations.

It may become necessary to move a patient to a different setting for a different level of care; ITU is considered the highest, while HDU is a step down. Care is provided by a multidisciplinary team (MDT) of ITU physicians and nurses, specialist physicians, dieticians and physiotherapists.

---

A.N. Ahmad, BSc (Hons) (✉)  
GKT School of Medical Education, King's College  
London, Great Maze Pond, London SE1 3QD, UK  
e-mail: [aminah.ahmad@kcl.ac.uk](mailto:aminah.ahmad@kcl.ac.uk)

F. Khan, MD, MRCS (Eng), MCh MIS(Hons)  
St James's University Hospital, Leeds, UK  
e-mail: [fahdkhan@doctors.org.uk](mailto:fahdkhan@doctors.org.uk)

**Table 10.1** A summary of the levels of care available to post-operative patients [2]

Level of care	Appropriate patients
0 – Ward	Those who have undergone minor surgical procedures Those whose needs can be met through normal ward care
1 – Surgical Ward	Those who are at risk of their condition deteriorating Those whose needs can be met on a surgical ward with advice and support from a critical care team available
2 – High Dependency Unit (HDU)	Those who require a monitored bed. Nurse:patient ratio in HDU is 1:2 Those who require support for failure of a single organ system, including the need for continuous positive airway pressure (CPAP)
3 – Intensive Therapy Unit (ITU)	Those who require complex support, e.g. advanced respiratory support or support for failure of more than one organ system Those who require mechanical ventilation and advanced monitoring Those who require one to one nursing

The patient's notes should also include any surgical or anaesthetic complications that occurred, and specific instructions for any problems that may arise.

### Care of the Critically Ill Surgical Patient

Critical illness is defined as injury overwhelming the physiologic reserve, to the point where life cannot be sustained without outside intervention; for example when asthma worsens, causing intubation and mechanical ventilation to become necessary. Physiological reserve may be compromised by age or prolonged illness.

The stress response to surgery causes physiological changes in patients. Figure 10.1 outlines the support methods provided in a critical care setting (HDU or ITU).

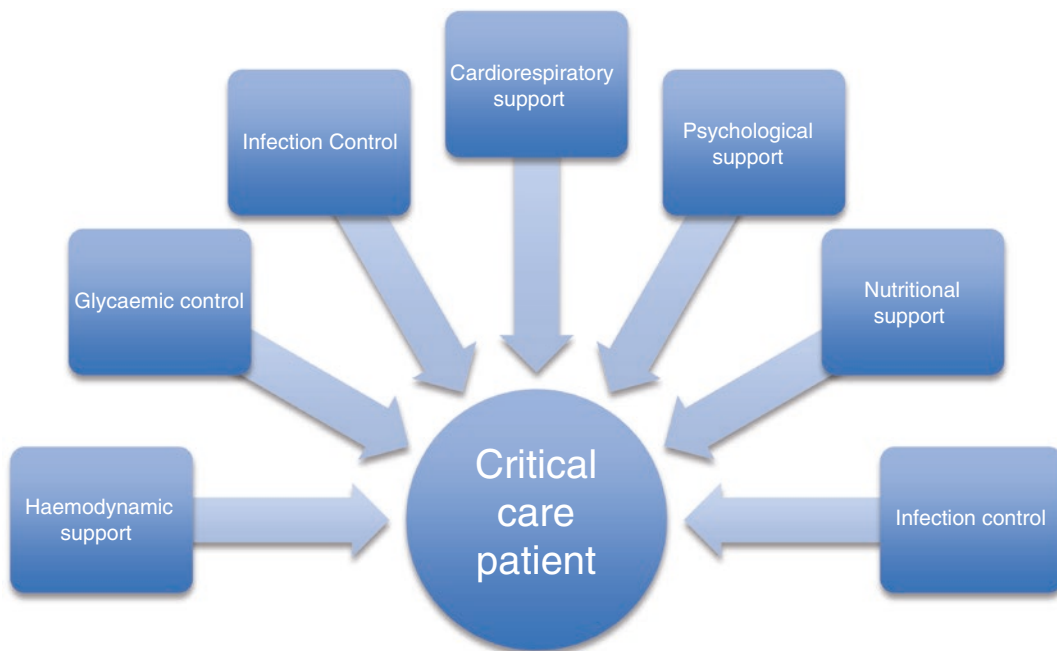
### Post-operative Assessment and Monitoring [5]

A post-operative assessment should be carried out upon the patient's return to the ward. This provides a baseline which subsequent assessments can be compared against during the recovery process.

This assessment should include:

- *A review of history and peri-operative instructions:*
  - Past medical history, medication and allergies.
  - Intraoperative complications and post-operative treatment instructions.
- *Respiratory status:* oxygen saturation, respiratory rate, breath sounds, percussion notes, and tracheal position.
- *Circulatory volume:* hands (warm or cool), capillary refill, pulse rate/rhythm, blood pressure, jugular venous pressure (JVP), urine colour and rate of production, and drainage from the wound.
- *Mental state:* assess patients' consciousness and responsiveness using the AVPU scale (**A**lert – **R**esponsive to **V**oice – **R**esponsive to **P**ain – **U**nresponsive).
- *Any significant symptoms:* chest pain, breathlessness
- *Post-operative pain*

A monitoring regimen for the patient should be established including: temperature, pulse rate, blood pressure, respiratory rate, peripheral oxygen saturation, and urine output. Pain should also be assessed. Monitoring should be frequent in the initial period after surgery (e.g. every 15 min for the first hour), and then less frequently over time (e.g. every 30 min, dropping to once an hour after 2 h).



**Fig. 10.1** Methods of support provided to critically ill patients in critical care settings. Cardiorespiratory support includes intubation, ventilatory and inotropic support, and a central line for monitoring central venous pressure.

Fluid resuscitation is important. Ventilation strategies, including spontaneous breathing trials, allow faster weaning from mechanical ventilation

Certain patients, including those in higher levels of care, those who have undergone longer or more invasive procedures, or those with pre-existing cardiorespiratory disease, may require additional monitoring including: electrocardiogram (ECG), arterial blood pressure (ABP), central venous pressure (CVP), arterial blood gas (ABG), and haematology.

Post-operative monitoring assesses the patient’s physiological state, allowing decisions regarding analgesia, nutrition, fluid management and wound care to be made.

**Table 10.2** The effects of uncontrolled post-operative pain by system

Effects of uncontrolled post-operative pain	
Metabolic	Catabolism (increased cortisol, glucagon and catecholamines)
Cardiovascular	Increased myocardial oxygen demand and coagulation
Respiratory	Decreased functional residual capacity, sputum retention
Gastrointestinal (GI)/ Genitourinary (GU)	Vomiting, ileus, sodium and water retention
Psychological	Anxiety and depression

### Post-operative Analgesia

Up to 75 % of surgical patients experience post-operative pain [1]. If uncontrolled, this can significantly affect recovery, increasing morbidity and mortality and decreasing quality of life. Post-operative management aims to minimise pain severity and duration.

### Effects of Post-operative Pain

If unrelieved, post-operative pain can have a variety of effects (Table 10.2).

Unrelieved pain increases the likelihood of negative clinical outcomes, such as: deep vein thrombosis (DVT)/Pulmonary embolism (PE), coronary ischaemia/myocardial infarction (MI),

poor wound healing, pneumonia, insomnia, and demoralisation.

There are also economic considerations – post-operative pain can extend the length of stay and increase chances of readmission [1].

The WHO analgesic ladder is reversed for surgical patients. Opioid analgesics, such as morphine, are usually administered as first line treatment intravenously or into the epidural space. These can have side effects, including nausea (an anti-emetic may be administered), urinary retention and respiratory depression. Supplementing opioids with other analgesics, such as non-steroidal anti-inflammatory drugs (NSAIDs), has been associated with reduced risk of opioid side effects.

A common management method for post-operative pain is patient-controlled analgesia (PCA), where a programmed dose of opioid is given ‘on demand’ – it is administered intravenously via a pump when the patient pushes a button. This is also used in labour pain and palliative care, and usually results in high patient satisfaction.

## Pain Scoring

Post-operative pain can be scored using a variety of methods.

- *Qualitatively*: verbal rating score (none/mild/moderate/severe).
- *Quantitatively*: numerical rating scale (0 -no pain, 10 -worst pain imaginable).
- *Visual analogue scale*: pain indicated on line (no pain to worst pain imaginable), which is good for children.

## Fluid Management

In addition to providing the normal daily fluid requirements of the patient, fluid management is used to administer drugs, correct fluid and electrolyte imbalances and for fluid resuscitation.

Normally, fluid production (metabolic processes) and intake (food and liquids) balance the fluid lost from urine, stool, lungs and the skin. If

losses exceed intake, patients become dehydrated; if intake is greater, they experience fluid overload.

Symptoms of dehydration: thirst, fatigue, impaired concentration, dry skin, cool peripheries, and reduced urine output.

Symptoms of fluid overload: shortness of breath, ankle swelling, and fatigue.

Assessing fluid balance: fluid balance should be assessed by examination. The basic procedure is outlined below.

- *General inspection*: IV fluids, consciousness level (Glasgow Coma Scale)
- *Hands*: peripheral perfusion, capillary refill, pulse, skin turgor, blood pressure
- *Face*: sunken eyes, dry mucous membranes
- *Neck*: jugular venous pulse, central venous pulse
- *Chest*: pulmonary oedema, extra heart sounds
- *Abdomen*: ascites
- *Legs*: peripheral oedema
- Daily weight

The fluid challenge: fluid balance can be assessed by a fluid challenge, where 250 mL of the colloid gelofusin is given over 15 min.

- If blood pressure increases and returns to normal, the patient is euvolaemic (normal blood volume).
- If blood pressure does not increase, the patient is hypovolaemic (decreased blood volume) and fluid resuscitation is necessary.
- If blood pressure increases, the patient is hypervolaemic (increased blood volume).

Prescribing IV fluids: there are two main types of IV fluid that can be prescribed to correct fluid balance -

- *Crystalloids* (solutions of water-soluble molecules) include 0.9% saline, dextrose saline and Hartmann’s solution (contains electrolytes such as sodium, chloride, potassium, and lactate).
- *Colloids* (insoluble particles in suspension) may be natural (blood and albumin) or synthetic (gelofusin or haemacell).

## Nutrition

Malnutrition in surgical patients is associated with poor outcomes and longer hospital stays. It impairs protein dependent functions in the body, leading to complications such as infection, poor wound healing and wound dehiscence (modern Latin *dehiscentem*, to gape).

Patients with weight loss of >10% of their body weight are considered to be severely malnourished. Nutritional support for post-operative patients can be provided in three ways: oral, enteral and parenteral.

Oral support: the rise of enhanced recovery after surgery (ERAS) programmes mean that more and more patients are provided with oral support after undergoing surgery, instead of enteral or parenteral. Oral support can be polymeric (whole or undigested proteins), elemental (individual amino acids that require little digestion) or disease specific, for example in patients with liver failure, branched chain amino acids and Vitamin K are provided.

Enteral support: administering nutrition directly into the GI tract. This is usually done via a nasogastric tube. Risks include malposition of the tube and aspiration of food into the respiratory tract.

Parenteral support: providing nutrition intravenously. Both macronutrients such as amino acids, lipids and glucose, and micronutrients such as electrolytes and vitamins can be administered using this method.

---

## Wound Healing

Types of incision closure: surgical incisions can be closed in two main ways.

- *Primary intention* – the edges of the wound are brought together and the wound is closed with sutures, staples, adhesives or tape. Epithelialisation occurs within 24–48 h.
- *Secondary intention* – the wound is left open and allowed to granulate.

The stages of wound healing: there are four main stages of wound healing.

1. *Haemostasis* – occurs immediately and Von Willebrand factor is secreted. Platelets then adhere to the damaged endothelium and aggregate, forming a platelet plug. Fibrin is added to this platelet plug, reinforcing it.
2. *Inflammation*: there are two phases.
  - *Early phase (24–48 h)* – the complement cascade is activated, and granulocytes produce free radicals and antibacterial proteases. Epithelial cell migration and proliferation then begins.
  - *Late phase (2–3 days)* – macrophages replace granulocytes, remove dead cells and aid in wound debridement, and produce growth factors that stimulate angiogenesis. Epithelialisation is complete.
3. *Regeneration*: takes place 3–20 days after a wound is sustained. Fibroblasts migrate to the wound site and lay down collagen, helping to create a new extracellular matrix. Angiogenesis continues.
4. *Remodelling*: takes place weeks after a wound is sustained. Consists of the dynamic deposition and degradation of type 3 collagen. A scar with 80% of the original strength of the wound site forms by 12 weeks.

Factors that impede wound healing can be divided into local and systemic. These are listed in Table 10.3.

Excessive wound healing: excessive wound healing occurs when the normal balance of collagen deposition and degradation during remodelling is disturbed. There are two main types.

- *Keloids*: the raised area extends beyond the wound margins and there is no wound contracture. They are treated by excision, steroids and cryotherapy, but typically recur. These are uncommon in children.
- *Hypertrophic scars*: the raised area is confined to the wound margins and there is wound contracture. They are treated by excision, steroids and cryotherapy, and typically do not recur. These can occur at any age.

Wound Dressing: there are many types of wound dressing. The most appropriate in any

**Table 10.3** Factors that impede wound healing, divided into local (factors related to the wound itself) and systemic (factors that affect the entire body)

Local	Systemic
Inadequate blood supply	Advancing physiological age
Increased skin tension	Obesity
Poor surgical wound apposition	Smoking
Wound dehiscence	Diabetes mellitus
Poor venous drainage	Malnutrition
Presence of foreign bodies	Vitamin/trace elements deficiency
Haematoma	Systemic malignancy
Infection	Shock
Excess local mobility (e.g. over a joint)	Chemotherapy or radiotherapy
Topical medicine	Immunosuppressants
	Corticosteroids
	Anticoagulants
	Chronic renal/hepatic failure

given situation is governed by the properties of the wound.

- *Semipermeable film dressings*: made of a polyurethane film that adheres to intact skin. Used in dry, superficial wounds.
- *Semipermeable pad dressing*: an interface between the wound and the dressing allows exudate to pass. Indicated with wounds with low exudate.
- *Hydrocolloid dressing*: when contact with exudate is made, a gel from cellulose or gelatin is formed. Indicated in wounds with low or moderate exudate.
- *Alginate dressing*: derived from seaweed. When contact with exudate is made, a gel is formed. Indicated in wounds with low or moderate exudate.
- *Hydrofibre dressing*: a textile fibre dressing formed of carboxymethyl cellulose. Reduces risk of skin maceration. Indicated in wounds with moderate to heavy exudate.
- *Foam dressing*: formed from silicon or polyurethane. Indicated in wounds with heavy exudate.

- *Hydrogel dressing*: formed from an insoluble polymer. Aids in wound debridement and slough. Indicated in dry, necrotic wounds with minimal exudate.

## Common Post-operative Complications

Surgical complications can be defined as undesirable and unintended results that affect the patient as the result of an operation. Common complications can be divided into immediate, early or late, depending on when they occur after surgery:

- *Immediate complications*: primary haemorrhage (which begins during surgery), shock, atelectasis (further described below in 'Respiratory Complications') and low urine output (due to renal injury or inadequate fluid replacement). If there appears to be no urine output, check the position of the catheter!
- *Early complications*: take place around 24 h after surgery. These include acute confusion, nausea and vomiting, fever, secondary haemorrhage, pneumonia, wound or anastomotic dehiscence and urinary tract infection.
- *Late complications*: take place a few days after surgery, including incisional hernias and neuralgic pain.

Post-operative complications can also be divided into systems: fever, infection, wound, respiratory, cardiovascular, gastrointestinal, genitourinary, and psychiatric.

### 1. **Fever**

This affects approximately 50% of post-operative patients and is a disorder of thermoregulation. Pyrogens induce interleukin one, altering the activity of temperature sensitive neurons in the anterior hypothalamus and raising the core temperature.

The cause of post-operative fever determines when it manifests (see Table 10.4).

**Table 10.4** The infectious and non-infectious causes of post-operative fever

Causes of fever in post-operative patients	
Infectious	Non infectious
Urine tract infection	Atelectasis
Wound infection	Dehydration
Pneumonia	Myocardial infarction
Peritonitis	Pulmonary embolism
Abscess	Transfusion

- Fever that presents 0–2 days after surgery is primarily caused by atelectasis.
- Fever that presents during days 3–5 is usually caused by sepsis or wound infection.
- Fever that presents after the first week is usually caused by wound infection, other infections (e.g. UTI), DVT or PE.
- Rarely, persistent fever can be caused by malignant hyperthermia, which is a rare autosomal dominant condition caused by abnormal temperature rise in response to anaesthesia. Symptoms include metabolic acidosis, hypercalcaemia, and cardiac arrhythmia. It is treated by use of cooling blankets, ventilation, or dantrolene.

## 2. Infection

Surgery and post-operative infection can stimulate the systemic inflammatory response syndrome (SIRS). If untreated, this can lead to failure of multiple organ systems including the respiratory and renal systems. It is diagnosed when two or more of the following criteria are met:

- Temperature  $>38^{\circ}\text{C}$  or  $<36^{\circ}\text{C}$
- Heart rate  $>90$  beats/min
- Respiratory rate  $>20$  breaths/min or  $\text{PaCO}_2 < 4.3$  kPa
- White blood cell count  $>12 \times 10^9/\text{L}$  or  $<4 \times 10^9/\text{L}$

*Sepsis*: SIRS plus known infection.

*Severe sepsis*: sepsis with evidence of organ dysfunction.

*Septic shock*: sepsis induced hypotension with a systolic pressure of  $<90$  mmHG that persists despite fluid resuscitation.

Both SIRS and sepsis are generally treated by treating the underlying cause.

## 3. Wound

- Infection
- Haematoma formation
- Seroma formation
- Wound dehiscence: occurs when there is closure failure and is treated by return to theatre for urgent wound closure. It results in approximately 30% mortality.
- Bleeding: can be intraoperative, immediately post-operative (in the recovery room), reactionary (within 48 h), secondary (within a week). It is treated by fluid resuscitation and blood transfusion.

## 4. Respiratory

- *Atelectasis*: loss of lung expansion that can occur early after surgical procedures. If ignored, it can develop into pneumonia and therefore it is treated with chest physiotherapy.
- *Pneumonia*: an infection with symptoms including fever, shortness of breath, chest pain and oxygen desaturation. It is treated by chest physiotherapy and antibiotics.
- *Aspiration pneumonia*: occurs when foreign bodies are inhaled into the lungs during or after anaesthesia and can cause vomiting. It is treated in the ITU by administration of IV antibiotics and ventilation.
- *Pulmonary embolism (PE)*: a blockage of the pulmonary artery or one of its branches by a blood clot that has travelled from another location in the body. 10% of patients die within the first hour. It can be diagnosed using a CT pulmonary angiogram (CTPA).
  - Types – central, peripheral, and massive (where both pulmonary arteries are involved).
  - Risk factors – venous stasis, hypercoagulable state, immobilisation, pregnancy, the oral contraceptive pill, genetic factors, acute illness, and malignancy.

- Symptoms – shortness of breath, chest pain, tachypnoea, tachycardia, fever, confusion, abdominal pain, desaturation, atrial fibrillation, and a patient that generally looks unwell.
- Treated by – oxygen, anticoagulants, and percutaneous extraction of the embolus.

## Cardiovascular

- *MI*: there is decreased oxygen supply due to hypoxia, hypovolaemia and hypotension. It commonly occurs on the third post-operative night.
  - Diagnosed by – ECG changes (such as ST elevation) and a raised troponin level.
  - Can be prevented by – oxygen mask, peri-operative beta blockers, and continuous post-operative cardiac monitoring in HDU or ITU.
  - Treated by – oxygen, aspirin, morphine, nitrates, heparin, and stent insertion.
- *Hypovolaemia*: volume depletion occurs in most post-operative patients. It is diagnosed by low urine output and dehydration, and treated by administration of IV fluids.
- *Post-operative hypertension*: can occur a few hours post-operatively. It is treated with anti-hypertensive drugs.
- *DVT*:
  - Virchow's Triad includes three contributing factors to DVT – endothelial injury, venous stasis and hypercoagulability.
  - Symptoms – majority are asymptomatic but can present with leg pain, Homan's sign (pain on dorsiflexion) and leg swelling.
  - Diagnosed by – ultrasound Doppler to lower limbs, venography, and D-dimer.
  - Risk factors – immobilisation longer than 3 days, pregnancy, age, long plane or car trips in the previous 4 weeks, cancer, previous DVT, stroke, acute MI, congestive heart failure, sepsis, burns, the oral contraceptive pill, and systemic lupus erythematosus.
  - Treated by – low molecular weight heparin, warfarin, and a filter in the inferior vena cava.

- Preventing DVT is described in more detail in the section '[DVT Prophylaxis](#)'.

## Gastrointestinal

- *Nausea and vomiting*: can occur as a reaction to anaesthesia.
- *Ileus*: can be worsened by opioids and hypokalaemia.
  - Symptoms – abdominal pain, nausea, vomiting, anorexia, bloating, abdominal distension, absent bowel sounds, lack of passage of flatus, and tympanic abdomen.
  - Treated by – NG tube, IV fluids, mobilisation, and enteral or parenteral feeding if required.
- *Diarrhoea*

## Genitourinary

- *Urinary retention*: can occur as a reaction to anaesthesia. It is treated by catheter insertion and consulting urology.
- *Acute kidney injury*

## Psychiatric Complications

- *Confusion and delirium*: most common in older patients.
- *Depression and anxiety*

---

## Prevention of Complications [6]

WHO recommend the following steps be taken to minimise the risk of post-operative complications:

- Encouragement of early mobilisation – deep breathing and coughing, active daily exercise, strengthening of muscles, and use of walking aids such as canes and walkers.
- Provision of adequate nutrition
- Provision of adequate pain control
- Prevention of pressure sores and skin breakdown – the patient should be turned frequently, and urine and faeces should be kept off the skin.



## DVT Prophylaxis

DVT is considered one of the most catastrophic post-operative complications. Autopsy studies have shown that up to 50% of patients who die in hospital have a DVT. Around 10–30% of these patients develop a secondary pulmonary embolism [4]. As a result of this, guidelines for post-operative DVT prophylaxis have been developed to reduce DVT incidence. These guidelines are summarised below [3]:

- All patients should receive a DVT risk assessment upon hospital admission.
- All patients should be encouraged to ambulate post-operatively, as early and frequently as possible.
- Patients judged to be at high risk of post-operative DVT (risk factors outlined above) should be prescribed a low molecular weight heparin to decrease the risk.

---

## Discharge [5]

When post-operative patients are discharged, the following should be recorded in the patient notes:

- Diagnosis on admission and discharge.
- A summary of the time spent in hospital including the operative procedure.
- Instructions for future management, including all prescribed drugs.

This information must also be given to the patient, along with details of any outpatient follow-up appointments made.

---

## The Enhanced Recovery After Surgery Programme

Given the stressful effects of surgery on patients physiologically and psychologically, the enhanced recovery after surgery (ERAS) programme exists to minimise the duration of hospital stay and number of complications encountered.

The programme begins with a referral from primary care and ends with patient follow up in

the community. The multiple settings for ERAS care make the multidisciplinary team of surgeons, nurses, physiotherapists and anaesthetists essential to the programme's success.

## Background of the Programme

The ERAS programme challenges the concept that the post surgical stress response is inevitable. It is a multi-modal perioperative care pathway that replaces traditional practices, with evidence-based best practice when necessary. All aspects of the patient journey are covered.

ERAS targets the key factors that keep patients in hospital after surgery, including the need for parenteral (Gr. *para + enteral*, beside intestine) analgesia, the need for IV fluids secondary to gut dysfunction, and lack of mobility. Primary care is an important aspect of the programme; prior to admission, general practitioners must optimise patient co-morbidities and play a role in reassuring and educating patients about their procedure. After discharge, they play an essential role in follow up.

This section summarises the measures taken at every stage of the patient journey to minimise the stress response during and after surgery and optimise a patient's experience.

## Preoperative Factors

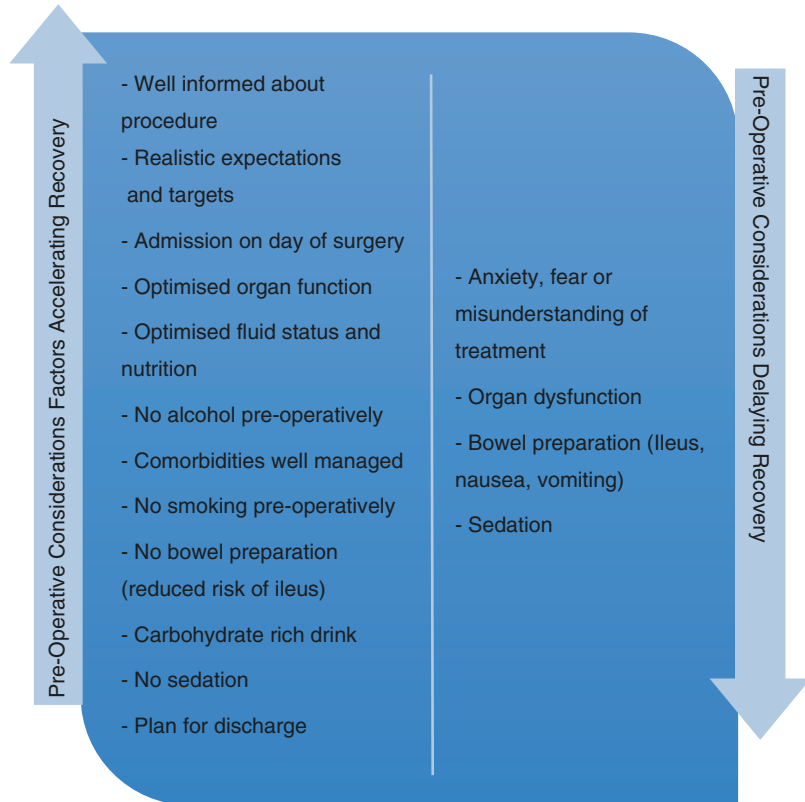
Pre-operatively, structured management of the patient can accelerate post-operative recovery. Factors to be considered can be found in Fig. 10.2.

## Perioperative Factors

Perioperative care can be altered to minimise the surgical stress response. Key points include:

- Thoracic epidural anaesthesia before the initial skin incision
- High inspired oxygen concentration (80%) during anaesthesia (and for 6 h postoperatively)
  - A face mask should be used to deliver this if necessary

**Fig. 10.2** Preoperative factors that can accelerate or delay recovery



- Use of a short acting anaesthetic agent for epidural anaesthesia and local blocks
- Warm air blankets to prevent hypothermia
- Fluid therapy and monitoring
- Short and transverse surgical incisions where possible
- Avoidance of abdominal drains and nasogastric tubes
- Minimally invasive surgery where appropriate
- Avoidance of excessive amounts of IV fluid
  - IV fluid administration should be terminated by the second postoperative day if possible
- Regular audits should take place to monitor clinical outcomes and keep readmission rates below 10 %

Figure 10.3 shows how these factors are controlled in ERAS patients during the first 2 days following a surgical procedure.

## Postoperative Factors

Post-operative care can be optimised to shorten the recovery period and allow early discharge. Key points include:

- Avoidance of opiates
  - Paracetamol and non steroidal anti-inflammatory drugs (NSAIDS) should be used if there are no contraindications
- Early mobilisation
- Reintroduction of diet and fluids within 24 h

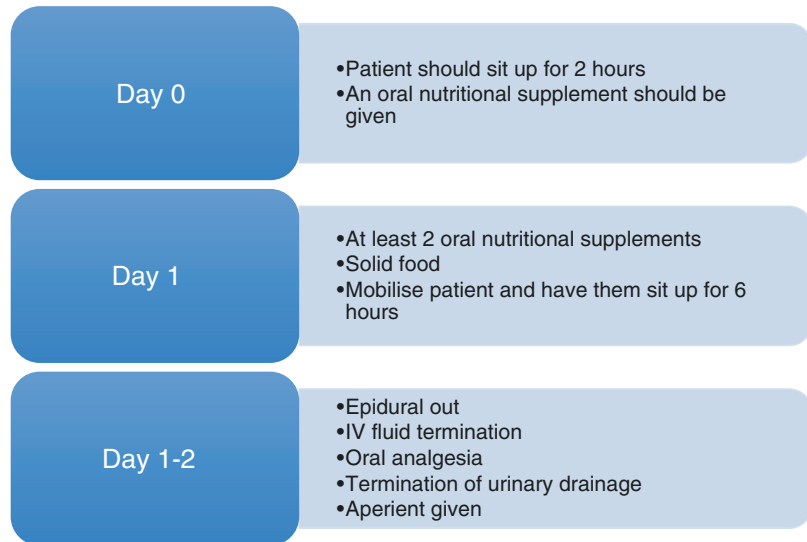
## Discharge

Patients on the programme can be discharged when three conditions are met:

- Good pain control on oral analgesics
- Independent mobility at pre-operative levels
- Consumption of solid food

In addition to these, the patient must be both willing to go home and have support at home.

**Fig. 10.3** Aims for management of ERAS patients in the first 2 days after surgery



### Follow-Up

Extra support during follow up is needed for ERAS patients. There must be a clear pathway for re-admission should the patient require re-hospitalisation. Follow up at clinic should take place a week after discharge, and a daily walk-in clinic should be available in case required in the interim period. A contact telephone is available in case the patient requires advice. Support from the patient's general practitioner is also vital.

#### Surgeons' Favourite Questions for Students

1. A patient develops fever 1 day after undergoing a surgical procedure. What is the most likely diagnosis and how would you manage this patient?
2. A post-operative patient seems to have no urine output. What is the most likely cause of this?
3. Which test would you use to diagnose PE and how would you manage a patient suffering from one?
4. Explain the fluid challenge.
5. Explain the differences between HDU and ITU.

### Bibliography

1. Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: results from a national survey suggest postoperative pain continues to be undermanaged. *Anesth Analg*. 2003;97:534–40.
2. Eddleston JGD, Morris J. Levels of critical care for adult patients. London, UK: Intensive Care Society; 2009.
3. Jobin S, Kalliainen L, Adebayo L, Agarwal Z, Card R, Christie B, et al. Venous thromboembolism prophylaxis [Online]. Rockville: Agency for Healthcare Research and Quality (AHRQ); 2012. Available: <http://www.guideline.gov/content.aspx?id=39350>. Accessed 10 Dec 2014.
4. Murugesan A, Srivastava DN, Ballehaninna UK, Chumber S, Dhar A, Misra MC, et al. Detection and prevention of post-operative deep vein thrombosis [DVT] using Nadroparin among patients undergoing major abdominal operations in India; a randomised controlled trial. *Indian J Surg*. 2010;72:312–7.
5. SIGN. Postoperative management in adults. Edinburgh: Scottish Intercollegiate Guidelines Network; 2004.
6. WHO. Surgical care at the district hospital. Geneva: World Health Organization; 2003.