

Post Operative Surgical Care

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The World Journal of Medical Education and Research (WJMER) is the online publication of the Doctors Academy Group of Educational Establishments. Published on a quarterly basis, it's aim is to promote academia and research amongst all members of the multi-disciplinary healthcare team including doctors, dentists, scientists, and students of these specialties from all parts of the world. The principal objective of this journal is to encourage the aforementioned from developing countries in particular to publish their work. The journal intends to promote the healthy transfer of knowledge, opinions and expertise between those who have the benefit of cutting edge technology and those who need to innovate within their resource constraints. It is our hope that this will help to develop medical knowledge and to provide optimal clinical care in different settings all over the world. We envisage an incessant stream of information will flow along the channels that WJMER will create and that a surfeit of ideas will be gleaned from this process. We look forward to sharing these experiences with our readers in our subsequent editions. We are honoured to welcome you to WJMER.





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Introduction

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Post Operative Surgical Care

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Introduction

There are a number of key issues that need to be considered in the post-operative period to ensure the safe recovery of the patient after surgery. These need to be managed remembering the patient's co-morbidities, actual surgery and progress.

1. Fluid Balance

Fluid balance is integral in caring for the surgical patient. Normal fluid distribution within the body is shown below:

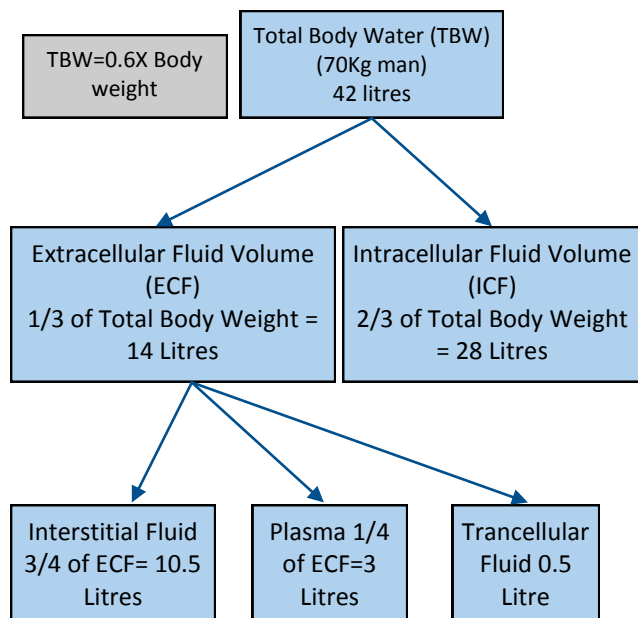


Figure 1: Diagram showing the major fluid compartments. *Anaesthesia UK, 2012. Relationship between the volumes of major fluid compartments [image online] Available at: <http://www.frca.co.uk/article.aspx?articleid=289> [Accessed 10 April 2013].*

The most important compartment is the plasma, as this is the circulating medium which carries cells, nutrients and oxygen around the body, to the tissues. Interstitial fluid is

found between tissues, and transcellular fluid is that between cells.

Surgery disrupts the normal balance of fluid and electrolytes. Fluid balance charts should be kept to accurately document fluid volumes going in and out of the patient. When considering whether there is need for supplemental fluids, consider maintenance and replacement fluids.

Maintenance fluid – in a 24 hour period a 70-kg patient needs to take in 2500 ml of water, 100mmol of Sodium and 40mmol of Potassium. If a post-operative patient is not able to take fluids orally, maintenance fluid can be given as 2000ml 5% Dextrose with 40mmol Potassium and 500ml of 0.9% Saline solution.

Replacement fluid – this is calculated by adding pre-existing fluid loss, ongoing losses and insensible losses. Ongoing losses in post-operative patients can be measurable as vomit, urine or bowel content, and from nasogastric tube, stomas, fistulas, drains and/or catheters. Insensible or immeasurable losses include losses through sweating and breathing.

Unwell surgical patients can be fluid depleted or overloaded when they have their surgery. Correction of these fluid imbalances may continue into the post-operative period and if not done slowly, may precipitate heart failure and/ or oedema.

2. Nutrition

Adequate nutrition is paramount for recovery in post-operative patients. Nutrition can be provided via either the enteral or parenteral route.

Enteral nutrition uses the gastrointestinal (GI) tract and is used preferentially if possible. This can be through oral supplements, nasogastric/ nasojejunal tubes or gastrostomy/ jejunostomy tubes.

Parenteral nutrition bypasses the GI tract. This is given directly into the blood stream, either into a peripheral or central vein. It is reserved for those who cannot use their GI tract, such as patients with Crohn's disease or short gut syndrome.

3. Analgesia

There are three main groups of analgesia available, non-

opioids, non-steroidal anti-inflammatory drugs, and opioids. Recommendation for their use is shown in the World Health Organisation (WHO) pain ladder (see Figure 2). This was originally designed for treating pain in cancer patients, but is now widely used for all patients in pain. It describes the step-wise combination of analgesics to ensure adequate pain relief.

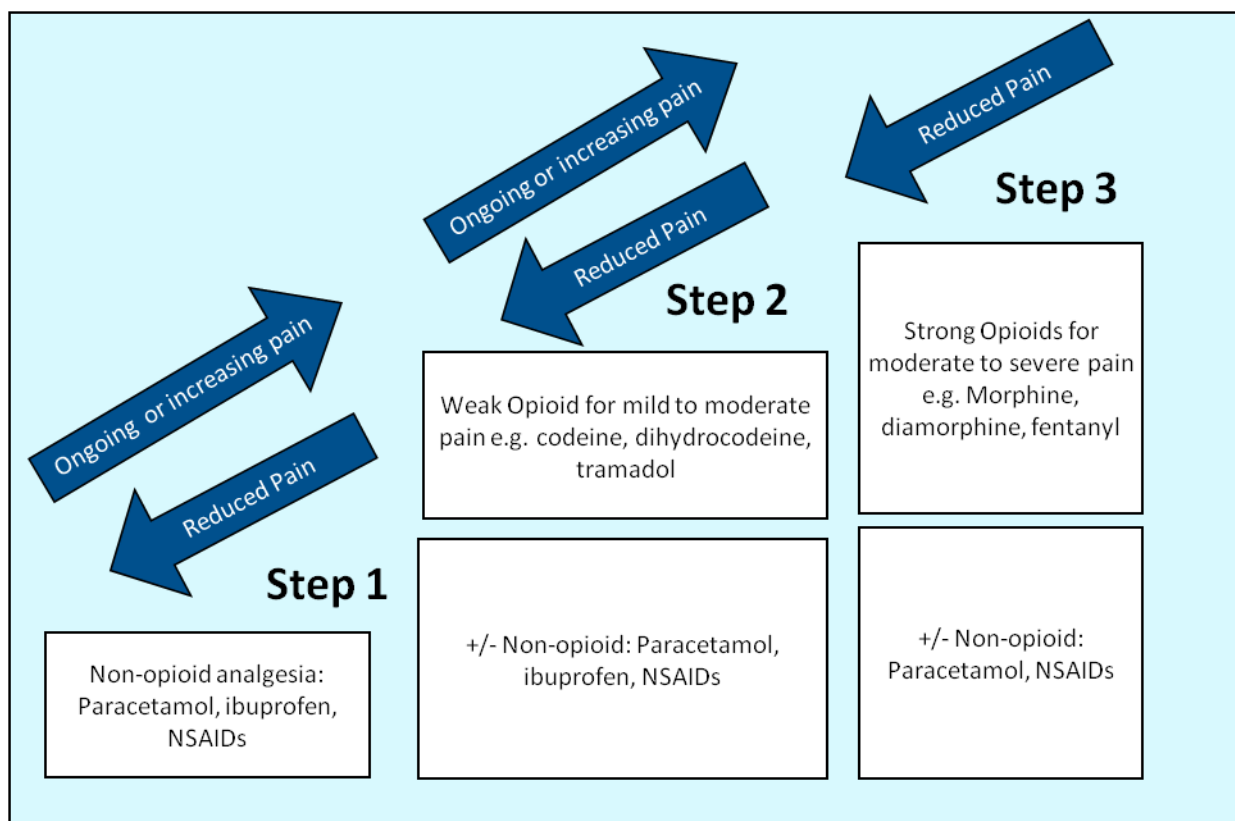


Figure 2: World Health Organisation pain ladder

Non-opioids (e.g. paracetamol) can be given orally, intravenously or subcutaneously. They are best given regularly to achieve maximum effect and combine well with other stronger analgesia.

Non-steroidal anti-inflammatory drugs (NSAIDs) are also often used in combination with other analgesia. They have to be used carefully in patients who have asthma, peptic ulcer disease or are at increased risk of bleeding.

Opioids are the strongest class of drugs and are widely used after surgery. They can be either weak or strong opioids. Weak opioids include codeine and dihydrocodeine.

They have many adverse reactions, the most serious being respiratory depression. Opioids can be delivered by a

multitude of methods. Apart from oral, and intravenous boluses, some frequently used post-surgical methods of administration include:

- Patient-controlled analgesia (PCA) pump - patient can self-administer a pre-set dose of morphine by pressing the button on the pump as they feel the need. The pump only delivers morphine if a certain amount of time has passed to avoid overdose.
- Epidural – this delivers analgesia around the spinal nerve roots. There is less risk of respiratory depression but as the drugs block both pain and sympathetic supply to the lower half of the body, there is profound vasodilatation which can cause problems with hypotension.

Post-operative Complications

Complications can affect any patient undergoing surgery. They can be classified into **early** (0-24hrs), **intermediate** (24-48hrs) and **late** (2-5 days).

Early and intermediate complications include:**Respiratory**

Atelectasis is the collapse of small airways caused by inadequate ventilation. This leads to a build-up of bronchial secretions. These secretions can block off airways and eventually cause Pneumonia, if left untreated.

Risk factors for respiratory complications are smoking, chronic airways disease (asthma or COPD) and post-operative pain, which hampers deep breathing and coughing. Adequate analgesia and regular chest physiotherapy are needed throughout recovery. Investigations for these complications are prompted by shortness of breath, productive cough, low oxygen saturations and pyrexia. These investigations include arterial blood gases and a chest x-ray.

Cardiovascular

Haemorrhage can be arterial or venous.

- Primary haemorrhage is bleeding which starts in surgery and continues post-operatively.
- Refractory Haemorrhage is an early post-operative complication (4-6 hrs after surgery) and is due to continuation of primary haemorrhage, removal of primary clots due to coughing or an increase in primary blood pressure, slippage or loosening of sutures, staples, etc.
- Secondary Haemorrhage is a late complication (>5 days post-op) and is usually due to infection.

Shock is inadequate circulation causing poor tissue perfusion and hypoxia. The hallmark clinical features are hypotension and low urine output. There are numerous causes of shock including hypovolaemic (dehydration, haemorrhagic), cardiogenic (heart failure) and distributive (septic, anaphylactic, neurogenic).

Hypovolaemic shock is suggested by cold and clammy peripheries, tachycardia and low central venous pressure (CVP). Septic shock can look similar but patients typically have warm peripheries. Cardiogenic shock is usually secondary to acute myocardial ischemia, arrhythmias or heart failure. It is suggested by signs of fluid overload - raised CVP, basal lung crepitations and a gallop rhythm.

Confusion

This more often occurs post-operatively in elderly

patients and can be due to unfamiliar surroundings, pre-existing dementia or changes in their medication regime. Patients who are susceptible should be monitored carefully. In new confusion, there is a need to rule out complications such as:

- Infection
- Effects of sedatives or anaesthetic agents – particularly anti-cholinergics or drugs with these side effects, opioids, benzodiazepines and anticonvulsants.
- Metabolic changes e.g. dehydration, acid-base disorders, hypo-or hyperglycaemia
- Hypoxia
- Substance (such as alcohol) withdrawal

Renal Failure

Renal failure is divided into three categories, pre-renal, renal and post-renal. Dialysis may be needed depending if the renal injury is severe.

Pre-renal failure is caused by insufficient blood supply to the kidneys. If left untreated pre-renal failure can progress to renal failure.

Renal failure has numerous causes. These include prolonged pre-renal failure, medications, hepato-renal syndrome, incompatible blood transfusion, and myoglobinuria (due to crush injury of soft tissue).

Post-renal failure is caused by a urinary outflow obstruction such as an enlarged prostate, catheter blockage or damage to the ureters.

Late (3 – 5 days) Complications include:**Thromboembolism**

Deep vein thrombi (DVT) or pulmonary emboli (PE) can occur during surgery or post-operatively. Factors that contribute to the formation of thrombi include hypercoagulability, venous stasis and endothelial damage, and is known as Virchow's Triad (see figure 3).

In healthy, active people, the calf muscle pump prevents venous stasis, and regular hydration prevents a hypercoagulable state, hence there is low risk of developing deep vein thrombosis. However, intra-operatively and in the initial post-operative period where mobility is impaired, deep vein thrombosis has a higher risk of forming. Furthermore, the thrombi in the lower limb can then detach and embolise to the pulmonary circulation. Hence after surgery, patients are often given low molecular weight heparin and compression stockings to reduce this risk whilst mobility is reduced and they recover.

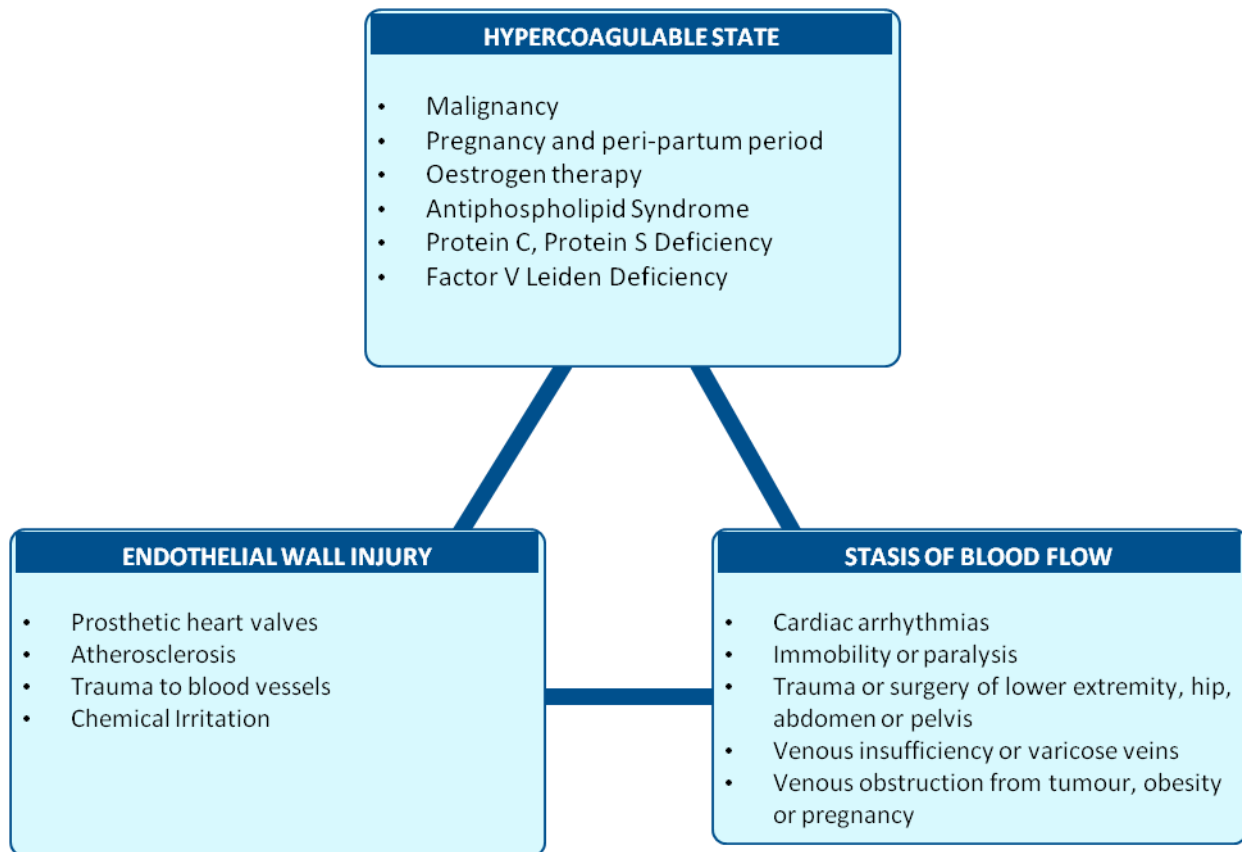


Figure 3: Virchow's triad – factors which contribute to thrombi formation

Hypercoaguability can occur due to dehydration or problems with clotting. Stasis can occur in theatre due to positioning particularly in long operations, and post-operatively if not mobile. Endothelial damage occurs due to surgery and inflammatory responses.

General patient risk factors include age, obesity, varicose veins, pregnancy, oral contraceptive pill, smoking, previous history of deep vein thrombosis or pulmonary embolism and malignant disease.

A DVT classically presents as a tender, swollen calf and requires Doppler ultrasonography to confirm the diagnosis. If there is a large PE, it can cause cardiac arrest and even death. If the clot is moderate symptoms include pleuritic chest pain, cyanosis, haemoptysis and progressive dyspnoea. The gold standard for diagnosis is to perform a computed tomography pulmonary angiography (CTPA), although in some instances, a ventilation-perfusion (V/Q) scan may suffice.

Wound Complications

Wound infection usually presents around the fifth post-operative day. Signs of infection include erythema, tenderness, warmth, oedema and foul smelling discharge. Patients thought to be at risk may receive antibiotic prophylaxis.

Risk of wound infection can be related to the cleanliness of the surgery being performed. "Clean" surgery carries the lowest risk of wound infection e.g. thyroidectomy, hernia repair. "Potentially contaminated" surgeries include elective gastrointestinal surgeries. "Contaminated" and "dirty" surgeries carry the greatest risk of wound infection as these have definite faecal contamination. Surgical technique can also influence risk of wound infections. Good technique such as careful debridement and washout, good haemostasis, no tissue ischaemia and minimal tissue trauma have been shown to reduce these risks.

Patient factors that increase wound infection include obesity, diabetes mellitus, immunocompromised patient for example if they are on glucocorticoid therapy or are malnourished. Infection risk is also increased if there is haematoma formation as collected blood is an excellent breeding ground for bacterial growth.

Superficial wound infections can be managed conservatively with regular wound care +/- antibiotics. Deeper infections or wounds involving prosthesis (i.e. synthetic graft or implant) may require surgical exploration, removal of prosthesis and healing by secondary intention.

Wound dehiscence is when healing fails and the wound falls apart. This usually occurs around 7-10 days post-operatively. Surgical risk factors include poor surgical technique, e.g. too much tension on sutures, or patient poor wound healing or infection. Treatment depends on depth of dehiscence but may involve re-suturing under anaesthesia.

Other infectious complications can occur anytime so it is important to monitor patients' infection markers (WBC, CRP, temperature, etc.) to ensure there are no system signs of infection. Line infections occur from peripheral cannulae, central lines, and catheters and may include MRSA pathogens.

Urinary Tract Infections (UTI) are predisposed to by

instrumentation of the urinary tract and indwelling urinary catheters.

Specific Surgical Complications

Different operations have unique approaches and anatomy, as so there are specific complications that may occur. It is important to be aware of the operation details including the common and serious complications for the consent process. Generally speaking, any surgery done as an emergency has more associated risks. Open operations will have more pain afterward and greater risk of wound infection, ileus and respiratory complications. Laparoscopic operations have specific complication including bowel / blood vessel injuries when inserting the trocars, injuries associated with limited field of view and conversion to open operations.

General Surgery (Upper and lower GI):

Operation	Description	Complications
Appendectomy	Removal of the appendix	<ul style="list-style-type: none"> Intra-abdominal abscess (including sub-phrenic, pelvic) Ileus – if open as handle bowel
Cholecystectomy	Remove the gallbladder	<ul style="list-style-type: none"> Bile leak Damage to biliary system Retained stones in biliary ducts
Inguinal/ femoral hernia repair	Repair of defect in the abdominal wall	<ul style="list-style-type: none"> Recurrence Bleeding Infection Chronic groin pain and numbness Ischaemic orchitis
Hartmann's procedure ⁵	Removal of sigmoid bowel, end colostomy and mucus fistula	<ul style="list-style-type: none"> Ileus Small bowel obstruction Stoma complications (parastomal hernias, prolapse, skin excoriations)
Abdominal-perineal resection ⁷	Removal of rectum and anus, end colostomy	<ul style="list-style-type: none"> Sexual dysfunction Stoma complications (see above) Ileus, small bowel obstruction
Anterior Resection	Removal of upper rectum, join colon to anus	<ul style="list-style-type: none"> Anastamotic leak Sexual dysfunction Ileus, small bowel obstruction
Flexible sigmoidoscopy or colonoscopy	To investigate bleeding or pain from the colon	<ul style="list-style-type: none"> Perforation of viscus Bleeding Colicky abdominal pains, bloating and excess flatus
Splenectomy	Removal of spleen	<ul style="list-style-type: none"> Bleeding Intra-abdominal abscess Bloods abnormalities Predisposition to infections – will require vaccines and lifelong antibiotic prophylaxis

Table 1: Common surgical operation by speciality, and the common/ important/ serious complications

Vascular:

Surgery	Description	Complications
Open AAA Repair	Repair of an aortic aneurysm with graft replacement	<u>Early:</u> <ul style="list-style-type: none"> • Renal failure • Impotence • Anastomotic leak • Peripheral emboli ("trash foot") <u>Late:</u> <ul style="list-style-type: none"> • Graft infection or thrombosis, • Aorto-enteric fistula • Pseudoaneurysm
AAA Repair - endovascular	Repair using an endoluminal graft under image guidance	<ul style="list-style-type: none"> • Endoleak • Device failure
Femoral-popliteal bypass graft	Bypass of femoral artery stenosis	<ul style="list-style-type: none"> • Re-stenosis • Thromboembolic events • Failure resulting in limb loss
Carotid Endarterectomy	Correcting carotid artery stenosis	<ul style="list-style-type: none"> • Nerve injuries (esp. hypoglossal, marginal mandibular, recurrent laryngeal) • Intra-operative CVA • Re-stenosis

Orthopaedics:

Fracture healing has a number of potential complications. These include malunion, non-union and infection. As many of these operations involve opening up a sterile cavity, and/or inserting prosthesis, they are carefully planned and the theatre environment is kept as sterile as possible.

Operation	Description	Complications
Total hip replacement	Replacement of hip joint with prosthesis	Loosening Periarticular calcification Adverse reaction to cement
Total knee	Replacement of knee joint	Patellar dislocation
Fixation of neck of femur fracture	Restore stability and alignment of neck of femur	AO screws - non-union <u>Dynamic Hip Screw (DHS)</u> : displacement of proximal fragment, malrotation <u>Dynamic Compression Plate (DCP)</u> : malalignment
Fixation of ankle fracture	Restore stability and alignment of ankle complex	Compartment syndrome Distal ischaemia Poor skin healing
Fixation of Colles' fracture	Restore stability and alignment of distal radius (+/- ulnar)	<u>Early:</u> <ul style="list-style-type: none"> • Compartment syndrome • Tendon (Extensor pollicis longus, EPL) rupture • Acute carpal tunnel syndrome • Peripheral oedema <u>Late:</u> <ul style="list-style-type: none"> • Radial shortening • Complex regional pain syndrome
Shoulder relocation	Correction of dislocation	Rotator cuff or capsular tear Damage to axillary or brachial plexi Recurrence
Carpal tunnel decompression	Release of Median nerve compressed in carpal tunnel	Injury to median nerve or vascular arch Recurrence

Urology¹³:

Surgery	Description	Complications
Nephrectomy	Removal of kidney, can be open/ laparoscopic	<ul style="list-style-type: none"> • Haemorrhage, haematoma • Injury to surrounding structures
Rigid cystoscopy and transurethral resection	Endoscopic inspection and sampling of urethra and bladder	<ul style="list-style-type: none"> • Bladder perforation • Infection – UTI, orchitis • Acute urinary retention • Urethral stricture
Scrotal exploration	To determine if a testes is strangulated	<ul style="list-style-type: none"> • Infertility • Bleeding • Infection

Conclusion

Postoperatively, patients need close monitoring to identify common early complications of surgery such as infection or haemorrhage. These can be adequately managed and have a better prognosis if caught early. Intermediate and late complications such as DVT or PE must also be examined for. Wound complications are also a common postoperative complication that can be prevented by aseptic surgical technique and careful monitoring of the wound site.

Every surgery is not without risk. If these risks are managed adequately and patients optimised before surgery, then complications are usually minimal. Patients recover uneventfully and are discharged in a timely manner. It is the management of pre and postoperative risks that determines the rate of complication. Sound management leads to a reduction in complication rate and happy patients.

References:

1. Anaesthesia UK, 2012. *Relationship between the volumes of major fluid compartments* [image online] Available at: <http://www.frca.co.uk/article.aspx?articleid=289> [Accessed 10 April 2013].
2. Kehlet H, Jørgen D. (2003) Anaesthesia, surgery and challenges in postoperative recovery. *The Lancet*, 362, pp. 1921-1928.
3. Hodder, Andre (2003) Confusion in the Post-operative patient: surgeon or shrink problem? [online] Available at: <http://www.med.mun.ca/Surgery/Divisions/General-Surgery/GS-Resident-Presentations/ConfusionPostoperativePatient.aspx> [accessed 18 July 2011].
4. Douketis, J., Spyropoulos, A., Spencer, F., et al. (2012) Perioperative Management of Antithrombotic Therapy: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest Journal*, 141 Suppl 2.
5. Pan-Birmingham Cancer Network (2006) *Hartman's Procedure: Your Operation Explained*. Birmingham: Pan-Birmingham Cancer Network.
6. NHS Choices (2010) Colostomy Complications [online] Available at: <http://www.nhs.uk/Conditions/Colostomy/Pages/Complications.aspx> [accessed 18 July 2011].
7. Tameside Hospital NHS Foundation Trust (2005) *Abdominal Perineal Resection*. Tameside: Tameside Hospital NHS Foundation Trust.
8. East Kent Hospital University (2010) *Femoropopliteal Bypass Graft*. East Kent Hospital University NHS Foundation Trust.
9. Biller, J., Feinberg, W., Castalodo, J., et al. (1998) Guidelines for carotid endarterectomy. *American Heart Association* 97: 501-509.
10. NHS Choice (2010) Total Hip Replacement [online] Available at: <http://www.nhs.uk/conditions/hip-replacement/pages/how-it-is-performed.aspx> [accessed 18 July 2011].
11. NHS Choices (2010) Total Knee Replacement [online] Available at: <http://www.nhs.uk/conditions/knee-replacement/pages/whathappens.aspx> [accessed 18 July 2011].
12. Dr. Preston, M (2009) Ankle fractures [online] Available at: <http://www.patient.co.uk/doctor/Ankle-Fractures.htm> [accessed July 18, 2011]
13. Taneja SS (2010) *Complications of Urologic Surgery: Prevention and Management*. New York: Elsevier.

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