

SURGERY IN GENERAL (EXCLUDING MALIGNANCY)

INTRODUCTION

Key points

- Formal shared care is increasing for elderly patients managed in orthopaedic and urological surgery.
- The majority of deaths occurred after emergency surgery.
- Radiologists increasingly have the ability to intervene in patient management using guided drainage of fluid collections. In the sickest patients, this may either provide definitive treatment or gain sufficient time so that their clinical status can be stabilised before surgery.
- The complications of diverticular disease are common and continue to be difficult to manage, particularly in the very elderly.
- There is a reluctance to catheterise patients with urinary incontinence.
- Trauma patients were more likely to suffer delays for non-medical reasons than patients in other specialities.

This section describes and discusses a variety of issues that arose during discussion of deaths occurring in many differing surgical specialties. Many issues apply generally and are covered in other sections of this report, for example audit performance. The deaths in some specialties followed wholly appropriate delivery of care, provided no new lessons and thus are not discussed further, for example burns patients and head and neck surgery. The care of patients suffering from malignancy is considered in a separate section.

In general surgery a total of 703 cases were reviewed. Forty-seven percent (332/703) had some form of malignancy and are considered separately in the section on oncology. The remaining 371 patients, those without malignant disease, are considered here.

In orthopaedic surgery there were 358 deaths reviewed in comparison with 420 in 1990 and 341 last year. There was a noticeable change in the age distribution compared to previous reports. Ninety-three percent of patients were aged between 70 and 99 in this sample compared with 88% in the 1990 group and 92% in 1998/99. This represents an increase in a vulnerable group of patients. The male to female ratio was 1:2, very similar to 1990 and 1998/99. The emergency admission rate in orthopaedics remained high at 83% and the range of procedures performed was similar to previous years, with the majority being performed for hip fracture.

There were 81 deaths following urological surgery. The majority of patients were aged between 60 and 99 years (73/81, 90%). This is similar to the age distribution seen in other years (89% in 1998/99 and 93% in 1990). The sex ratio was male: female 3:1. Approximately half the admissions in urology were urgent or emergencies.

The sample of gynaecological surgery this year showed a similar age range to previous years with 88% (22/25) being over 60 years old. Emergency or urgent admissions accounted for half the sample and most procedures were undertaken for patients with gynaecological malignancy, or where malignancy was suspected.

There were 74 neurosurgical deaths in the sample. The majority of the neurosurgical patients were extremely sick, and in many, death was an inevitable consequence of the underlying condition. Thirty-six of the 59 (61%) non-oncology neurosurgery patients were classified as ASA 4 or 5. The indication for surgical intervention in this group of patients was often unclear.

Supporting sections of interest to surgeons in general are 'General information about anaesthesia and surgery' and the 'Organisation of perioperative care' (both in section 6).

QUALITY OF QUESTIONNAIRES

The quality of completion of the questionnaires varied. Some questionnaires provided comprehensive and valuable information, others were poorly completed and from these it was difficult to detect whether there were deficits in facilities or standards of care. The questionnaires are a confidential disclosure. NCEPOD relies on their accuracy in order to make its recommendations, not to criticise individuals. Clinicians are reminded that it is an important clinical governance issue that questionnaires are filled in carefully and conscientiously.

PROCEDURES PERFORMED

In general surgery, procedures were categorised into general abdominal, hepatobiliary and pancreatic, colorectal, hernias and a miscellaneous group of procedures. A number of patients had more than one procedure performed during their operation and in total there were 409 procedures performed in 371 patients. The most common procedures were Hartmann's procedure, laparotomy for small bowel ischaemia and repair of perforated duodenal ulcer.

For 12/35 general surgery patients, who had a 'laparotomy' only, no operation note was sent and the questionnaires were so poorly completed that it was impossible to determine the reason for the laparotomy. The operation note and a summary are important inclusions that help NCEPOD understand events. They should be submitted with the questionnaire. Amongst these laparotomies there were cases of peritonitis (cause uncertain), bowel ischaemia and pancreatitis. There were several misdiagnoses; in one laparotomy the abdomen was entirely normal, one patient had a pseudo-obstruction, another had a distended liver due to severe right heart failure and one had bilateral hydronephrosis presenting as an acute abdomen.

In orthopaedic surgery the range of procedures performed was similar to previous years, with the majority being performed for hip fracture.

DELAYS

Orthopaedic patients continue to have their operations delayed for non-clinical reasons and the figure in this sample is no different from last year's

(43/358, 12% compared to 40/341, 12% last year). These delays will often militate against a good outcome.

TRANSFER

Patients with severe trauma do not travel well, and neurosurgical units should have an adequate number of ICU beds to prevent the need for inappropriate transfer. In one instance, a 17-year-old ASA 4 patient with severe head injury had to be transferred because the receiving neurosurgical unit did not have an ICU bed. The severity of this patient's injuries made survival unlikely, but his chances were not improved by having to travel.

CLINICAL CONSIDERATIONS

Perioperative care and fluid management

Most cases admitted under general surgeons were emergencies and required an emergency or urgent operation. Many patients had suffered some intra-abdominal catastrophe with accompanying dehydration. Many were likely to develop multiple organ dysfunction, be dependent on careful fluid management and require high level or critical care. The interface between critical care units and ward based care, and the problems of fluid management are discussed in detail in the section on the 'Organisation of perioperative care', (see section 6). All surgeons with responsibility for the care of acute surgical patients should read that section.

A urinary catheter was placed in only 83/358 (23%) of orthopaedic patients despite the fact that fluid balance charts revealed many wet beds and hence inaccurate fluid 'balance'. Presumably many of these incontinent patients may have gone on to develop pressure sores. Failure to maintain adequate fluid requirements was a major problem within the orthopaedic sample.

Radiological support for an acute surgical unit

There were some cases where it was thought that radiological diagnostic or therapeutic intervention might have obviated an operation or might have been more appropriate than the operation. This Enquiry does not know the supporting radiological services available to all acute surgical units. Nor does it know the denominator data and details of those patients who had non-surgical intervention, either successfully or unsuccessfully, for a similar disorder. Nevertheless, it can raise questions and suggest standards of support that should be provided by radiology departments.

Water soluble contrast investigations of the GI tract

Three patients underwent a diagnostic laparotomy for obstruction during which pseudo-obstruction was diagnosed. The resulting operations were caecostomy, colostomy and abdominal closure without any further procedure. In each case a water soluble contrast enema might have been diagnostic and identified whether these patients would have been better managed with non-operative treatment.

CT scanning

Case Study 57

A 90-year-old, ASA 4 patient with ischaemic heart disease and dehydration was admitted with a working diagnosis of peritonitis due to a perforated peptic ulcer. However a raised serum amylase was noted. Nevertheless, the patient underwent a laparotomy at 21.55 on the day of admission. Operation revealed acute pancreatitis. After the operation the patient returned to the general ward and died within 24 hours.

Case Study 58

A 63-year-old, ASA 4 patient with severe mitral incompetence, cardiomyopathy and right heart failure was admitted with a history of colicky abdominal pain and tenderness in the right upper quadrant. A laparotomy was performed at 23.00, at which the only abnormality was a very distended liver. The patient died of cardiac and renal failure on the third postoperative day.

In these two cases, a CT scan might have confirmed the diagnosis and obviated the need for a laparotomy. In both cases the operation was performed out-of-hours. Was emergency CT scanning available?

Ultrasound investigation

Case Study 59

An 87-year-old, ASA 3 patient with diabetes mellitus was admitted with an acute abdomen. Preoperative investigations revealed a haemoglobin 9.1gm/dl, white cell count $15.7 \times 10^9/l$ and serum creatinine of 600 micro mol/l. Two days later a laparotomy revealed bilateral infected hydronephroses that were drained. The patient returned to the general ward and died there on the seventh postoperative day.

An ultrasound scan could have made the diagnosis and been used for percutaneous drainage.

Case Study 60

A 75-year-old, ASA 4 patient with diabetes mellitus and a mucocoele of the gall bladder, which was failing to resolve, was admitted for an urgent cholecystectomy. After a 50 minute operation the patient was admitted to ICU and died on the third postoperative day.

Would an ultrasound-guided aspiration of the gall bladder have enabled surgery to be avoided?

These are just some examples where radiological procedures, as alternatives to surgery, could have been considered.

Planning the radiology service

The NHS in its plan for investment and reform⁵⁴ is committed to delivering a consistently high standard of care to all patients, and investing in staff and facilities. It specifically mentions updating existing and purchasing new CT scanners. Many aspects of elective and urgent admissions can be measured and compared, as can changes in their standards. It is less easy to quantify the care of emergency patients. Nevertheless, sensible plans can be drawn up; the benefits of which will be recognised by the pragmatist. The above cases highlight possible problems in the radiological facilities and skills available for the acute surgical patient both in and

out-of-hours, and poor recognition of the potential for intervention radiology. Hospitals may wish to consider the following:

- Within all hospitals there should be a multidisciplinary review of the organisation of acute surgery and radiology services. This review should define what is currently available, and what is desired and should be planned for.
- All hospitals admitting patients with intra-abdominal emergencies should be able to provide radiological investigations including ultrasound, CT and water-soluble contrast investigations of the gastrointestinal tract 24 hours a day.
- Radiologists increasingly have the ability to intervene in patient management using guided drainage of fluid collections. In the sickest patients this may either provide definitive treatment or gain sufficient time so that their clinical status can be stabilised before surgery. There should be sufficient skilled radiologists to provide interventional radiology for emergency cases both in and out-of-hours.

Perforated peptic ulceration

Thirty-one patients presented to general surgeons with perforated peptic ulceration.

Case Study 61

A 78-year-old, ASA 4 patient with a past history of a previous perforated peptic ulcer was admitted with another perforated duodenal ulcer. There was a four day delay between admission and the operation that finally started at 21.00. A partial gastrectomy was performed. After a 2 h 20 min operation the patient was admitted to the ICU and died there two days later.

Was this definitive operation appropriate, given the patient's poor physical status?

Case Study 62

An 89-year-old ASA 4 patient with ischaemic heart disease and a history of transient ischaemic attacks was admitted with an acute abdomen. The patient had been unwell for several days

and preoperative investigations revealed a serum creatinine of 225 micromol/l. A diagnosis of perforated peptic ulcer was made and at 22.00 on the day of admission the patient had a laparotomy and the perforated duodenal ulcer was oversewn. The patient returned to the ward and died two days later.

Case Study 63

A 78-year-old, ASA 3 patient with COPD, hypoxia, ischaemic heart disease and a previous CVA was admitted with a diagnosis of an acute perforated ulcer. Preoperative investigations revealed a haemoglobin of 16.1 gm/dl, white cell count of $2.0 \times 10^9/l$ and creatinine 145 micromol/l. The patient had a laparotomy and oversew of a perforated duodenal ulcer at 17.30, which was within 30 minutes of arriving in the hospital. Trainee surgeons and anaesthetists managed the patient during the operation without any consultant involvement. Postoperatively the patient returned to the general ward, was admitted to ICU when problems supervened and died there on the eighth postoperative day.

All these patients were operated on and anaesthetised by trainee surgeons and anaesthetists late in the day. The experience of these trainees in the management of perforated peptic ulcer can be questioned. There is ongoing controversy amongst experienced surgeons about the most appropriate operative approach for acute perforated peptic ulcers. The incidence of perforated peptic ulcer has declined in association with the increased treatment of chronic peptic ulceration using anti-secretory drug therapy; histamine₂ receptor blockers and proton pump inhibitors, and with the control of helicobacter pylori infections. The availability of these treatments postoperatively can influence the extent of the operative procedure for perforated peptic ulceration, particularly for patients of poor physical status⁵⁵. Moreover, it is recognised that some perforated peptic ulcers heal spontaneously⁵⁶ and that when diagnosis is delayed, unless there is persistent leakage, operative treatment is not always indicated and careful non-operative management can result in comparable outcomes⁵⁷.

As part of their governance responsibility, general surgeons could review the clinical evidence and formulate local guidelines for the management of acute perforated peptic ulceration for both stable

and unstable patients. This should clarify the appropriate management of these patients who are admitted as emergencies. NCEPOD recommends the referenced papers as a useful starting point.

Inappropriate operations in surgery

There were a number of patients where it was thought that the operative management was inappropriate. This applied to all specialties. This has been commented on in previous reports. The problems can be summarised as:

- inexperience on the part of the surgeon;
- patients with little chance of survival;
- misdiagnosis;
- too major or an inappropriate procedure.

Pancreatitis

Deaths occurred following operations for acute pancreatitis. Patients with pancreatitis are often severely ill and treatment is primarily medical, unless complications supervene that require surgical intervention. Three operations in patients with acute pancreatitis were considered inappropriate as no CT imaging was done. CT scanning in equivocal cases of pancreatitis can be diagnostic and these three laparotomies might have been prevented by CT scan examination.

There are UK guidelines for the management of acute pancreatitis. These state that severity stratification should be made in all patients within 48 hours⁵⁸. A simple mnemonic ‘PANCREAS’ has been suggested for remembering the criteria used in assessing severity⁵⁹:-

The reader is referred to the original publication for details on the interpretation of these results. Those who are assessed as having severe pancreatitis should not only be treated on an HDU or ICU, but consideration should also be given to referral to a pancreatic specialist.

Diverticular disease

Forty-six patients died following an emergency operation for diverticular disease. Of these 21 had a Hartmann’s procedure. Hartmann’s procedure is not always simple and straightforward; in particular complications with a colostomy performed as an emergency do seem to be more common than when a stoma is created electively. Three patients had problems of either retraction or necrosis of the colostomy and required a further laparotomy and re-fashioning of the colostomy.

Perforated diverticulitis is accompanied by an overall high mortality of between 20-25%⁶⁰. Intra-abdominal abscess formation has a mortality of 12%, purulent peritonitis 27% and faecal peritonitis 48%⁶¹.

In an attempt to predict severity and outcome, two risk assessment systems for scoring patients with peritonitis have been devised.

The Mannheim Peritonitis Index (MPI) devised by Billing and colleagues gives a weighted score for age >50 years, female gender, organ failure, malignancy, duration >24 hours, generalised peritonitis and a purulent or faecal exudate⁶². A score of 21-29 is associated with a mortality of 22%; this rises to 59% when the MPI score is greater than 29⁶³.

The Peritonitis Severity Score (PSS)⁶⁴ devised by Biondo and colleagues gives a weighted score for age >70 years, ASA of 3 or 4, organ failure, immunocompromise, ischaemic colitis and peritonitis.

Mnemonic Letter	Criteria	Positive when
P	PaO ₂	<60 mmHg
A	Age	>55 years
N	Neutrophils (white blood cell count)	>15 x 10 ⁸ /l
C	Calcium	<2 mmol/l
R	Raised urea	>16 mmol/l
E	Enzyme (lactic dehydrogenase)	>600 units/l
A	Albumin	<32 g/l
S	Sugar (glucose)	>10 mmol/l

Mortality based on the PSS score ranges from 0% with the minimum score of 6 to 100% with a score of 13 (maximum score 14). The overall mortality in this series was 22.4%. There was a significant difference between those aged <70 years (15.3%) and >70 years (37.2%) ($p=0.01$) and between those graded ASA 1-2 (9.4%), ASA 3 (38.1%) and ASA 4 (64.7%) ($p<0.0001$ for ASA 4 compared with ASA 1-2).

The Physiological and Operative Severity Score for the Enumeration of Morbidity and Mortality (POSSUM) has also been applied to diverticulitis⁶⁵ but its main use is as a retrospective audit tool. However, like the other scoring systems age >71 years and faecal peritonitis are scored highly (4 and 8 respectively). Although not specifically designed for it, the APACHE II (Adult Physiology and Chronic Health Evaluation) score has also been used to assess the outcome of patients with peritonitis. Mortality increased from 4.8% with a score below 15 to 46.7% with a score above 15. Mortality was significantly greater in those patients over 65 years or with four-quadrant peritonitis, diabetes mellitus or organ failure⁶⁶.

Age does have an impact on mortality from peritonitis. In a 5 year audit of the acute complications of diverticulitis⁶⁷ the overall mortality was 17.7% whilst in those patients over 80 years' of age, it rose to 72% ($p=0.01$). ASA 4 was associated with a mortality of 89% and patients who were shocked on admission had a mortality of 71%.

There is no doubt that an increasing number of patients aged 80 years or older will present to surgical units with peritonitis⁶⁸. What advice then can be offered about their management and probable outcome? The MPI and PSS have demonstrated that a patient over 70 years' with generalised or faecal peritonitis of more than 24 hours duration, an ASA score of 3-4 and evidence of single organ failure is most unlikely to survive surgery. The decision not to operate on a sick patient who will die without surgery is difficult and should be made by a consultant after discussion with relatives, nurses and, where possible, the patient. If a decision is made to operate, there must be an agreement to care for the patient on ICU afterwards. If the chance of survival is negligible due to age, multi-organ failure, co-morbidity and faecal peritonitis of more than 24 hours duration, then there may be a place for accepting the inevitable, carrying out no further procedure and withdrawing support other than effective analgesia.

Upper GI haemorrhage

There were some examples of problems with the management of upper GI haemorrhage. There were examples of high risk elderly patients where an injection of the bleeding point via gastroscopy should have been considered but was not.

One was a patient with very profuse bleeding from a gastric ulcer who vomited during gastroscopy and died shortly after, presumably as a result of inhalation of vomit. Perhaps, in patients with severe gastrointestinal haemorrhage like this, it would be safer to perform a gastroscopy after induction of anaesthesia and endotracheal intubation by an experienced anaesthetist in order to make the airway secure.

There were also examples of patients with bleeding from oesophageal varices who might have benefited from treatment in a specialist unit with a full range of therapeutic options.

The reader is reminded of the guidelines for good practice in the management of upper gastrointestinal haemorrhage⁶⁹. This is being updated and is due to be published on the British Society of Gastroenterology's Web site by the end of the year (2001)⁷⁰.

There is concern, that with the increasing management of upper GI cancer in specialist centres, surgeons in district general hospitals may have a problem maintaining the necessary skills required to manage patients with upper gastrointestinal haemorrhage, as they are increasingly unlikely to be familiar with gastric and oesophageal problems.

Use of staples in the presence of intestinal obstruction

There were a number of patients who had a right hemicolectomy or small bowel resection done as an emergency, in the presence of intestinal obstruction, where the operation note indicated that staples were used at the anastomosis. There were six patients who had a right hemicolectomy (all were in the oncology group) in whom it was noted that staples were used and two out of these six had an anastomotic leak. There were also a further two small bowel anastomoses in the presence of obstruction where staples were used and which subsequently leaked.

The question was raised as to whether a sutured anastomosis might be safer than staples in the presence of obstructed and oedematous bowel, although we were unable to find any references alluding to this. Is there a place for a thoughtful and well-constructed trial to be invoked?

Shared care in orthopaedic and urological surgery

There has been a steady increase in formal shared care. In 1990 21% of cases were managed under formal shared care. By 1998/99 this had increased to 30% and the present sample showed that 39% (139/358) of patients were managed jointly by orthopaedic surgeons and another specialty, usually general or elderly medicine. Given the increasingly elderly nature of these orthopaedic patients and the incidence of comorbidity (50% had cardiac disorders, 35% respiratory disease and 19% psychiatric disturbances), such joint management should become the norm.

In urology 40% of the patients (32/81) were managed on a formal shared care basis. This is a considerable improvement on the figure reported last year (20/73, 27%).

Recommendations

- Early consideration of diagnostic or therapeutic radiological procedures might avoid surgery in some high risk patients.
- Acute hospitals should continually review their radiological provision to ensure the availability of appropriate and modern methods for the investigation and treatment of emergency cases.
- Fluid balance and urinary incontinence should be proactively managed especially in orthopaedic patients.

VASCULAR SURGERY

Key points

- Correction of coagulopathy, including the use of platelets, is important in the management of bleeding associated with surgery for ruptured abdominal aortic aneurysms.
- MRSA infection is a hazard for surgical patients.

There were 222 questionnaires relating to deaths after vascular surgery. The majority were over the age of 70 (72%). Twenty-three percent were in their sixties and only 5% of those who died after vascular operations were under the age of 60. There were twice as many men as women.

There was a high instance of coexisting medical problems with 62% of patients (137/222) having cardiac problems, 27% (61/222) respiratory problems, 21% (47/222) renal problems and 18% (40/222) with diabetes mellitus.

QUALITY OF QUESTIONNAIRES

A high proportion of the vascular surgical questionnaires were poorly completed making it very difficult for the NCEPOD Vascular Advisors (who are nominated by the Vascular Surgical Society of Great Britain and Ireland) to analyse the data received. Vascular surgeons are reminded that the object of the exercise is to improve the quality and delivery of care to patients. The NCEPOD questionnaires should be filled in carefully and conscientiously.

PROCEDURES

The procedures performed are shown in Table 7.1. This table shows that the most frequent operations amongst the reported perioperative deaths were repair of leaking abdominal aortic aneurysm and above knee amputation.

Table 7.1 Procedures in Vascular Surgery (n=222, procedures may be multiple)

Procedure	Number
Abdominal aortic aneurysm surgery (including iliac and thoracic aneurysms presenting to vascular or general surgeons)	
Leaking (ruptured) aortic aneurysm	63
Elective abdominal aortic aneurysm	8
Urgent /elective surgery for non-leaking abdominal aortic aneurysm	7
Suspected AAA - other pathology found	4
Leaking iliac aneurysm	3
Endovascular repair of AAA	2
Removal of infected aortic graft	2
Leaking thoracic aneurysm	2
Miscellaneous aortic procedures (including one each of: elective repair of thoracic aneurysm, repair of aorto-enteric fistula, exploration of thrombosed aortic graft)	3
Aortoiliac surgery for occlusive disease	
Aorto-femoral bypass	6
Axillo-femoral bypass	5
Femoro-femoral bypass	3
Ilio-femoral bypass	1
Iliac endovascular stent	1
Peripheral vascular surgery	
Femorotibial bypass	9
Femoropopliteal bypass	7
Brachial embolectomy	4
Femoral thromboembolectomy	4
Popliteal tibial bypass	3
Ligation of popliteal aneurysm	1
Removal of infected arterial prosthesis	1
Amputation surgery	
Above knee amputation	38
Below knee amputation	15
Debridement of toes or leg ulcer	11
Gritti-Stokes amputation	3
Miscellaneous	
Carotid endarterectomy	
Operation to revascularise ischaemic bowel	4
Fasciotomy	4
Suture of bleeding point following angioplasty	2
Repair of vascular catheter damage	1
A-V fistula for dialysis	1
Angiogram only	1
Angioplasty	1

TRANSFER OF PATIENTS, DELAYS AND CANCELLATIONS

There were six patients who were transferred from another hospital and whose condition was considered to have deteriorated during the transfer. All six were patients with a ruptured abdominal aortic aneurysm. In three, no reason was given for the need to transfer; in one, transfer was because the admitting hospital had no vascular surgical service and in the remaining two cases, although the hospital had a vascular surgical service, there were no available ICU beds. It is inappropriate to repair an aneurysm unless the full backup of intensive care, including ventilation, is going to be applied. One of these patients was haemodynamically unstable and would undoubtedly have been more likely to survive if the operation had been performed at the initial hospital, had an ICU bed been available. Perhaps an operation at the initial hospital with transfer later when the patient was stable might have been better in this particular case, although, this cannot be seen as best practice.

Of the fifteen cases that were delayed, three were elective operations cancelled because there was no HDU/ICU bed available (two were abdominal aortic aneurysms and one was an aortofemoral bypass). In order to provide a proper vascular service it is essential that there are an adequate number of ICU/HDU beds to support a satisfactory emergency service and avoid cancelling elective operations.

In a further patient, who was subsequently found to have an aorto-enteric fistula, the diagnosis was delayed because the endoscopy list was full.

INAPPROPRIATE OPERATIONS

Ruptured aneurysms

There were seven patients who underwent ruptured aortic aneurysm repair in which the decision to operate was questioned. There were four patients who were over 80 years old and moribund. Two others had considerable comorbidity.

Case Study 64

An 82-year-old, ASA 5 patient with ischaemic heart disease (angina and orthopnoea) and a known abdominal aortic aneurysm was admitted following rupture of the aneurysm. Preoperatively the patient was shocked with an arterial pressure of 60/30 mmHg. An experienced consultant general surgeon who had an on-call commitment for vascular emergencies and had done three similar cases in the past 12 months performed the operation, which lasted for four hours. However, the bleeding was never controlled and the patient had persistent hypotension, despite an epinephrine infusion. The patient died in theatre.

Would a specialised vascular surgeon have started this case, or carried on so long with an evidently failing cardiovascular system?

There is a need to identify those patients who have little or no chance of survival. A scoring system has been suggested using a multiple organ dysfunction score (MOD)⁷¹. In this study of 56 patients from the University of Berne in Switzerland, seven patients, who scored badly, died. These patients consumed a quarter of all the ICU bed-days and three-quarters of the ICU bed-days of patients who died.

Elective aortic surgery

There were three patients who underwent elective aortic surgery where the decision to operate was questioned. Two had poor cardiac function; one of these patients also had chronic renal failure.

Case Study 65

An 82-year-old, male, ASA 4 patient was admitted to a teaching hospital for a scheduled endo-luminal repair of an 8.5 cm infra-renal aortic aneurysm. A cardiologist, who had been investigating his poor heart function, referred the patient. Coexisting disorders included severe ischaemic heart disease (occluded right coronary artery and poor left ventricular function), aortic stenosis with a gradient across the valve of 60 mmHg, CCF, hypertension and chronic renal impairment (bilateral reduced kidney perfusion with a creatinine 157 micromol/l). A consultant surgeon working with a consultant radiologist performed the operation that lasted for 3 h 40 min. Immediately postoperatively the patient developed acute renal failure for which he required dialysis. Subsequently he developed a chest infection and severe heart failure such that he no longer tolerated dialysis. He died on the thirteenth postoperative day.

This questionnaire and the enclosures for this case were very detailed for which NCEPOD is grateful. It is evident that the operation was carefully planned and the postoperative care of this patient was of the highest standard. Interventional radiology is pushing back the frontiers of technical feasibility. Nevertheless, patients must be assessed individually for operability. This patient obviously had a very high operative risk and, excluding the risk of the aneurysm rupturing, his co-morbidity alone gave him a life expectancy of about one year. Was it appropriate then to advise that he had this operation? The influence of aortic stenosis on operative risk is discussed more fully in section 6.

The third case is presented below

Case Study 66

An 83-year-old ASA 2 patient was investigated for intermittent claudication of his buttocks. His aortogram revealed a 4.3 cm infra-renal aortic aneurysm with a right iliac artery occlusion and multiple stenosis in the right femoral artery. Coexisting medical problems were hypertension, an asymptomatic 50% right internal carotid artery stenosis and renal impairment with a serum creatinine of 185 micromol/l. The operation, an aorto-bifemoral graft with a jump graft to the right profunda artery, lasted for nine hours and was complicated by massive blood

loss and consequent worsening haemodynamic status. Postoperatively the patient required re-exploration for a thrombosed right limb of the graft and a right femoro-popliteal arterial graft was performed. Unfortunately the patient developed multiple organ failure and died four days later.

The UK Small Aneurysm trial has shown that there is no benefit to be gained from an operation on an aneurysm less than 5.5 cm in diameter⁷². An extra-anatomic bypass may have been a better option if surgery was required at all for his claudication.

Patients not fit for operation?

There were six patients in whom it was questioned whether they were fit enough to withstand the operation. Five of these had critical leg ischaemia.

Case Study 67

A 77-year-old, male, ASA 5 patient was admitted with a critically ischaemic leg and peripheral gangrene. Three weeks previously he had suffered a myocardial infarction that was accompanied by left ventricular failure. The surgeon recognised the operative risks and recorded that death was "expected". A femoro-tibial arterial bypass was performed. It was difficult to establish good flow down the graft and the operation lasted for 4 h 20 min. Postoperatively the patient developed increasingly intractable left ventricular failure and died on day eight.

Considering his clinical status, was a lesser operation considered; for example amputation or good palliative care?

Patients with critical limb ischaemia are difficult to manage. They are often very unwell, and it is a fine clinical balance between doing too much or too little. The levels of intervention are well known. It should be remembered that primary amputation, although initially difficult for the patient to contemplate, is sometimes the best form of pain relief for a patient with critical limb ischaemia. Also, compared with a dubious arterial reconstruction, the prospects for ambulation may be better after a successful amputation⁷³.

However, there are undoubtedly some patients who would be best treated by analgesia and palliation, thus allowing their inevitable death to take place peacefully⁷³.

The sixth patient, whose fitness for operation was questioned, was said to be pre-terminal. Nevertheless debridement of leg ulcers was performed. If the patient was pre-terminal then why was the operation done? Alternatives are available such as larval therapy.

LACK OF SUPERVISION

Consultant input in theatre was generally good and a consultant was involved in the decision to operate in almost all patients, and was present in operating theatre for a high proportion of procedures. Nevertheless, there were some cases where it was thought that the supervision should have been better. Three patients had an emergency repair of a ruptured abdominal aortic aneurysm performed by SpRs with no consultant supervision. In one of these cases the patient lost 22 units of blood. In another, a straight tube graft was performed which was later revised to a bifurcated graft to both iliac arteries. In neither case was any request made for the consultant to come and help. Is it ever appropriate for an SpR to repair a ruptured aneurysm on his own? Certainly, if an SpR is going to repair a ruptured aortic aneurysm, the consultant should be immediately available to help and, until the SpR has demonstrated his proficiency, the consultant should be scrubbed up and assisting with the operation. If an SpR has never reached this level of proficiency then the first time that he has to do this procedure will be when he is a newly appointed consultant. In this situation, the newly appointed consultant should ask for help. The concept of consultant invincibility is outmoded; surgical units should be organised to provide support for newly appointed surgeons, who as a result of shortened time in training and reduced junior doctor hours are likely to be less experienced in the future.

PREOPERATIVE INVESTIGATION

Ninety-eight percent of patients (218/222) were appropriately investigated and prepared for vascular surgery. There were four cases out of the 222 where preoperative investigations were considered deficient, two patients had cardiac problems and two had renal failure.

INFECTION AND MRSA

There were two patients who had PTFE grafts inserted in the presence of infection. Both subsequently developed prosthetic graft infections. Synthetic grafts should be avoided whenever possible for femoro-popliteal or femoro-tibial arterial bypass in the presence of infection. In such cases, if a long saphenous vein is unavailable, alternative sources of autologous vein such as arm veins or deep leg veins may be considered as conduits.

There were four cases of documented MRSA infections. Hospital acquired infections are an increasing hazard and are causing great concern^{74,75}. It has been shown that the incidence of MRSA transmission in hospital can be reduced by conscientious hand hygiene using spirit based antiseptic hand rubs⁷⁶. Has the time come for spirit based hand rubs to be available at each surgical bed space?

RETROPERITONEAL HAEMATOMA FROM SUPERFICIAL FEMORAL ANGIOPLASTY

There was one death following a retroperitoneal haematoma complicating an angioplasty. The diagnosis was made, the haematoma was evacuated and the cavity packed. The patient subsequently died of cardiac failure.

The NCEPOD report on Interventional Vascular Radiology⁷⁷ stated that it is dangerous to cannulate the femoral artery above the inguinal ligament, because of the risk of retroperitoneal haematoma. This is particularly likely to occur in the antegrade puncture that is used for subintimal angioplasty of the superficial femoral artery. The danger is greater when the block comes up to the origin of the superficial femoral artery, and where its origin is high and therefore close to the inguinal ligament. The incidence of cannulating the vessel above the inguinal ligament during antegrade puncture for subintimal angioplasty of the superficial femoral artery is not known, nor is the incidence of retroperitoneal haematoma when this occurs. Likewise we do not know the mortality rate of this complication. Problems can be avoided if the artery is not cannulated above the inguinal ligament.

RUPTURED ABDOMINAL AORTIC ANEURYSM

This continues to be the operation associated with most vascular surgical deaths. There are a number of aspects to be considered under this heading.

Specialty of surgeon

There continue to be general surgeons, who do not have vascular surgery as a subspecialty, who repair leaking abdominal aortic aneurysms. This is despite the fact that they perform little if any elective aortic graft replacements. This would appear to be due to on-call service requirements irrespective of the surgeon's specialist interest. This situation presumably arises because, in some hospitals, there are insufficient surgeons with a sub-specialist vascular surgical practice to provide a vascular on-call rota.

Case Study 68

A 67-year-old, ASA 4 patient was admitted at 04.00 with a diagnosis of a ruptured aortic aneurysm. Coexisting medical disorders were asthma and a three month history of hypertension. Preoperative arterial pressure was 128/81 mmHg and heart rate 115/min. The surgeon was a consultant with an interest in upper gastrointestinal surgery and had performed one similar operation in the past 12 months. The operation, a tube graft replacement of the aorta, took 4 h 30 min, during which time the patient received 30 units of blood and the haemodynamic status deteriorated. Bleeding continued postoperatively and the patient died later that day.

This situation should not continue. Those hospitals admitting vascular emergencies should now take steps to ensure that there are sufficient surgeons of appropriate ability to provide an acceptable emergency vascular surgical rota.

General surgeons seeking for help from vascular surgeons

If a general surgeon is not familiar with the vascular problem that he is facing, then it would be good practice to seek help and support from a more experienced colleague. There was at least one example of a general surgeon who was having difficulty and, quite correctly, called for help. Unfortunately there were also several other examples where, even though the surgeon was getting into difficulty, there was apparently no attempt to contact a specialist vascular surgeon.

Ischaemic leg

There were several examples of patients undergoing emergency surgery for ruptured abdominal aortic aneurysms, or having elective surgery to repair an aneurysm, where one limb was ischaemic at the end of the operation but this problem was not recognised at the time. It is important to recognise and correct such ischaemia before the patient leaves the operating theatre. If the problem is not detected until the following day there is a high probability that irreversible damage will occur, resulting in amputation or death. If the operating surgeon has insufficient experience to assess the lower limb circulation then it is essential to seek the help of a specialist vascular surgeon.

Case Study 69

A 72-year-old patient had an elective repair of an infrarenal abdominal aortic aneurysm. Overnight he developed ischaemic legs but the problem appears to have been overlooked. Once diagnosed the patient was returned to theatre where a thrombosed aortic graft was found and a thrombectomy and distal embolectomy done. Unfortunately, one leg was unsalvageable and the patient rapidly deteriorated. Death occurred 48 hours after the initial surgery.

Case Study 70

A 71-year-old patient had a repair of a leaking abdominal aortic aneurysm. The day after surgery, one leg was noted to be ischaemic and a femoral embolectomy and femoro-femoral crossover graft was done. The patient died three days later from acute renal failure. All the surgery was done by a gastrointestinal surgeon who did not request the help of a vascular surgeon, even when complications developed.

Coagulopathy, platelets and packing

There were several cases of patients developing coagulopathy during repair of ruptured abdominal aortic aneurysm. In two of these, fresh frozen plasma was given but the anaesthetists were unable to obtain platelets even though the platelet count was low. Ideally platelets should be given prior to the release of the vascular clamps rather than waiting for uncontrollable haemorrhage to confirm a low platelet count. NCEPOD recommends that blood banks ensure that platelets are readily available for such cases. The use of an abdominal pack may also help in these cases. The abdomen is closed with the pack in place so compressing the bleeding site and the pack removed two to three days later.

Because abdominal aortic aneurysm repair is associated with high mortality and morbidity, NCEPOD recommends that the specialist societies should conduct a more detailed audit of abdominal aortic aneurysm surgery, both elective and ruptured.

- At the end of an aortic operation it is essential to assess the adequacy of the circulation in both legs and, if deficient, to correct it before the patient leaves the operating theatre.
- Blood banks should have platelets readily available for the correction of coagulopathy for ruptured AAA cases.

Recommendations

- There needs to be sufficient ICU/HDU beds so that major elective arterial operations are not cancelled and emergency admissions can be cared for without the need to transfer the patient to another hospital or discharge another patient from the unit too early.
- Those hospitals admitting vascular emergencies should now take steps to ensure that there are sufficient surgeons of appropriate ability to provide an acceptable emergency vascular surgical rota.
- The concept of consultant invincibility is outmoded; surgical units should be organised to provide support for newly appointed surgeons, who are likely to be less experienced in the future.
- There is a need for a scoring system to assess the likelihood of survival of a patient with a ruptured abdominal aortic aneurysm.