THE REPORT OF THE NATIONAL CONFIDENTIAL ENQUIRY INTO PERIOPERATIVE DEATHS

1990

E. A. CAMPLING
H. B. DEVLIN
R. W. HOILE
J. N. LUNN

Association of Anaesthetists of Great Britain and Ireland
Association of Surgeons of Great Britain and Ireland
College of Anaesthetists at the Royal College of Surgeons of England
College of Ophthalmologists
Faculty of Dental Surgery of the Royal College of Surgeons of England
Faculty of Public Health Medicine of the Royal College of Physicians of the United Kingdom
Royal College of Surgeons of England
Royal College of Pathologists
Royal College of Obstetricians and Gynaecologists
Royal College of Radiologists

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(1 January to 31 December 1990)

E A CAMPLING BA DipHSM
H B DEVLIN MD FRCS
R W HOILE MS FRCS
J N LUNN MD FFARCS

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National Confidential Enquiry into Perioperative Deaths

35-43 Lincoln's Inn Fields
LONDON
WC2A 3PN

Tel: 071 831 6430

Requests for further information on the Enquiry should be addressed to the Administrator

It will probably always be necessary to employ locum surgeons and anaesthetists from time to time. While these colleagues do valuable work in service provision there is evidence that more scrupulous attention is necessary on appointment as to their training and experience and more adequate supervision and support for their clinical activities is required.

The aforementioned blemishes in what, it must be emphasised, is in the main a good and efficient service, are all capable of correction and practical steps to do so must be instituted without delay. The essential purpose of the Enquiry will have been achieved if future reports demonstrate that this has been done and the encouraging trends which have been identified in this report continue.

Finally, it remains to congratulate all the anaesthetists, surgeons and others who have so willingly collaborated in this Enquiry in the public interest. A great debt is also owed to the unflagging efforts of the three Coordinators, the specialist advisers, the Administrator and all her staff. Without them such a valuable and detailed report could not have been produced. As the retiring Chairman, I would also like to express my personal gratitude to all members of the Steering Group whose wisdom, experience and support have continued to be invaluable in conducting the Enquiry.

Donald Campbell, C.B.E.
Chairman, Steering Group
April 1992

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The data in the sections on anaesthesia and surgery are presented in tables which refer to the question numbers in the relevant questionnaire. The questionnaires (deaths) are reproduced as Appendices C and D.

The National Confidential Enquiry into Perioperative Deaths is concerned with the quality of the delivery of anaesthesia and surgery: it does not study the causation of death. Many of the patients mentioned in the report were old, very seriously ill, and were expected to die by the doctors who cared for them. The report contains recommendations about improvements in the care of patients. There are no *new* lessons.

GENERAL CONCLUSIONS

The conclusions are relevant to both the *medical profession* and to *managers.*

1 **Information.** There are examples throughout the report about deficiencies in the hospital notes; at least 90 cases could not be studied because notes were acknowledged to be lost. Operation notes were sometimes missing or lacking in essential details such as the name of the surgeon or the diagnosis; anaesthetic notes regularly failed to record physiological changes. Hospital notes about dead patients tend to be given a low priority by records staff and soon disappear and become difficult to find.

2 **Essential services.** Recovery rooms, high dependency units and intensive care units need not merely to exist as structures, they must also be ready for use. Proper equipment and qualified specialist staff (nurses, operating department assistants) must be available at all times if patients are to survive anaesthesia and surgery. If these services are not available patients may have to be moved elsewhere. Services were noted to be deficient, or closed, on Bank Holidays (particularly Christmas) and, perhaps surprisingly, at night. The proper and safe provision of pain relief after surgery implies that more high dependency units are required.

3 **Emergency operating rooms.** The provision of this essential service is important for all surgical specialties. Best results are obtained when there is no (non-medical) delay in the management of, for example, fractured neck of femur. If patients are to receive the greatest benefit from modern surgery it must be performed at the clinically most opportune moment. Dedicated operating rooms for emergency surgery are an essential service for all surgical specialties.

4 **Split sites.** The problems caused by the requirement for Consultants (and their teams) to work and to be on call regularly on more than one NHS site are well known. The use of split sites should be historical.

5 **Consultants.** In this Enquiry, 83% of the decisions about surgery were made by Consultants or Senior Registrars.

About half the anaesthetics for the group of patients who subsequently died were conducted in the precise knowledge and (or) presence of a Consultant. This proportion is not yet satisfactory but many of the deaths occurred as a result of factors outside the clinical responsibility of anaesthetists.

6 **Specialty involvement.** A few surgeons persist in occasional operating outside their primary specialty; this is deplored.

7 **Locums.** Temporary appointments are sometimes necessary. The most senior operating surgeon was a locum in 7% of the deaths; similarly, 9% of anaesthetists *working alone* were locums. Sometimes these locums, of both disciplines, were "acting up" but too often they admitted personally that they were inadequately trained or out of practice at particular procedures.

8 **Non-medical assistance.** The need for trained non-medically qualified assistants for anaesthetists is overwhelming; in 59% of deaths the anaesthetist was working without medical assistance.

9 **Post mortem examinations.** The infrequency of this useful investigation revealed in this Enquiry is to be deplored. Communication between pathologists (both hospital and Coroners') and clinicians is so poor that useful lessons can often not be learnt.

10 **Non-trainee, non-Consultant clinicians.** There is evidence within this report that these clinicians (Associate Specialist, Staff Grade, Clinical Assistant) are sometimes isolated. Arrangements whereby these individuals are fully integrated into departments of surgery and anaesthesia need to be improved. This should include involvement in audit meetings.

11 **Supervision.** Trainee surgeons and anaesthetists need to be encouraged to request supervision. Consultants must ensure that trainees have the confidence to ask and to know that their request will not be rebuffed. If proper supervision of trainees is to be achieved, there may need to be more Consultants, particularly in orthopaedic surgery and in anaesthesia.

12 **Confidential Enquiries.** The influence of confidential enquiries in the practice of medicine in the United Kingdom is undeniable. The effects of CEPOD and NCEPOD are such that this unique Enquiry should continue.

GENERAL RECOMMENDATIONS

1. The provision of clinical and management information about patients, including post mortem records, needs to be improved significantly.

2. Essential services (including staffed emergency operating rooms, recovery rooms, high dependency units and intensive care units) must be provided on a single site wherever emergency/acute surgical care is delivered.

3. Decisions for or against operations should be made jointly by surgeons and anaesthetists; this is a Consultant responsibility.

4. The supervision of locum appointments at all grades in anaesthesia and surgery needs an urgent review.

5. All grades of surgeon and anaesthetist should be involved in medical audit and continuing medical education.

6. Efforts should be made to increase the number of post mortem examinations.

7. The National Confidential Enquiry into Perioperative Deaths should continue.

MANAGEMENT OF THE ENQUIRY

The National Confidential Enquiry into Perioperative Deaths was launched in 1988 following the publication of the report of a similiar enquiry which reviewed surgical and anaesthetic practice over one year (1985/1986) in three NHS Regions[1]. The Enquiry reviews the quality of the delivery of care and does not study causation of death. Maternal deaths are excluded. The first report of the National Enquiry (1 January to 31 December 1989) was published in June 1990.

All NHS and Defence Medical Services hospitals in England, Wales and Northern Ireland, and public hospitals in Guernsey, Jersey and the Isle of Man were included in the Enquiry in 1990 as well as hospitals managed by AMI Healthcare Group PLC and BUPA Hospitals Limited, and The London Independent Hospital. Funding is provided by the Department of Health, the Welsh Office, the Department of Health and Social Services (Northern Ireland), the relevant authorities in Guernsey, Jersey and the Isle of Man, and by the participating independent health care companies.

Consultant Anaesthetists, Surgeons and Gynaecologists in all specialties are invited to participate and receive regular information about the Enquiry. We maintain a database of names and addresses of these Consultants, which is not available elsewhere.

Corporate structure

The Enquiry is an independent body to which a corporate commitment has been made by the Associations, Colleges and Faculties related to its areas of activity. The Association of Anaesthetists and the Association of Surgeons are included as initiators of the original (1982) Enquiry.

Each of these bodies nominates members of the Steering Group which is responsible for the management of the Enquiry, and for its protocol.

STEERING GROUP

Chairman
Professor D Campbell
Former Dean, Faculty of Medicine, University of Glasgow
(College of Anaesthetists)

Vice Chairman
Mr J A P Marston
Consultant Surgeon
(Royal College of Surgeons of England)

Secretary
Mr H B Devlin
Consultant Surgeon
(Royal College of Surgeons of England)

Treasurer
Dr M M Burrows
Consultant Anaesthetist
(Association of Anaesthetists of Great Britain and Ireland)

Professor E D Alberman
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(Faculty of Public Health)

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Professor of Urology
(Royal College of Surgeons of England)

Dr D C Cumberland
Consultant Radiologist
(Royal College of Radiologists)

Professor T Duckworth
Professor of Orthopaedic Surgery
(Royal College of Surgeons of England)

Dr N P Halliday
Senior Principal Medical Officer
(Department of Health)

Dr A C Hunt
Consultant Pathologist
(Royal College of Pathologists)

Dr J N Lunn
Reader in Anaesthetics
(Association of Anaesthetists of Great Britain and Ireland)

Mr C G Munton
Consultant Ophthalmologist
(College of Ophthalmologists)

Mr W J Owen
Consultant Surgeon
(Association of Surgeons of Great Britain and Ireland)

Dr J C Stoddart
Consultant Anaesthetist
(College of Anaesthetists)

Professor V R Tindall
Professor of Gynaecology
(Royal College of Obstetricians and Gynaecologists)

Mr J Ll Williams
Consultant Maxillofacial Surgeon
(Faculty of Dental Surgery)

The Clinical Coordinators, Mr H B Devlin and Dr J N Lunn are assisted by Mr R W Hoile. The full-time Administrator, Ms E A Campling is supported by a Deputy Administrator and six administrative staff.

The data collection and analysis, and the production of this report would not be possible without the support and enthusiasm of the NCEPOD staff. We are pleased to acknowledge the hard work of Julie Allan, Linda Friel, Sean Gallimore, Joanne Hawkins, Sharon McGarrity and Jennifer Maynard.

PROTOCOL

The protocol (Appendix B) is derived from that of the Confidential Enquiry into Perioperative Deaths which reported in December 1987[1].

Confidentiality

All data are *confidential*; access to information is restricted to NCEPOD staff. All forms and other written information are *shredded* when the report has been published.

The Enquiry functions as a separate entity, although its offices are within The Royal College of Surgeons.

Data collection - Deaths

The Enquiry collects data on patients who have died *in hospital* within 30 days of a surgical procedure, defined as:

"any procedure carried out by a surgeon or gynaecologist, with or without an anaesthetist, involving local, regional or general anaesthesia or sedation".

Maternal deaths are excluded.

From its start, the Enquiry has depended on local reporters to provide details of the relevant patients. The Enquiry is clinically led and the reporters in the public hospitals are Consultant Clinicians, mostly Pathologists (74%), who have devised their own methods of obtaining information within their hospitals or Districts. Many have delegated the data collection to administrative staff. In the independent sector, the hospital managers provide the data. Reporters are occasionally informed of deaths at home, after discharge from hospital, and these are reported to the Enquiry.

When incomplete information is provided by the local reporters, the NCEPOD staff contact the appropriate Medical Records Officer or Consultant Surgeon.

Guidance notes and reply-paid envelopes are supplied to each reporter as well as forms on which to report the following information;

District/ Regional/Other Health Authority

Patient's details;

First name(s)
Surname
Sex
Hospital Number
Hospital
Operation Date (last before death)
Date of Birth
Date of Death

Name of Consultant Surgeon
Name of Anaesthetist (if known)

Data from the forms are entered in the database held on computer within the NCEPOD offices and are then aggregated by Region by the NCEPOD staff.

Annual Sample

A more detailed study of anaesthetic and surgical practice is gained through a sample selection, varied annually.

Questionnaires

The detailed review of anaesthetic and surgical practice uses questionnaires on the admission, diagnosis, pre-, intra- and post-operative treatment of the patient, the circumstances of the death and the post mortem as well as more general information on the organization of clinical services.

The surgical and anaesthetic questionnaires are sent to the Consultant Surgeon "in charge" at the time of the final operation before death. He/she is asked to pass the anaesthetic questionnaire to the most appropriate Consultant Anaesthetist.

The patient's details appear in the covering letter to the clinicians, but questionnaires are identified only by a *number* which is allocated in the NCEPOD office. Operation notes, anaesthetic records and correspondence returned with completed questionnaires are all rendered anonymous on receipt.

The Steering Group recommended that Consultants ask their junior staff to complete the questionnaire from the patient's notes. The completed form should then be reviewed by the Consultant and his/her junior as a training exercise. Trainees and Consultants were invited to write confidentially to the Enquiry if they wished to provide further information.

Index Cases

Details of a further sample of patients undergoing surgery are requested in the *index cases.* All Consultant Surgeons and Gynaecologists are asked to complete a questionnaire on a patient who fits the criteria specified by NCEPOD. The surgeon is asked to pass the anaesthetic questionnaire to the most appropriate Consultant Anaesthetist.

Survivor Cases

The protocol (December 1988) required the selection of *survivor cases* matched for sex, age group and mode of admission, with the sampled deaths. The Steering Group agreed in June 1991, however, that the search for these cases would be discontinued because of difficulties which are described on page 24.

Advisers

The Colleges and Specialist Associations are asked to nominate advisers in anaesthesia, pathology, surgery and gynaecology for each data collection year. The advisers devise the detailed questionnaires for the year's sample and they then review the data.

UPDATE ON THE 1989 REPORT

In order to calculate operation-specific mortality rates, accurate numbers of each type of operation performed, as well as the number of 30-day deaths are necessary. To compare these between Regions we also need accurate Regional populations.

The Administrator wrote to the Department of Health (Statistics and Management Information) requesting data relating to the period 1 January to 31 December 1989 (the year covered by our first report[1]). Information was sought on the number of patients in England on whom surgical procedures were performed, and on the number of patients who died in hospital within 30 days of a surgical procedure. The reply was eventually received at the end of September 1991.

The basic data are stored on computer by the Department of Health as a random 25% sample; the main data set are stored by the Office of Population Censuses and Surveys. The data were provided to us as "raw" (ie ungrossed figures). The period specified covers two NHS financial years and the accompanying letter commented that coverage for 1989/90 was believed to be considerably better than that for 1988/89.

The Department of Health is unable to provide accurate numbers of deaths within 30 days of an operation, because some Health Authorities omitted the dates of admission and/or of operation in their returns. Authorities which code efficiently are likely to show a higher number of procedures and deaths than the inefficient; in other words, the more efficient hospitals are likely to produce apparently worse results! Unless NHS information systems improve dramatically these problems will persist.

The lack of a unique patient identifier is a *major* problem. It is not possible to ascertain the number of patients who have surgical operations but only the total number of surgical procedures performed. One patient may have experienced during the course of the year several procedures classified as operations in the "Classification of Surgical Operations and Procedures, Fourth Revision" (Office of Population Censuses and Surveys).

Maternal deaths are excluded from the Enquiry. Procedures listed in the Classification include many which do not fall within the NCEPOD definition of a surgical procedure. In particular, many would be performed by physicians, radiologists, anaesthetists, nurses, midwives and many other specialties and disciplines. A few examples are:

M47.3	*Removal of urethral catheter from bladder*
R24	*Normal delivery*
T12	*Puncture of pleura*
X36.1	*Blood donation*
X37	*Intramuscular injection*

A further request was therefore made to the Department of Health to re-run the data search excluding over 150 primary operation codes. We then attempted to compare the number of deaths with those reported to us, and summarised in the NCEPOD Report 1990[2].

The following table identifies some of the problems of data collection.

Table M1
Deaths in hospital within 30 days of a surgical procedure (England only)

1 January 1989 to 31 December 1989.

Authority	Deaths (DoH)	Deaths (DoH after re-run)	Deaths (NCEPOD,1989)
Northern	1408	1140	1089
Yorkshire	1672	1416	1596
Trent	4664	3456	1849
East Anglia	912	556	722
North West Thames	1028	900	1026
North East Thames	3340	2496	1436
South East Thames	2548	1600	1599
South West Thames	2084	1412	1241
Wessex	1364	1000	1028
Oxford	916	624	649
South Western	2640	1732	1278
West Midlands	2268	2068	1902
Mersey	1036	932	845
North Western	3012	2160	2019
Special Health Authorities	452	348	147
	----	----	----
Total	29344	21840	18426
Total number of surgical procedures	5790268	2783172	not available

It is of particular note that, according to the Department of Health statistics, there were *no* relevant deaths during 1989 at the National Hospitals for Nervous Diseases and only 12 at The Hospitals for Sick Children. NCEPOD recorded 11 at the former and 52 at the latter where reporting was very efficient. However, from the overall figures, it appears that there is an approximate 16% shortfall in reporting to NCEPOD for England.

THE ENQUIRY IN 1990

(1 January to 31 December 1990)

Sample - deaths

A random sample of 20% of reported deaths, *excluding* children aged 10 years or less was chosen to provide cases for more detailed study of anaesthesia and surgery. These cases are the subject of this Report.

The questionnaires were sent to the Consultant Surgeon or Gynaecologist as soon as possible after the death was reported to us. A reminder letter was sent to Consultant Surgeons who had not returned their questionnaires by March 1991. At this stage, a reminder was sent to Consultant Anaesthetists if their names were known to us (from the local reporting form or identified by the surgeon). If the name of the anaesthetist was not clear, the Administrator wrote to the local tutor of the College of Anaesthetists for assistance with distribution of "reminder" questionnaires.

Sample - index cases

For the *index* cases, each Consultant Surgeon or Gynaecologist was asked to select retrospectively the first patient on whom a member of his/her surgical team had operated from 08.30 hrs on Monday 1 October 1990. This request was made in late October 1990, and the criteria included patients of any age who had operations under general, local or regional anaesthesia or sedation. This sample did *not* exclude patients who died postoperatively.

Hospital managers in the independent sector were asked to pass questionnaires to any Consultant Surgeon or Gynaecologist who performed a surgical procedure in their hospital, on 1 October 1990.

Sample - survivor cases

Four hundred requests were made for completion of *survivor case* questionnaires. The criteria for selection of a survivor case were that it matched the sex, age group, mode of admission and procedure of the patient who had died. This was an attempt to obtain a sample of cases on whom surgery had been performed under similar conditions and which could be compared to the sample of deaths.

Most of the responses to these requests stated that the surgical team could not "match" the criteria. This was particularly difficult in orthopaedic surgery where, for instance, the surgeon's preferred indications for, and method of, total hip replacement vary widely. The difficulties were reported to the Steering Group, who decided to abandon the search for survivor cases.

We are grateful to the 64 Consultant Surgeons and 60 Consultant Anaesthetists who were able to complete and return survivor case questionnaires, and apologise that the data were not analysed.

Advisers

Groups of advisers for anaesthesia, surgery and pathology were formed following nominations from the relevant Colleges and Specialist Associations. The Enquiry is extremely grateful to these advisers who are listed below:

Anaesthesia	
Dr F Bostock	(Leeds)
Dr J C Edwards	(Southampton)
Dr M J Lindop	(Cambridge)
Dr R A Mason	(Swansea)
Professor J Moore	(Belfast)
Pathology	
Dr A R Morley (Chairman)	(Newcastle upon Tyne)
Dr C Angel	(Sheffield)
Dr T G Ashworth	(Coventry)
Dr C W Edwards	(Birmingham)
Dr M M Esiri	(Oxford)
Dr B Fox	(London)
Dr N Kirkham	(Brighton)
Dr J C Macartney	(Redditch)
Professor J C E Underwood	(Sheffield)
Professor G T Williams	(Cardiff)
Cardiothoracic Surgery	
Mr F C Wells	(Cambridge)
General Surgery	
Mr J Bancewicz*	(Manchester)
Mr I A Donovan	(Birmingham)
Mr B L Dowling	(Northampton)
Professor J B Elder	(Stoke on Trent)
Mr R G Faber	(Reading)
Mr R E Glass	(Swindon)
Mr S T Irwin	(Belfast)
Mr C G Marks*	(Guildford)
Mr R Motson	(Colchester)
Mr W E G Thomas	(Sheffield)
Mr J P S Thomson*	(London)
Mr M H Wheeler	(Cardiff)

Gynaecology

Mr A G Amias	(London)

Neurosurgery

Mr D Byrnes	(Belfast)

Ophthalmology

Mr C G Munton	(Maidstone)

Oral/Maxillofacial Surgery

Mr P J Leopard	(Stoke on Trent)

Orthopaedic Surgery

Mr R M Atkins	(Bristol)
Mr F J Beddow	(Liverpool)
Mr G Dowd	(London)
Mr R A Elson	(Sheffield)
Mr G Evans	(Isle of Wight)
Mr D A Jones	(Swansea)
Mr M A Leonard	(Newcastle)
Mr C J McClelland	(Antrim)

Otorhinolaryngology

Mr R J Parker	(Reading)

Plastic Surgery

Mr M J M Black	(Newcastle upon Tyne)

Urology

Mr C P Bates	(Nottingham)
Mr R C L Feneley	(Bristol)
Mr R Morgan	(London)
Mr R E D Williams	(Leeds)

Vascular Surgery

Mr S G Darke	(Bournemouth)
Mr R L Doig	(Leeds)
Mr W B Campbell	(Exeter)
Mr P L Harris	(Liverpool)
Mr M Horrocks	(Bath)
Mr I G Kidson*	(London)

* These surgeons were nominated but were unable to attend the meetings.

The anaesthetic and surgical advisers reviewed, with the Clinical Coordinators, completed questionnaires with the copies of operation notes, anaesthetic records and post mortem reports when available. The commentaries from these meetings have been used by the Coordinators in this report.

The post mortem data and reports were reviewed by the pathologist advisers. Their comments and data are presented in the section on surgery (pages 344 to 351).

Analysis

Before input of information to the database, each questionnaire was scrutinised by the Administrator to eliminate contradictory or confusing responses and to interpret illegible handwriting. When data input was complete (total 9371 questionnaires), the information was analysed by the Administrator and appears in the anaesthesia and surgery sections.

THE CURRENT ENQUIRY AND THE FUTURE

The Steering Group agreed during 1990 that the data collection year of the Enquiry should match that of the Department of Health (1 April to 31 March).

The detailed NCEPOD sample for 1991/92 comprises specific surgical procedures, covering all specialties. In 1992/93 we shall select deaths of patients aged between 6 years and 70 years.

The participation of the independent sector has expanded and includes Compass Healthcare Ltd. (from 1 January 1991), Nuffield Hospitals and The London Clinic (both from 1 April 1991) and Community Hospitals Ltd. (from 1 April 1992).

ANALYSIS OF DATA

(1 January to 31 December 1990)

Deaths

A total of 18817 deaths were reported to the Enquiry.

Table M2

Days from operation to death

	(*n*=18817)
0	2178
1	2414
2	1495
3	1193
4	995
5	888
6	766
7	763
8	697
9	726
10	598
11	558
12	502
13	489
14	456
15	448
16 to 20	1632
21 to 25	1184
26 to 30	835

Days from operation to death

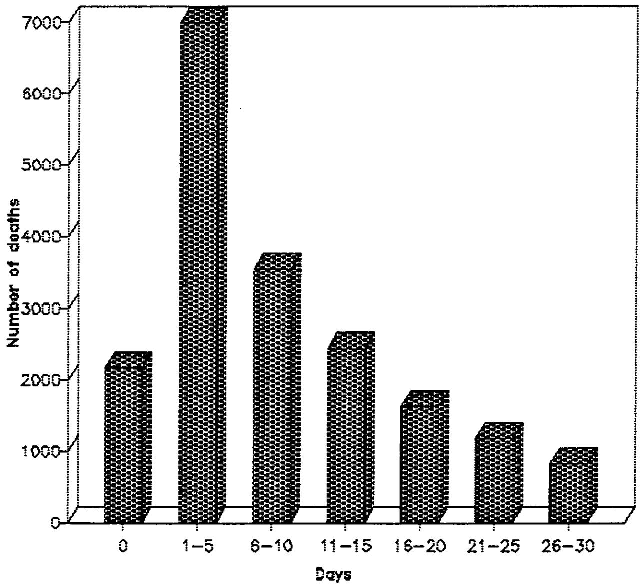

Table M3
Age/sex distribution of reported deaths

	Male	Female	Total
0-10	219	174	393
11-20	102	52	154
21-30	140	55	195
31-40	135	122	257
41-50	347	249	596
51-60	932	594	1526
61-70	2574	1619	4193
71-80	3407	2691	6098
81-90	1829	2755	4584
91-100	197	607	804
>100	3	14	17
	----	----	-----
Total	9885	8932	18817

Table M4
Deaths reported to NCEPOD

Region/Authority	**Number of reported deaths** (n=18817)	**Size of resident population where appropriate* (thousands)**
England		
Northern	1069	3075.4
Yorkshire	1395	3655.7
Trent	1722	4704.5
East Anglia	768	2059.0
North West Thames	1019	3498.6
North East Thames	1427	3802.9
South East Thames	1443	3658.2
South West Thames	1014	2978.6
Wessex	913	2940.3
Oxford	599	2563.9
South Western	1084	3262.1
West Midlands	1826	5219.3
Mersey	799	2402.8
North Western	1937	4016.1
Special Health Authorities		
Hammersmith and Queen Charlotte's SHA	19	▨
Moorfields Eye Hospital	1	
Royal Brompton National Heart and Lung Hospitals	15	
The Bethlem Royal Hospital and The Maudsley Hospital	-	
The Eastman Dental Hospital	-	
The Hospitals for Sick Children	53	
The National Hospital for Neurology and Neurosurgery	3	
The Royal Marsden Hospital	17	
Wales	1102	2881.4
Northern Ireland	316	1589.432
Other authorities		
Guernsey	39	58.867
Jersey	22	83.600
Isle of Man	25	69.788
Defence Medical Services	60	▨
Independent sector	130	▨

* references 3 to 7

Local reporting

All reports of deaths received by 12 March 1991 were included in the analysis. Some reporters, however, experienced considerable difficulties in reporting and either sent delayed reports or were able to report only a small number of the deaths.

A total of 497 reports were received too late to be included in the analysis.

North Bedfordshire Health Authority had not reported any deaths before the closure date.

Other health authorities reported surprisingly few deaths. These were:

	Total number reported
Ealing	6
Grimsby	3
Isle of Wight	6
Southmead	7
South West Durham	6
Hammersmith and Queen Charlotte's SHA	19
Royal Brompton National Heart and Lung Hospitals (all deaths reported were from the London Chest Hospital)	15
The National Hospital for Neurology and Neurosurgery	3

Problems were again[2] experienced at Horton General Hospital (Oxfordshire HA) where reports of deaths before June 1990 were not received. Although reports were received from Parkside HA, none of these were from St Mary's Hospital, and a similar problem occurred with Riverside HA as only eight of the reports related to the Westminster Hospital. The London Independent Hospital (independent sector) did not report any deaths and we have been unable to confirm whether any deaths occurred.

Data collection systems in the above health authorities and hospitals are clearly inadequate and need urgently to be improved if the Enquiry is to be truly representative.

Particular problems with *delayed* reporting were encountered in Bath, Sheffield and Wandsworth Health Authorities, despite numerous attempts by the local reporters to obtain timely data from the Information Services departments.

When *incomplete* reports were received, NCEPOD wrote to the local reporter, medical records officer or appropriate Consultant Surgeon for assistance in obtaining the missing data. This procedure was successful so that 249 forms on which the following data were absent could be completed:

Date of birth	91
Date of operation	84
Date of death	53
Name of Consultant Surgeon (needed *only* for sampled deaths)	58

However, replies were not received to 46 requests for information.

Inappropriate reports (total 350) were received and *not* included for the following reasons;

More than 30 days (day of operation to day of death)	327
Procedure not performed by a surgeon	10
No surgical procedure performed	4
Duplicates	6
Death in "non-participating" hospital	2
Patient still alive (incorrectly coded)	1

Table M5
Deaths selected as sample for further review

Authority	**Sampled deaths** (*n*=3485)	**% of reported deaths**
England		
Northern	184	17.2
Yorkshire	268	19.2
Trent	298	17.3
East Anglia	157	20.4
North West Thames	175	17.2
North East Thames	264	18.5
South East Thames	254	17.6
South West Thames	185	18.2
Wessex	165	18.1
Oxford	110	18.4
South Western	208	19.2
West Midlands	361	19.8
Mersey	146	18.3
North Western	377	19.5
Special Health Authorities		
Hammersmith and Queen Charlotte's SHA	4	21.0
Moorfields Eye Hospital	-	
Royal Brompton National Heart and Lung Hospital	2	13.3
The Hospitals for Sick Children	2	3.8
The National Hospital for Neurology and Neurosurgery	1	33.3
The Royal Marsden Hospital	4	23.5
Wales	214	19.4
Northern Ireland	51	16.1
Other authorities		
Guernsey	13	33.3
Jersey	4	18.2
Isle of Man	2	8.00
Defence Medical Services	11	18.3
Independent sector	25	19.2

Sample selection

The sample for detailed study was randomly selected (1 in 5, 20%) from all the deaths reported to us. Table M5 shows that this was achieved in all the *geographic* regions of the NHS.

The total number of deaths selected for the sample was 3485.

There were, however, other selected cases which were found to be inappropriate when replies were received to the requests for questionnaire completion. These cases were deleted from our records for the following reasons;

More than 30 days between date of operation and date of death	35
Procedure not performed by a surgeon, or no operative procedure performed	92
Maternal death	5

Twenty-one deaths of children aged 10 years or less were excluded from the sample although these had been selected by random number.

Delayed reports received from Sheffield (32), Riverside (12), Doncaster (15), Hampstead (8), and Hartlepool (4) Health Authorities were selected as sample cases by random number. However, it was decided that questionnaires should *not* be sent to the Consultants because there was an interval of between 10 months and one year from the dates of death to the receipt of the reports. These cases were therefore *not* included in the sample.

There were 16 cases which were selected as sample deaths (but *not* included in the sample) for which we were unable to send questionnaires, because the name of the Consultant Surgeon was omitted from the reporting form and we were unsuccessful in our enquiries to the local reporter or medical records officer.

QUESTIONNAIRES (DEATHS)

Tables M6 to M8 show the numbers of anaesthetic and surgical questionnaires completed and returned. Questionnaires received by 31 May 1991 were analysed.

These numbers differ from the totals in the anaesthetic and surgical sections because eight questionnaires received were *not* entered on the database as they were incomplete.

Table M6
Completed surgical questionnaires (deaths) returned to NCEPOD

Authority	Number returned	% return rate
England		
Northern	143	77.7
Yorkshire	197	73.5
Trent	220	73.8
East Anglia	119	75.8
North West Thames	144	82.3
North East Thames	169	64.0
South East Thames	182	71.6
South West Thames	146	78.9
Wessex	124	75.1
Oxford	84	76.4
South Western	147	70.1
West Midlands	264	73.1
Mersey	111	76.0
North Western	259	68.7
Special Health Authorities		
Hammersmith and Queen Charlotte's SHA	3	75.0
Royal Brompton National Heart and Lung Hospitals	1	50.0
The Hospitals for Sick Children	2	100.0
The National Hospital for Neurology and Neurosurgery	1	100.0
The Royal Marsden Hospital	2	50.0
Wales	155	72.4
Northern Ireland	45	88.2
Other authorities		
Guernsey	13	100.0
Jersey	4	100.0
Isle of Man	1	50.0
Defence Medical Services	11	100.0
Independent sector	18	72.0
	----	-----
	2565	73.6

128 surgical questionnaires were received after the closure date.

Table M7
Completed anaesthetic questionnaires (deaths) returned to NCEPOD

Authority	Number returned	% return rate
England		
Northern	124	72.1
Yorkshire	177	70.8
Trent	196	68.5
East Anglia	103	70.5
North West Thames	122	71.8
North East Thames	117	46.6
South East Thames	149	60.6
South West Thames	129	71.7
Wessex	110	67.9
Oxford	76	70.4
South Western	131	65.8
West Midlands	226	65.3
Mersey	96	69.6
North Western	220	62.0
Special Health Authorities		
Hammersmith and Queen Charlotte's SHA	-	-
Royal Brompton National Heart and Lung Hospitals	2	100.0
The Hospitals for Sick Children	2	100.0
The National Hospital for Neurology and Neurosurgery	1	100.0
The Royal Marsden Hospital	1	33.3
Wales	134	64.1
Northern Ireland	30	65.2
Other authorities		
Guernsey	11	84.6
Jersey	4	100.0
Isle of Man	-	-
Defence Medical Services	9	81.8
Independent sector	22	88.0
	----	-----
	2192	65.8

There were 154 cases where completion of the anaesthetic questionnaire was not appropriate. These have been removed from the calculations.

251 anaesthetic questionnaires were received after the closure date. The overall return rate of 65.8% reflects the method used for distribution of anaesthetic questionnaires.

Table M8

Completed questionnaires received and analysed (deaths)

Both anaesthetic and surgical*	2170	(62.2%)
Anaesthetic only	160	(4.6%)
Surgical only	388	(11.1%)
Neither received	771	(22.1%)

* includes those cases where an anaesthetic questionnaire was inappropriate.

In 29 of the cases for which neither questionnaire was received, the Consultant Surgeon or Gynaecologist was no longer working at the hospital when the questionnaires were sent.

Lost case notes

The medical case notes had been *lost* in 90 (out of 3485) cases for which questionnaires were not returned;

Neither questionnaire received	55
Anaesthetic questionnaire not received	28
Surgical questionnaire not received	7

This is a problem not only for the Enquiry but for the Consultant Surgeons and Anaesthetists who organised extensive searches before informing us that the notes were irretrievable. The situation is worse than that reported by CEPOD[1] (1985/86) when 55 case notes (out of 3522) were lost.

The surgical questionnaires provide information on the difficulties in obtaining notes. Tables S63 to S65 (pages 158 to 159) and S122 to S124 (page 181) show that in 9.6% of the deaths and 7.2% of the index cases, the surgeons encountered difficulties in obtaining the patient's notes. Parts of the notes were *unavailable* in 14.5% of the deaths and 3.6% of the index cases. The death certificate book was *not* available for 8.5% of the deaths.

A particular cause for concern is the loss of notes sent for microfilming. Other notes of deceased patients were sent for *shredding*, for example;

> *"We have just rescued the case notes from the shredder, but it* (sic) *had already been dismantled prior to shredding and is in some disorder".*

The letter from which the above is extracted was written six months after the patient died. Guidance from the Department of Health[8] on the Public Records Acts and the Limitation Act clearly states that personal health records should be retained for at least *eight* years after the conclusion of treatment. Anaesthetic records and operation notes are not likely to be regarded as "elements of a transitory nature" which may be discarded[8].

Questionnaires

The sample of deaths for more detailed review was selected (1 in 5, 20%) as soon as the deaths were reported and entered to the database. The number of questionnaires sent to individual surgeons was not restricted. 748 Consultants received only one questionnaire; 141 received five or more. Table M9 shows the number of individual Consultant Surgeons or Gynaecologists to whom at least one questionnaire was sent; Table M10 shows the number of these Consultants who returned completed questionnaires to the Enquiry.

Table M9 (deaths)
Number of individual surgeons and gynaecologists to whom questionnaires (deaths) were sent.

Authority	Number of individual surgeons to whom questionnaires (deaths) sent	Total number of sampled deaths
England		
Northern	92	184
Yorkshire	118	268
Trent	118	298
East Anglia	75	157
North West Thames	73	175
North East Thames	123	264
South East Thames	108	254
South West Thames	83	185
Wessex	67	165
Oxford	55	110
South Western	101	208
West Midlands	157	361
Mersey	71	146
North Western	165	377
Special Health Authorities		
Hammersmith and Queen Charlotte's SHA	3	4
Royal Brompton National Heart and Lung Hospitals	2	2
The Hospitals for Sick Children	2	2
The National Hospital for Neurology and Neurosurgery	1	1
The Royal Marsden Hospital	4	4
Wales	92	214
Northern Ireland	36	51
Other authorities		
Guernsey	4	13
Jersey	3	4
Isle of Man	2	2
Defence Medical Services	10	11
Independent sector	19	25

Table M10 (deaths)
Completed surgical questionnaires returned/return rate by individual surgeons

Authority	A	B	C
England			
Northern	61	12	19
Yorkshire	71	26	21
Trent	78	16	24
East Anglia	50	14	11
North West Thames	36	18	19
North East Thames	66	28	29
South East Thames	61	28	19
South West Thames	48	22	13
Wessex	37	18	12
Oxford	37	10	8
South Western	51	26	24
West Midlands	90	30	37
Mersey	44	15	12
North Western	85	46	34
Special Health Authorities			
Hammersmith and Queen Charlotte's SHA	2	-	1
Royal Brompton National Heart and Lung Hospitals	1	-	1
The Hospitals for Sick Children	2	-	-
The National Hospital for Neurology and Neurosurgery	1	-	-
The Royal Marsden Hospital	2	-	2
Wales	58	14	20
Northern Ireland	29	2	5
Other authorities			
Guernsey	4	-	-
Jersey	3	-	-
Isle of Man	1	-	1
Defence Medical Services	8	1	1
Independent sector	16	-	3

A = Number of individual surgeons who returned *all* questionnaires
B = Number of individual surgeons who returned *at least one* questionnaire
C = Number of individual surgeons who returned *none*

In 1988, all Consultant Surgeons, Gynaecologists and Anaesthetists were invited to participate in the Enquiry; fewer than 10 declined. The table above, however, suggests that the percentage participation amongst those to whom death questionnaires were sent (excluding the independent sector) is at the most 80% (columns A plus B), and that there are 313 non-participants (20%). Participation in the independent sector is 84.2%. It is likely that those surgeons in column C did not even forward the anaesthetic questionnaire to the anaesthetist. A list of participants is not included in the report; further information can be obtained from the Administrator.

QUESTIONNAIRES (INDEX CASES)

Index case requests were sent to 4386 Consultant Surgeons and Gynaecologists in NHS and Defence Medical Services hospitals; these Consultants were asked to forward the anaesthetic questionnaire to the most appropriate Consultant Anaesthetist. Questionnaires for the independent sector hospitals were distributed via the hospital managers. The criteria for case selection are described on page 24.

Completed questionnaires returned to the Enquiry by 31 May 1991 were analysed. The data are shown in the sections on anaesthesia and surgery. Tables M11 and M12 show, by Authority, the number of completed questionnaires returned and the percentage return rates. The totals received differ from those analysed as 67 surgical questionnaires and three anaesthetic questionnaires referred to obstetric procedures and were excluded. Incomplete questionnaires (19 surgical, 8 anaesthetic) were not analysed.

Table M11
Completed surgical questionnaires returned (index cases)

Authority	Number returned	% return rate
England		
Northern	189	65.8
Yorkshire	200	67.8
Trent	215	62.7
East Anglia	108	66.2
North West Thames	132	52.8
North East Thames	180	54.2
South East Thames	191	60.4
South West Thames	125	57.9
Wessex	144	66.3
Oxford	119	63.6
South Western	160	64.5
West Midlands	275	62.1
Mersey	119	65.0
North Western	215	60.9
Special Health Authorities	31	56.4
Wales	157	65.4
Northern Ireland	87	65.9
Defence Medical Services	40	76.9
	----	----
	2687	62.3

Forty-nine surgical index questionnaires were received after the closure date.

Table M12
Completed anaesthetic questionnaires returned (index cases)

Authority	Number returned	% return rate
England		
Northern	151	57.0
Yorkshire	157	55.3
Trent	180	55.0
East Anglia	83	55.0
North West Thames	113	46.7
North East Thames	142	43.8
South East Thames	158	51.3
South West Thames	104	50.0
Wessex	125	59.0
Oxford	93	51.4
South Western	143	59.6
West Midlands	213	50.6
Mersey	91	55.5
North Western	171	49.8
Special Health Authorities	25	48.1
Wales	128	55.6
Northern Ireland	75	59.5
Defence Medical Services	31	60.8
	----	----
	2183	52.9

There were 186 cases where completion of the anaesthetic questionnaire was not appropriate and these have not been included in the calculations,

Fifty-eight anaesthetic questionnaires were received after the closure date.

It is not possible to give a percentage return rate for the *independent sector* because we do not know how many were distributed by the hospital managers. Sixty-nine completed anaesthetic questionnaires and 79 surgical questionnaires were returned by independent sector Consultants. Questionnaires were not sent to Guernsey, the Isle of Man or Jersey due to an administrative error.

Table M13
Questionnaires received and analysed (index cases)

Both anaesthetic and surgical*	2353	53.7%
Anaesthetic only	74	1.7%
Surgical only	327	7.5%
Neither received	1625	37.1%

* includes those cases where an anaesthetic questionnaire was inappropriate.

ANAESTHESIA

The preparation of this report is not easy. It is important at least to attempt to avoid personal bias. It may be impossible to be entirely objective but the various Consultant Anaesthetists (listed on page 25) gave unstinting support and it is a great pleasure to record this acknowledgement.

Several anaesthetists have seen the (anonymous) questionnaires and helped the author to a considerable extent. The Consultant Anaesthetists wrote comments (at 12 meetings) on 688 of both the anaesthetic and surgical questionnaires and these reviews form the basis of most of the brief accounts below. They have also read, contributed to, and approved the draft report.

The amount of information about the clinical practice of anaesthesia is daunting. NCEPOD holds much more detailed clinical data about anaesthesia than about surgery and this makes the analysis complex.

Many of the patients who died were at very grave risk from anaesthesia and surgery; either conservative management or operation were likely to lead to early death. This comment should be recalled in the interpretation of the tables and case reports but it should also be remembered that the purpose of NCEPOD is to survey the entire practice of anaesthesia and surgery as revealed by both the deaths and the index cases; thus the question, "could the management of this patient, regardless of outcome, have been improved?" is relevant.

Objective

The aim of both the Enquiry and this report remains that the practice of anaesthesia should improve. This is the purpose of the report. Readers will note that again in this section there is no sub-classification of avoidability or culpability. The subjective nature of opinions required for such a classification, particularly in the absence of agreed standards of care, has rendered these distinctions outmoded. It was hoped that comparisons between pooled data for both the deaths and the index cases would allow the facts to be further interpreted but, as is apparent later, the different characteristics of the two groups have hindered this approach.

The abbreviated case reports presented in synoptic form and the notes on the Tables are all intended to assist this process. The former do not represent all the examples within each category: there are usually others. The synopses are based upon what is in the questionnaires: there is no other information and if the information sent to NCEPOD is inaccurate or inadequate all that can be done is to report it as it is.

Completion of questionnaires

The *return rate* of questionnaires was not satisfactory (see page 37). The value of a random sample of all deaths in hospital within 30 days of operation is reduced as a technique if that sample is incomplete. It is likely that there are many different reasons for anaesthetists' failure to return all the questionnaires (approximately 15% less than surgeons) and these may not all be avoidable because of the method NCEPOD uses. Surgeons may have failed to pass the questionnaire on to any, or the appropriate, anaesthetist. The trainee anaesthetist may have left the department. The patient's notes were lost, were with the surgeon or were unobtainable from the pathology department. All these reasons are recognised.

A letter was sent to the College tutor (College of Anaesthetists') when questionnaires were not received and this caused a large influx of questionnaires. NCEPOD is very grateful to these tutors for their support and active help. The need to maintain confidentiality even, or particularly, within a department has prevented our use of this tactic for all questionnaires.

There were *blanks* in response to some questions. Some of these were understandable; others were surprising and a few were even alarming. It is difficult to understand, for instance, why an individual doctor should ignore questions about primary medical qualifications (country or date). This comment refers to those questionnaires which were completed by the patients' anaesthetists, not by a third party. Many blanks were apparently necessary because the third party had no means whereby information could be ascertained accurately.

Many questionnaires were completed by *third parties* because the patient's anaesthetist had left the department or the country. Ideally all Consultants would know about their trainee staff or, at the very least, have relatively easy access to the relevant information.

The employment of many *short-term locums* causes many, but not all, of these particular problems.

The incidence of *lost notes* is alarming. Proper audit cannot be achieved unless notes are readily available to clinicians and particularly when questionnaires are to be completed by third parties.

Survivor Cases

It is noted in the first section (page 24) of this report that the tactic of scrutiny of survivor cases had to be abandoned. The reasons for this decision are explained elsewhere but it is evident that a case control chosen on the basis of mode of admission, sex and operation is itself unlikely to reveal much of interest to anaesthetists.

Comparisons

Index cases were specifically requested from Consultant Surgeons as the first patient managed by the team on or after a particular time and date. This selection process proved unsatisfactory since many index cases were relatively minor surgical ones and also were frequently children. Thus direct comparison between the management of anaesthesia for deaths and for index cases is impossible since the two populations were so different (see Table A27).

The potential for this type of comparison however still exists and NCEPOD intends to improve and refine the selection process for index cases so as to achieve this in the current (1991-2) enquiry. Meanwhile a comparison between two *deaths* is informative.

Deaths within 30 days of a surgical operation are more common in patients aged over 60 years than in the young age groups (see Table A15). One of the more common modes of death in this group is from *ruptured aortic aneurysm.* The quality of management of this condition varies very widely.

> *One patient (67 years) died six days after successful repair of ruptured abdominal aneurysm by a Consultant Surgeon in a District General Hospital. The anaesthetic was managed by a Consultant-led team including a Registrar and Senior House Officer. Monitoring was comprehensive and the patient was managed after operation in an intensive care unit with controlled ventilation of his lungs and a continuous narcotic infusion. Renal failure developed and death followed.*

The anaesthetic for another 62-year-old man with a ruptured aortic aneurysm was managed in a District General Hospital by a Senior Registrar and a Senior House Officer. The diagnosis, made by the Senior Surgical Registrar, was of acute appendicitis (and the operation took place 36 hours after referral to the surgeons). Later the Consultant Surgeon came in to help on the Saturday afternoon. Neither an operation record nor an anaesthetic record were sent to NCEPOD and there were serious discrepancies between the answers in the two questionnaires: iliac aneurysm ligation according to the surgeon but aortobifemoral graft according to the anaesthetist! The surgeon states that 'collapse' occurred on induction of anaesthesia but no such statement occurs on the anaesthetic questionnaire which was completed by the anaesthetist concerned. The specialists agree that the patient remained anuric and died two days later.

The contrast in the reported quality of care between these two cases is obvious and requires no further comment.

Format of report

The tables follow the sequence of questions in the questionnaire; (see Appendix C) each table is entitled by the question and comments are added. Some tables report information not apparently relevant to deaths: these are included since nowhere else are the facts available about the use, for example, of a variety of therapeutic drugs before operation, premedicant drugs or intravenous fluids culled from such a wide geographical area of medical practice. They are presented as a matter of record. It is important in this context to recall that NCEPOD uses the occurrence of death as a method whereby a sample of clinical practice is obtained for detailed study. Illustrative *synopses*, which necessarily contain some items not immediately relevant to the preceding table, are then used to highlight some aspect of the table. It is hoped that this arrangement will encourage readers to peruse the entire section on anaesthesia.

Table A1 (q1)

In what type of hospital did the anaesthetic take place?

	Deaths (*n*=2191)	Index* (*n*=2241)
District General	1679	1425
University/Teaching	419	551
Single surgical specialty	44	106
Community	1	13
Defence Medical Services	7	29
Independent	32	82
Other	9	27
Not answered	-	8

* These were cases specifically requested from Consultant Surgeons as the first one managed by the team after a particular time and date (see page 24).

The use by anaesthetists of the term 'Other' hides an inexactitude: hospitals are still not accurately defined by anyone, let alone the Department of Health; the precise definitions do not exist!

ANAESTHETISTS

Table A2 (q 2)
If you were not involved in any way with this anaesthetic and have filled out this questionnaire on behalf of someone else, please indicate your position

	Deaths (*n*=439)	Index (*n*=267)
Chairman of Division	59	51
College Tutor	57	34
Duty Consultant	175	73
Other Consultant	90	68
Other	58	41

This table includes a serious message for NCEPOD: the fact that 20% of questionnaires were completed by someone other than the involved anaesthetist illustrates a difficulty for departments whose trainee staff move on. NCEPOD is grateful to those who did this extra task but we do not yet have an alternative scheme to suggest. One possible change to our current protocol would be that the Duty Consultant should always be responsible for the supervision of completion of questionnaires. Another tactic would be to send all questionnaires for completion by trainees to the College Tutor. He (she) would at least be able to speed up the process of completion if a trainee had left the department.

The local report form contains all the information which NCEPOD has about the deaths. It does not always, for understandable reasons, include the name of the anaesthetist; hence the need to ask the surgical team to deliver the questionnaires to anaesthetists.

The problem seems to be greater amongst the deaths than the index cases. The explanation for this is probably that the interval of time between the operation and receipt of the index questionnaire and (or) patient's notes is shorter. This delay is exacerbated by the widespread habit whereby notes of deceased patients are regarded as unimportant and are not retained in a systematic manner by some Departments of Medical Records. The efficiency of NCEPOD is not improved thereby.

Table A3 (q3)

Grade(s) of anaesthetist(s) present (locums)

	Deaths (*n*=2191)		Index (*n*=2241)	
Senior House Officer	926	(47)	567	(15)
Registrar	602	(71)	395	(32)
Senior Registrar	305	(24)	201	(19)
Consultant	1130	(58)	1548	(76)
Staff Grade	18	(1)	17	(0)
Associate Specialist	58	(6)	95	(2)
Clinical Assistant	94	(6)	93	(8)
General Practitioner	2	(-)	3	(-)
Hospital Practitioner	3	(-)	11	(-)
Other	3	(-)	7	(-)
Not answered	6	(-)	9	(-)

NB - this can be a multiple entry

The attendance of a Consultant Anaesthetist at some stage during an operation was recorded in 51.6% deaths and 69.1% of index cases. This difference is important. It is also paradoxical because (see Table A27) there are fewer very sick patients amongst the index cases; nevertheless Consultants were involved in more than two thirds of their anaesthetics.

Table A4 (q4)

Grades of anaesthetists working alone (locums)

	Deaths (*n*=1301)		Index (*n*=1555)	
Senior House Officer	331	(23)	155	(5)
Registrar	236	(43)	177	(20)
Senior Registrar	98	(11)	82	(12)
Consultant	521	(31)	952	(53)
Staff Grade	12	(1)	16	(0)
Associate Specialist	34	(3)	87	(2)
Clinical Assistant	66	(3)	77	(7)
General Practitioner	-	(-)	1	(-)
Hospital Practitioner	2	(-)	9	(-)
Other*	1	(-)	-	(-)

* Senior Clinical Medical Officer

This table shows the numbers by grade of *solo* anaesthetists. Forty-three per cent of the patients who died were anaesthetized by Senior House Officers or Registrars who worked without supervision by themselves whereas 21% of index cases were anaesthetized by solo trainee anaesthetists. These solo anaesthetists were locums for 11.6% of the patients who died and 7.5% of the index cases. Each time a Consultant works alone it may be regarded as an opportunity for training which is wasted, assuming that there are doctors to be trained.

Table A5 (qs 3 and 18)
Anaesthetist working alone/classification of operation

	Deaths (*n*=1301)			
	Emergency* (*n*=163)	Urgent* (*n*=578)	Scheduled* (*n*=430)	Elective* (*n*=128)
Senior House Officer *n*=331	46	207	63	15
Registrar *n*=236	31	133	62	10
Senior Registrar *n*=98	29	34	28	6
Consultant *n*=521	46	158	237	79
Staff Grade *n*=12	-	5	3	4
Associate Specialist *n*=34	3	14	12	5
Clinical Assistant *n*=66	8	26	24	8
Hospital Practitioner *n*=2	-	1	1	-
Other *n*=1	-	-	-	1

NB Question 3 not answered on 4 questionnaires
Question 18 not answered on 7 questionnaires

* These terms are defined in the glossary (Appendix A).

Country of primary medical qualification

Most of the "most senior anaesthetists present in the operating room" had received their primary medical education in the United Kingdom (1486 amongst the deaths and 1577 amongst the index cases). Universities in 44 other countries were recorded as the source of the anaesthetist's primary medical education. This implies wide variation in background and makes equivalence of training in anaesthetics difficult to assure. The possibility of language difficulties should not be ignored.

Table A6 (q 5a)

Which higher diploma in anaesthesia is held by the most senior anaesthetist in the operating room at the start of the procedure?

	Deaths (*n*=2191)				
	None	FCAnaes	DA	Other	Not answered
Senior House Officers *n*=336	60	9	132	33	9
Registrar *n*=353	34	99	175	80	16
Senior Registrar *n*=221	3	206	12	1	8
Consultant *n*=1130	6	1093	158	42	5
Staff Grade *n*=14	6	3	5	3	-
Ass. Spec. *n*=51	6	16	29	4	2
C. Assistant *n*=76	20	20	35	9	2
H. Practitioner *n*=2	-	-	2	-	-
Other* *n*=2	-	-	2	-	-

NB - this can be a multiple entry; grades of those present were not answered on 6 questionnaires.

* Clinical Medical Officers

Deaths

This table has a great deal of information.

Fifteen per cent of patients who died were anaesthetized by Senior House Officers, half of whom had *no* higher qualification, and they were the most senior anaesthetist present in the operating room.

A similar proportion of patients were anaesthetized by Registrars but most of them had an *appropriate* qualification although 9.6% did not.

NCEPOD can only report the answers to questions. Three deaths occurred after anaesthesia given by Senior Registrars who claimed to have *no* qualifications. They did not hold locum appointments. This might be one individual anaesthetist; nevertheless it is impossible to hold a substantive Senior Registrar post preparatory to accreditation, without the FCAnaes. Perhaps the entries on the questionnaires were errors.

Six deaths followed anaesthesia by Consultant Anaesthetists who claimed to have *no* qualification in anaesthesia; this is surprising but not impossible.

It was appropriate that in 61.5% deaths anaesthesia was given in the presence of a Senior Registrar and/or a Consultant.

Forty-five per cent of patients who died were ASA 4 or 5 (Table A27). ASA class did not seem to be matched to the grade of the most senior anaesthetist; perhaps it should be.

The qualifications of non-training grades need to be kept in review: in particular *Staff Grade* doctors, who are in permanent posts, would ideally have appropriate qualifications (FCAnaes) but some are appointed without diplomata.

Table A7 (q 5a)

Which higher diploma in anaesthesia is held by the most senior anaesthetist in the operating room at the start of the procedure?

	Index Cases (*n*=2241)				
	None	FCAnaes	DA	Other	Not answered
Senior House Officer *n*=155	70	7	66	18	7
Registrar *n*=207	14	66	106	44	8
Senior Registrar *n*=121	1	116	9	6	-
Consultant *n*=1548	3	1498	271	58	13
Staff Grade *n*=17	4	5	8	1	1
Ass. Specialist *n*=93	15	13	57	12	4
C. Assistant *n*=81	15	21	37	15	3
Gen. Practitioner *n*=1	-	-	1	-	-
Hosp. Practitioner *n*=9	1	1	6	-	1

NB - grades of those present were not answered on 9 questionnaires.

Index Cases

Seventy per cent of these cases were conducted by a Consultant Anaesthetist. (Three Consultant Anaesthetists claimed to have no higher qualifications).

Table A8 (q 6)

Has the most senior anaesthetist been in continuous anaesthetic practice since the first training job?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	1794 (82%)	1832 (82%)
No	336	374
Not answered	61	35

No difference was anticipated. Furthermore most of the absences were related to periods of training in other disciplines (or for family reasons); no long absences were noted in any of the case reports. This is essential information if experience in anaesthesia is to be assessed.

Table A9 (q 7)
If the most senior anaesthetist was *not* a Consultant, was a Consultant anaesthetist informed about this case BEFORE the anaesthetic?

	Deaths (*n*=1061)		Index (*n*=693)	
Yes	301	(28.4%)	87	(12.5%)
No	712		580	
Not answered	48		26	

Table A10 (q 8)
If the most senior anaesthetist was *not* a Consultant, was a Consultant anaesthetist informed DURING the anaesthetic?

	Deaths (*n*=1061)		Index (*n*=693)	
Yes	81	(7.6%)	20	(2.9%)
No	918		647	
Not answered	62		26	

Table A11 (q 9)
If the most senior anaesthetist was *not* a Consultant, was a Consultant anaesthetist informed AFTER the anaesthetic?

	Deaths (*n*=1061)		Index (*n*=693)	
Yes	260	(24.5%)	25	(3.6%)
No	734		639	
Not answered	67		29	

A detailed analysis (i.e. not directly possible from the above data) of the individual answers to questions 7, 8 and 9 shows that consultation happened at one stage or another when the most senior anaesthetist was not a Consultant in about 40% deaths and in only about 14% index cases. It is often assumed that once a Consultant knows about a patient the ultimate responsibility for management has passed from the more junior doctor: it is really then the Consultant's responsibility to ascertain subsequent events. The rarity of consultation in connexion with index cases is partly a reflection of the relatively uncomplicated nature of index cases.

Mature trainees anticipate problems and consult early: departments may need to emphasize this key factor in the promotion of safety in anaesthesia.

Table A12 (q 10)

Did the anaesthetist (of whatever grade) seek advice from another anaesthetist at any time?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	467	70
No	1494	1940
Not answered	230	231

Source of advice

	Deaths (*n*=467)	Index (*n*=70)
Senior House Officer	13	-
Registrar	102	10
Senior Registrar	85	12
Consultant	300	48
Staff Grade	1	1
Associate Specialist	9	1
Clinical Assistant	4	1
General Practitioner	1	-
Hospital Practitioner	-	-
Other*	1	-
Not answered	2	-

NB - this can be a multiple entry.

* Other = ICU Consultant

Most consultation was hierarchical; that is to say, a junior consulted a more senior anaesthetist. This was not always the case since in a few complex procedures more than one Consultant was involved and in other cases trainees helped one another.

If advice was sought it was from Consultants in 64% deaths.

The reluctance of non-Consultant, *non*-training grade doctors to admit their need for advice or support is illustrated in some synopses and in Table A13.

Table A13 (qs 3 and 10)

Grade of most senior anaesthetist where advice *not* sought from another anaesthetist.

	Deaths (*n*=1494)	Index (*n*=1940)
Senior House Officer	166	130
Registrar	205	189
Senior Registrar	148	108
Consultant	860	1309
Staff Grade	13	17
Associate Specialist	34	91
Clinical Assistant	61	78
General Practitioner	-	1
Hospital Practitioner	2	9
Other	1	2
Not answered	4	6

It is evident that the degree to which consultation happens varies not only with the type of case but also by grade and perhaps by years of experience. The consistent absence of consultation by non-Consultant, non-training grade, anaesthetists is noteworthy.

Table A14 (q 11)

Did any colleague(s) come to help at any time?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	437	129
No	1610	1957
Not answered	144	155

Grade(s) of anaesthetist(s) who came to help

	Deaths (*n*=437)	Index (*n*=129)
Senior House Officer	153	55
Registrar	130	25
Senior Registrar	59	21
Consultant	134	31
Staff Grade	2	1
Associate Specialist	10	2
Clinical Assistant	12	5
General Practitioner	1	-
Other*	2	-
Not answered	2	1

NB - this can be a multiple entry.

* Other = Registrar in Cardiology
Cardiac arrest team

Attendance at operation in order to assist implies, at least for Consultants, acceptance of responsibility and this occurred in 31% of deaths and 24% index cases with which assistance was requested.

Non-Consultant, non-trainee anaesthetists should not be *expected* to come to the assistance of trainees (Table A14). Their technical and professional experience is not denied and it is important that they should be involved in all departmental activities; nevertheless involvement as supervisors is not one of their functions. It is important that they should participate, in particular, in proper educational activities.

EXPERIENCE OF ANAESTHETISTS

Senior House Officers and Registrar trainees

Trainee anaesthetists have to learn. The moment at which they have to start to learn by working by themselves is a matter for individual decision. We have to refer to these doctors by their grades in the NHS and we appreciate that sometimes these grades do not represent the true experience and skill of individuals. The examples below should be understood in context.

> *A 97-year-old man was anaesthetized to enable treatment of a fractured hip in a District General Hospital by a Senior House Officer with two years' experience (Part 1 FCAnaes) who did not consult anyone else. The operation took place at 1130 hours at a weekend. Induction of anaesthesia was difficult and the (40-minute) attempt at spinal anaesthesia failed. General anaesthesia (etomidate, nitrous oxide, and oxygen) administered through a laryngeal mask was substituted. He was discharged by a nurse after 15 minutes in the recovery room. Death occurred 21 days later as a result of 'bronchopneumonia'.*

> *An 88-year-old man had a hemicolectomy in a District General Hospital for perforated diverticulitis. He also had cardiorespiratory disease. A Consultant Surgeon saw the patient but left the surgical Registrar to perform the operation in the small hours (0010-0315). The Senior House Officer anaesthetist had no contact at all with anyone else and, although the anaesthetic and operation were carried out to an apparently acceptable standard (apart from duration), the patient died in cardiac failure within 24 hours despite treatment for hypotension which appeared to include no less than 6 litres of crystalloid fluid in a few hours.*

> *A 72-year-old woman was to have an abdominoperineal excision of rectum. A Senior House Officer, with a single year's experience was to anaesthetize her in a District General Hospital. No Consultant was available and a Senior Registrar was consulted. (The surgeon's questionnaire stated that a Consultant Anaesthetist was in the hospital solely in the mornings). The patient was described as symptomless and ASA 2 despite long-standing therapy with digitalis, diuretics and antihypertensive drugs! She was also known to have aortic stenosis. Anaesthesia was with thiopentone (175 mg), nitrous oxide, isoflurane, fentanyl (0.375 mg) and muscle relaxants. Two intravenous infusions were used and the record is comprehensive; there was no central venous monitoring. The operation resulted in significant blood loss (3 litres) and the next day she died on the ward to which she was sent from theatre. Autopsy confirmed the clinical diagnosis of significant aortic stenosis. There is a high dependency unit but there is not an intensive care unit in the hospital.*

Was the significance of aortic stenosis appreciated and were the facilities available for her care adequate?

> *An 86-year-old man had a laparotomy for small bowel intestinal obstruction in a District General Hospital. He was described as 'shocked' and 'shutdown' on the anaesthetic record. A stomach tube was used before anaesthesia but aspiration of faeculent material occurred at intubation despite the application of cricoid pressure. A Consultant Anaesthetist was told about the patient beforehand but left a Registrar (with the DA) and a Senior House Officer to manage the patient who remained hypotensive (60/40 mmHg) throughout the procedure (which took one hour at 2300 hours). The most senior surgeon involved before and during the operation was a locum Registrar. Fast atrial fibrillation was treated just before induction with digoxin, and inotropes (dopamine and dobutamine) were also given intravenously. He died ten days later on a general ward.*

Is this a suitable problem for anaesthetists (let alone surgeons) of limited experience?

The tables above show the number of occasions on which Senior House Officers worked more or less unsupervised. There were so many of these occasions (a very few examples of which are given) that the Consultant Anaesthetist advisors became disenchanted with the picture that they gained of the practice of anaesthesia in some hospitals. Inexperienced trainees should not work unsupervised on major cases: when so many do it is obvious that those control systems which exist are ineffective and the organisation within some departments needs to be reviewed and revised. There would need to be more Consultant Anaesthetists.

There may be a conflict of interest in this option: if Consultants are to take a dominant role in the provision of care of the sickest, emergency and urgent patients (ASA 4 and 5) then others will have to look after the fitter patients. The latter by custom are allocated to regular operating lists and are anaesthetized by Consultants. An anaesthetic mishap to fit patients is often perceived as a greater disaster than the one which our recommendation is designed to lessen. This matter is not resolved and is beyond the remit of NCEPOD.

Senior House Officers from outside the United Kingdom.

We cannot avoid drawing attention to the number of Senior House Officers whose primary qualification in medicine is from outside the United Kingdom; they have no UK qualifications in anaesthesia and many spend limited time here but they feature frequently as the sole anaesthetist, that is, they work unsupervised. Furthermore there may possibly be language difficulties. If these doctors are to be employed they must be supervised at least as scrupulously as other Senior House Officers and, some evidence from the questionnaires suggests, even more so.

> *One such anaesthetist had no skilled help with anaesthesia for a 79-year-old ASA 2 patient who required an operation which lasted nearly four hours late at night in a District General Hospital. The anaesthetic record, which is otherwise exemplary, does not include information about reversal of muscle relaxants. Suxamethonium 75mg and atracurium 75mg in divided doses with isoflurane and a single dose of fentanyl 0.05mg were used. Respiratory and cardiac arrest occurred in theatre immediately after the operation and from which full recovery occurred, but the patient died five days later. The Senior House Officer surgeon claimed two years' experience and had to perform two enteroenterostomies for intestinal obstruction from lymphosarcoma but without senior help. The Consultant Anaesthetist was told of the event.*

> *Another similar trainee in a District General Hospital did not consult anyone and anaesthetized a 91-year-old for insertion of an Austin Moore prosthesis by a Consultant Surgeon. A Consultant Anaesthetist arrived by chance and found the Senior House Officer in a panic about hypotension which had received treatment with massive fluid administration (4 litres) despite a high inspired concentration of isoflurane (2%). The hypotension responded to reduction of the concentration of isoflurane and to a diuresis provoked by frusemide. The patient died three days later after a proven myocardial infarction. No narcotic analgesics (or other sedatives) were given after operation.*

Staff - non-training grades

Misconceptions exist about relationships between these grades (Staff Grade, Clinical Assistant, General Practitioner, Hospital Practitioner, Associate Specialist) and Consultants. Ideally the latter should be available to assist all these doctors when the need arises; all too often it seems that they are left alone.

The fact that fixed doses of drugs have dangers is well appreciated by modern anaesthetists. However, some of these grades of doctor, who were trained many years ago, seem to continue to practise in the manner in which they were trained. One Clinical Assistant in a District General Hospital claimed to be independent of other staff (i.e. Consultant).

> *Another Clinical Assistant gave 5mg/kg thiopentone to a chronically malnourished (27.6 kg) woman for an emergency operation in a District General Hospital for perforated peptic ulcer. She also had emphysema, ischaemic heart disease, chronic anaemia, dysphagia and was suspected to have carcinomatosis. Hypotension occurred at induction from which she was rescued but she died from peritonitis five days later.*

Is it possible that appropriate supervision of this anaesthetist, who had considerable experience (14 years), would have altered events?

> *Another Clinical Assistant managed an anaesthetic in a District General Hospital for a 67-year-old to have an amputation of a leg with a 19-gauge (sic) cannula as the sole venous access and used an ECG and non-invasive BP as monitoring devices.*

THE PATIENT AND OPERATION

Table A15 (q 12)
Age of patient

	Deaths (*n*=2191)		Index (*n*=2241)
10 or less*	-	5.5%	369
11 - 19	15		151
20 - 29	18		237
30 - 39	27		263
40 - 49	60		271
50 - 59	159	(7.2%)	247
60 - 69	493	(22.5%)	323
70 - 79	728	(33.2%)	271
80 - 89	561	(25.6%)	99
90 - 99	126	(5.7%)	10
100 or more	4		-

* this age group was excluded from the sample of deaths but was represented in the index cases

Deaths

94.5% over 50 years; 31.5% over 80 years. This table merely confirms previous data about mortality after operations: death is more common in the older age groups.

Index cases

This follows the known distribution by age of operation in the population. It is unfortunate that the method of selection of index cases produced a high proportion of children since they often appear first on operation lists.

Table A16 (qs 14 and 74)
Days from operation to death or discharge

	Deaths (*n*=2191)	Index cases (*n*=2241)
Same day	250	415
Next day	275	580
2 days	184	224
3 days	137	123
4 days	109	89
5 days	112	75
6 to 10 days	423	345
11 to 15 days	279	149
more than 15 days	422	146
discharge date not answered	-	95

This table confirms previous reports that half the deaths in hospital within 30 days of an operation happen within six days.

Table A17 (q 18)

Classification of operation (%)

	Deaths (*n*=2191)		Index (*n*=2241)	
Emergency	391	(17.8)	26	(1.2)
Urgent	914	(41.7)	140	(6.2)
Scheduled	674	(30.8)	464	(20.7)
Elective	205	(9.4)	604	(71.6)
Not answered	7	(0.3)	7	(0.3)

The distributions of cases between deaths and index cases are as might be predicted, except that there seem to be too many classified by anaesthetists as 'emergency'.

CONDITION BEFORE OPERATION

Table A18 (q 19)

Was a record of the patient's weight available?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	874	1710
No	1305	524
Not answered	12	7

Twenty-three per cent of index patients (admitted mostly for scheduled or elective surgery) are either not weighed or their weight is not available. This surprising deficiency could readily be rectified. It is less surprising that a mere 40% of those patients who died subsequently were weighed because, on the average, they were sicker than the index cases and it is difficult to establish a routine whereby patients who are admitted as emergencies to hospital are weighed. Nevertheless weight remains an important measurement in planning of management of anaesthesia for patients of all ages.

Table A19 (q 20)
Was a record of the patient's height available?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	216	222
No	1953	2000
Not answered	22	19

The similarity (10% in each) between the two groups is indicative that height is not measured routinely in hospitals. There may be theoretical indications (surface area calculations for fluid balance and drug dosage calculations) for this measurement but it is obvious that anaesthetists are unconvinced about the need for this.

Table A20 (q 21)
Was an anaesthetist consulted by the surgeon (as distinct from informed) before the operation?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	1116	376
No	1025	1840
Not answered	50	25

This is an interesting and explicable difference. The implication is that for the patients who died more consultation (51%) took place between the disciplines than amongst the index cases (16.8%).

A further increase in cross-consultation between specialties seems a desirable objective.

Table A21 (q 22)

Did an anaesthetist visit the patient before operation?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	2026	2049
No	136 (6.2%)	181 (8.1%)
Not answered	29	11

Was this anaesthetist present at the start of the operation?

	Deaths	Index
Yes	1901	1865
No	120	179
Not answered	5	5

It appears that about 7% of cases are not seen by an anaesthetist before operation.

Most patients (94% deaths and 91% index cases) were seen by the anaesthetist who was also present at induction. This implies that such practice is regarded as the standard by a considerable proportion of anaesthetists. However, it must be remembered that this same anaesthetist need not have been the most senior (and therefore responsible) anaesthetist. Trainees may have visited the patient and been present at induction. The ideal is that the most senior anaesthetist should visit the patient beforehand *and* be present at induction.

Table A22 (q 23)

Were any investigations done before the operation?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	2157	1669
No	32	563
Not answered	2	9

Table A23 (q 23a)

Investigations before operation (%)

	Deaths (*n*=2191)		Index (*n*=2241)	
Haemoglobin	2118	(96.7)	1539	(68.7)
Packed cell volume (haematocrit)	1753	(80.0)	1257	(56.1)
White cell count	2038	(93.0)	1392	(62.1)
Sickle cell test (eg Sickledex)	37	(1.7)	60	(2.7)
Plasma electrolytes - Na	2075	(94.7)	1040	(46.4)
- K	2010	(91.7)	1014	(45.2)
- Cl	1211	(55.3)	610	(27.2)
- HCO_3	1331	(60.7)	632	(28.2)
Blood urea	2010	(91.7)	974	(43.5)
Creatinine	1607	(73.3)	791	(35.3)
Serum albumin	1035	(47.2)	391	(17.4)
Bilirubin	931	(42.5)	351	(15.7)
Glucose	1139	(52.0)	455	(20.3)
Urinalysis (ward or lab)	1088	(49.6)	845	(37.7)
Blood gas analysis	396	(18.1)	65	(2.9)
Chest X-ray	1752	(80.0)	639	(28.5)
Electrocardiography	1805	(82.4)	798	(35.6)
Respiratory function tests	133	(6.1)	70	(3.1)
Echocardiography	90	(4.1)	31	(1.4)
Special cardiac investigation	99	(4.5)	44	(2.0)
Special neurological investigation	75	(3.4)	46	(2.0)
Other	370	(16.9)	207	(9.2)
Not answered	2		-	

NB - this can be a multiple entry

The management of diabetic patients for surgery still causes problems: when simple tests are used before operation the results should not be ignored. One example of this was noted.

> *A locum Senior House Officer anaesthetized a 69-year-old dehydrated woman, ASA 4, for a defunctioning colostomy in a District General Hospital. The presence of triple-plus glucose in the urine before operation was apparently ignored (no measurement of blood glucose) despite the attendance of a consultant anaesthetist to help with the anaesthetic. Renal failure supervened and she died eight days later.*

Was the investigation before operation adequate?

Table A24 (q 24)
Coexisting medical diagnoses

	Deaths (*n*=2191)	Index (*n*=2241)
None	233	1212
Respiratory	726	248
Cardiac	1175	360
Neurological	384	113
Endocrine	279	129
Alimentary	427	118
Renal	229	62
Musculoskeletal	268	143
Haematological	244	50
Genetic abnormality	7	20
Other	381	173
Not answered	49	77

Many respondents failed to answer questions 23 and 24 completely. Thus it was often impossible to determine the significance of laboratory tests since no results were given and similarly the specific diagnoses of intercurrent disease were omitted.

Table A25 (q 25)

What drug or other therapy was the patient receiving at the time of operation (but excluding premedication or drugs for anaesthesia)?

	Deaths (*n*=2191)	Index (*n*=2241)
None	249	1143
Analgesic - aspirin	157	58
Analgesic - other non-narcotic	546	253
Analgesic - narcotic	492	48
Anti-angina	289	101
Antiarrhythmic	319	60
Anticoagulant	229	51
Anticonvulsant	61	26
Antidepressant	127	33
Antidiabetic	155	65
Antihypertensive	356	191
Anti-infective	521	130
Anti-Parkinson's	47	9
Anxiolytic	46	19
Benzodiazepines	286	113
Bronchodilator	271	132
Cardioactive drug	193	29
Contraceptive	4	44
Corticosteroid	205	63
Cytotoxic	35	11
Diuretic	661	144
H_2 blockers	318	90
Psychotropic	49	9
Other	656	301
Not answered	31	33

Table A26 (q 26)

Was there any history of a drug (including anaesthetic) reaction?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	141	230
No	1986	1930
Not answered	64	81

Most (70%) of these reactions in the series of deaths were to penicillin or other antibiotics; 18% to aspirin and other minor analgesic; elastoplast, chlorpromazine and methyldopa also featured but none were reported to anaesthetic drugs.

A very similar picture emerges from the index cases but there was one patient about whom the anaesthetist reported a recent reaction after thiopentone and suxamethonium. There was also one case of malignant neuroleptic syndrome after haloperidol.

Table A27 (q 27)
ASA Class*

	Deaths (*n*=2191)	Index (*n*=2241)
Class 1	22	1309
Class 2	443	680
Class 3	716	183
Class 4	706	41
Class 5	280	9
Not answered	24	19

* This is defined in the glossary (Appendix A).

Eighty-nine per cent of index cases were ASA 1 or 2 and 45% deaths were ASA 4 or 5. Thus, on this crude clinical assessment, the two populations were *very* different. One reason for this is the method by which NCEPOD chose the index cases (the first case after a particular date and time): this is to be different in the future and will avoid, we believe, the selection of young patients with trivial conditions who often come first on an operating list. This selection did not preclude patients (24) who subsequently died.

Three out of nine index cases described as ASA 5 survived operation (one of these should not have been so described) but the management of all of those who died was not obviously different from all the other patients who died (death cases). The description ASA 5 includes the statement "little chance of survival" which is not really appropriate for patients with reactionary haemorrhage after tonsillectomy.

Two index cases died on the operating table.

> *One patient (55 years and ASA 4) was anaesthetized by a Senior House Officer and Registrar (FCAnaes) for a thoraco-abdominal aortic aneurysm with repeated consultation with a Consultant in a University Hospital. Monitoring was comprehensive and the anaesthetic record exemplary. The patient died from uncontrolled haemorrhage.*
>
> *The other patient (71 years, ASA 5) was anaesthetized in a District General Hospital by two Registrars, one of whom had the Part II FCAnaes. A Consultant opinion was sought beforehand (ruptured aortic aneurysm). The anaesthetic was complicated by cardiac arrest early in the 1 hour 40-minute procedure. The anaesthetic consisted of one dose of ketamine (100mg), neuromuscular paralysis and 200 micrograms fentanyl but the anaesthetic record is incomplete. The operation was abandoned.*

Some of the 22 ASA 1 patients amongst the deaths are outlined in detail elsewhere in this report, (pages 78, 83, 89 and 105) particularly when there were aspects of management to which attention needs to be drawn. The deaths of the remainder did not appear to be causally related to the management of the anaesthetic.

Decision to anaesthetize or operate

Everyone assumes that decisions are made in the best interests of patients; sometimes NCEPOD found these decisions difficult to understand, perhaps because insufficient information is available to us.

> *An 82-year-old woman had an infected olecranon bursa which was to be drained. Surgeons and anaesthetists considered her to be ASA 5. She was referred by her GP as an elective admission to a District General Hospital and she suffered also with myelodystrophic anaemia (Hb 7.1 gm/100ml), mental confusion, cardiac failure, bronchopneumonia, and renal failure. Notwithstanding all this she was anaesthetized by a Registrar whose qualifications are not known to us (blank answers, the form was completed by 'another Consultant'). The Registrar consulted no-one. Midazolam (2mg) was given as premedication and intravenous ketamine 50mg, and increments to 70mg, with 50% nitrous oxide as the anaesthetic. The procedure lasted 20 minutes (automatic blood pressure record) although the surgeon said five minutes. She died 36 hours later in the ward.*

How did this operation help the patient?

> *A senile, ASA 4, 79-year-old lady had peritonitis. A Registrar surgeon, who consulted his Senior Registrar, and a Registrar anaesthetist who did not consult anyone, managed the operation (laparotomy); Hartmann's procedure was then deemed to be necessary and was performed competently despite delay in access to the operating room of four hours because of another surgical operation. Nevertheless the required and available facilities of intensive care or high dependency unit in the University Hospital were not used because medical and nursing staff agreed with the relatives that this would be inappropriate (for unreported reasons) and the patient died within 48 hours.*

Would a more limited operation have been more humane?

> *A 75-year-old man was said by a Consultant Surgeon to require an elective exploration of his groin because of a suspected femoral hernia. He was ASA 3 with cardiomegaly, pulmonary oedema, right bundle branch block and atrial fibrillation. A Senior House Officer with one year's experience anaesthetized him in a District General Hospital during the day. He was found to have a thrombosed saphenavarix. The operation by a surgical Registrar with one year's experience took 50 minutes and he died 85 minutes later in the recovery room. The blood pressure was unstable during the operation and varied from 180/110 to 60/40mmHg. Anaesthesia was induced with etomidate (18mg atracurium) and maintained with enflurane. Calcium gluconate 10 ml and 2.5 mg diazepam (as Diazemuls) were also given for unexplained indications. Consultant and Senior Registrar anaesthetists came to assist the Senior House Officer during the operation. No autopsy was performed since the 'cause of death was known', according to the surgeons. The anaesthetists did report ischaemic changes on the ECG, pulmonary oedema and cyanosis followed by ventricular fibrillation; myocardial infarction was assumed.*

Was this operation really necessary?

> *An 85-year-old man had a successful repair of an inguinal hernia in a District General Hospital. Sixteen days later he was subjected to a further general anaesthetic for surgery for bilateral carpal tunnel compression. He weighed 73kg, had controlled diabetes mellitus but also had atrial fibrillation and was in left ventricular failure. Drug treatment for each condition was reported. There was no assessment beforehand by the Consultant Anaesthetist who described him as ASA 3.*
>
> *The anaesthetic appeared to be appropriate but the record is sketchy. He was discharged back to the ward from the recovery room by a nurse. He died two weeks later of an assumed myocardial infarct.*

Did the two general anaesthetics accelerate the occurrence of his death? What was the urgency to operate?

> *The need for two general anaesthetics may also have contributed to another patient's death in a District General Hospital. This need was absolutely avoidable had the surgeon checked that his machinery (a compressed air drill) was functional. It was not on the first occasion and on the next occasion it was still grossly inefficient and the alternative drill could not be used either. The proposed elective operation was mastoidectomy for cholesteatoma in a 70-year-old man. The anaesthetic record and both questionnaires are poorly completed and there is no proper account of the process which led to the patient's death on the same evening of the second operation (see also page 335).*

The information sent to us by the Consultant Surgeon and Senior House Officer anaesthetist about the next case is scanty: the impression we have may therefore be incorrect, nevertheless the report is interesting.

> *A 66-year-old (ASA 4) lady had a pyrexia, was sweating, had received 2000ml of crystalloid fluid intravenously, was in congestive cardiac failure and was presented for manual removal of faeces in a District General Hospital. She was seen by a Consultant-led surgical team and the procedure was done by a Senior House Officer of six years' experience. The anaesthetist was a Senior House Officer, with two years' experience and the DA; the Senior Registrar was informed about the case afterwards. The anaesthetic consisted of two doses of etomidate and the procedure took 20 minutes. She was discharged to the ward by a nurse. Massive fluid loss occurred afterwards and 10 litres of various types of intravenous fluid were administered. She died 24 hours later in cardiorenal failure on the ward: the Consultant Anaesthetist did not see the anaesthetic questionnaire.*

What was the intercurrent disease? Why was the procedure done?

PREPARATION OF PATIENT BEFORE OPERATION

Table A28 (q 28)

When was the last fluid/food given by mouth?

	Deaths (n=2191)	Index (n=2241)
More than 6 hours before	1792	1927
Between 4 - 6 hours before	115	209
Less than 4 hours before	25	37
Not known/not recorded	245	53
Not answered	14	15

Table A29 (q 29)

Indicate measures taken to reduce gastric acidity and volume.

	Deaths (n=2191)	Index (n=2241)
None	1476	1952
Antacids	44	12
H_2 antagonists	246	82
Metoclopramide	138	161
Nasogastric/Stomach tube	389	22
Other	34	33
Not answered	45	24

The inclusion of metoclopramide in this table may mislead: this drug is given by some anaesthetists not only for the stated reason but also as a routine anti-emetic and by others to aid the absorption of drugs, for example, diazepam.

Aspiration of stomach contents in a patient with intestinal obstruction is not a novel event and it was disappointing to read the questionnaire which is abstracted below. *Old lessons still need to be emphasised by teachers.*

> *A 76-year-old man, ASA 2, had an obstructed inguinal hernia in a District General Hospital. A Senior House Officer, with the Part I FCAnaes, anaesthetized him but aspiration of stomach contents occurred on induction of anaesthesia despite cricoid pressure. A Consultant Anaesthetist came to help. The management was appropriate but the patient died 12 hours later on the intensive care unit. There was no nasogastric tube used before the regurgitation and when one was passed 1500ml of fluid was obtained.*

Table A30 (q 30)

Did the patient receive intravenous fluid therapy in the 12 hours before induction?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	1224	122
No	947	2106
Not answered	20	13
Nature of fluid		
Crystalloid or dextrose	1063	104
Colloid	397	15
Whole blood	138	6
Red cell component	78	4
Other components	39	3
Inotropes	61	1
Vasopressors	8	-
Other	8	1
Not answered	11	1

Table A31 (q 31)

Was anything added to the IV solution(s)?

	Deaths (*n*=1224)	Index (*n*=122)
Yes	361	40
No	774	73
Not answered	89	9

Table A32 (q32)

Were measures taken to improve the respiratory system *before* induction of anaesthesia?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	527	166
No	1641	2058
Not answered	23	17
Treatments		
Bronchodilators	200	81
Chest physiotherapy	307	86
Airway management	58	5
Other	159	25
Not answered	5	1
Other		
Intermittent positive pressure ventilation	45	
Oxygen therapy	37	
Tracheal intubation alone	17	
Antibiotics	24	
Residual 'other'*	35	

* Residual 'other' includes physiotherapy, chest drains, bronchodilators, diuretics, inotropes, admission to the intensive care unit before operation.

Table A33 (q 33)

Were premedicant drugs prescribed?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	864	1597
No	1321	637
Not answered	6	7

Two thirds of the patients who subsequently died were given no premedicant drugs.

Table A34 (qs 27 and 33)

Premedication (percentage) by ASA Class

	ASA 1 and 2	ASA 3	ASA 4 and 5
Yes	55.9	48.5	24.9
No	43.9	51.4	74.6

It is clear that anaesthetists tended not to prescribe premedicant drugs for the poor risk patients.

Table A35 (q 33a)
Premedicant drugs prescribed.

	Deaths (*n*=864)	Index (*n*=1597)
Atropine	81	188
Chloral hydrate	5	7
Diazepam	104	201
Droperidol	34	50
Fentanyl	18	9
Glycopyrronium	26	13
Hyoscine	105	290
Lorazepam	61	103
Ketamine	1	-
Methohexitone	1	-
Midazolam	13	9
Morphine	21	19
Papaveretum	210	350
Pethidine	139	119
Temazepam	235	530
Promethazine	85	94
Trimeprazine	2	140
Other	240	384
Not answered	1	-

NB - this can be a multiple entry.

Table A36 (q 34)
Did you have non-medical help?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	2169	204
No	14	32
Not answered	8	5

Non-medical help

	Deaths	Index
Trained anaesthetic nurse	469	514
Trainee anaesthetic nurse	42	63
Trained ODA	1579	1533
Trainee ODA	130	127
Operating department orderly	83	88
Ward nurse	93	116
Physiological measurement technician	38	23
Theatre nurse	37	35
Recovery and intensive care nurse	6	3
Other	18	24
Not answered	9	13

Most anaesthetists had non-medical help with both groups of patients: on average there were 1.15 non-medical persons to help and these were mostly trained anaesthetic nurses or operating department assistants. There is no gross difference between the two groups despite the obvious differences in risk.

Nevertheless it is disturbing to note that individuals without special training (ward nurses or operating department orderlies) were deemed suitable assistants for anaesthetists. The group of 'other' assistants included porters, medical laboratory technicians, dental technicians, 'nurse for admitting', and auxiliary nurses. (Mothers were included in this category on two occasions.)

The 14 patients who died and the 32 index cases when no non-medical help was available included a variety of all types of case. The anaesthetists were of all grades but, if the information is accurate, it is alarming that Senior House Officers and Registrars were left without non-medical help and by themselves on five occasions to manage patients who later died and on five occasions with index cases. On three separate occasions *locums* (Consultant, Associate Specialist and Clinical Assistant) were similarly left without non-medical help for ASA 1 and 2 patients who were to have elective or scheduled procedures.

Anaesthetists of all grades *must* have non-medical help. It is the responsibility of clinical directors (divisions of anaesthesia) to ensure this provision and that the individuals have suitable abilities.

> *A Senior Clinical Medical Officer (DA, 1969) anaesthetized a 16-year-old girl for two teeth to be extracted electively in a Community Hospital as a day case. No tests were done beforehand and the patient was stated to be ASA 1. The anaesthetist was assisted by a dental surgery assistant. A gaseous induction with nitrous oxide, oxygen and halothane took two minutes and the entire procedure lasted ten minutes; death was recorded two and a half hours later. A pulse oximeter was used, but no other monitoring device. The mask was replaced on the nose and 100% oxygen administered during the procedure. No monitoring was used in recovery. A Consultant Anaesthetist and two other doctors came to help. The surgeon's questionnaire suggests that the patient had cardiorespiratory, alimentary, and renal disease before operation and graded her ASA 2, with a small but definite risk of death. Cardiac arrest is reported. The administration have withheld both the autopsy report and the death certificate.*

Table A37 (qs A27/S42)
ASA Class (deaths) - comparison of anaesthetic and surgical questionnaires where both questionnaires received.

	ASA Class (Anaesthetic Questionnaire)					
ASA Class (Surgical Questionnaire)	**1**	**2**	**3**	**4**	**5**	**Not answered**
1	10	49	30	12	2	1
2	4	205	217	82	14	3
3	-	82	252	163	37	6
4	2	32	118	301	110	5
5	1	2	8	62	86	2
Not answered	2	36	38	36	15	3
SQ not received	3	37	53	50	17	4

It is obvious that the assessment of the physical status of patients by two clinicians of different disciplines is likely to vary. It is perhaps remarkable that there is so much agreement here. Anaesthetists are more pessimistic, or perhaps realistic, about this than surgeons although both groups could be influenced by the fact that they already knew that the patient had died. There was 45% complete agreement but the excess of 29% greater by one grade and 14% less than one grade does not seem unreasonable (see histogram).

Excess of anaesthetists' grading over surgeons' grading (ASA) excluding surgical non-replies.

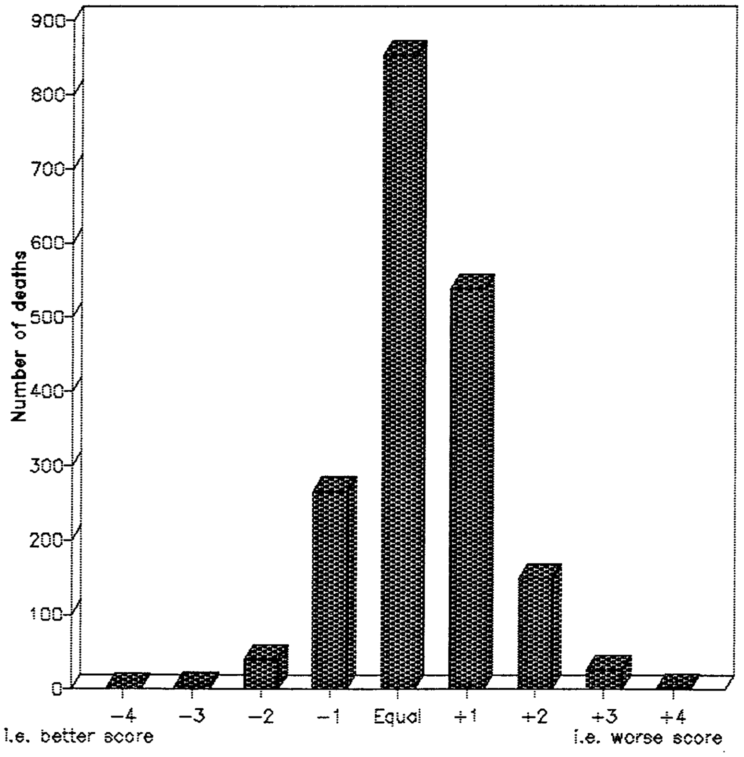

Table A38 (q 35)

Was *non-invasive* monitoring established just *before* the induction of anaesthesia?

	Deaths (*n*=2191)		Index (*n*=2241)	
Yes	1850	(84.5%)	1369	(61.1%)
No	298		857	
Not answered	43		15	
Monitors				
ECG	1557	(84.2%)	992	(72.0%)
BP	1390		725	
Pulse oximetry	1165	(63.0%)	746	(54.0%)
Other	50		57	
Not answered	6		8	

Non-invasive monitoring was more frequently started before induction in the group of deaths (84.5%) than amongst the index cases. This may reflect a greater degree of concern for these patients but it also demonstrates, amongst the index cases, how practice has changed to the extent that, in this non-selected sample, 72% had an ECG connected at the start of the anaesthetic (when it may be particularly useful) and 54% had oximetry. This trend is anticipated to continue.

Table A39 (q 36)

Was *invasive* monitoring established *before* induction of anaesthesia e.g. CVP, arterial line?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	457	70
No	1693	2094
Not answered	41	77

The fact that in 20% of the deaths invasive monitoring was established before induction is an indication of the change in practice which has happened in the United Kingdom over the last few years. The differences between index cases and deaths presumably reflects the anaesthetists' perception of risk in the individual patients and the immediate need for monitoring as well as the fundamental differences between the two groups.

Table A40 (q 37)

Were any measures taken (before, during or after operation) to prevent venous thrombosis?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	879	538
No	1282	1679
Not answered	30	24

Treatments

	Before/during	After	Before/during	After
Aspirin*	48	15	20	5
Heparin	397	322	164	135
Dextran infusion	38	12	34	15
Leg stockings	272	174	183	120
Calf compression	144	7	108	8
Other	46	23	55	31
Not answered	2	2	-	-

* Anaesthetists and surgeons should realise that aspirin does not prevent venous thrombosis[9].

The absence of confirmatory evidence of pulmonary embolism as a cause of death inhibits close evaluation of the benefit of these prophylactic measures. Coroners' autopsy reports were not always released to clinicians and thus not to NCEPOD; not all deaths are followed by autopsy and thus there is no objective evidence that death was or was not caused by pulmonary embolism. There were certainly cases of proven pulmonary embolism which caused death in patients who had, and in those who had not, prophylaxis. There were also a few cases of patients who died partly as a result of haemorrhage. There were a number of patients who should have received prophylaxis (eg previous history, obesity, varicose veins, malignant disease, pelvic surgery, prolonged bed rest before surgery) who died as a result of pulmonary thromboembolism. NCEPOD is not an appropriate means whereby this important question may be resolved (see page 190).

Table A41 (q 38)
Was it necessary to take *additional* measures to improve the patient's cardiovascular function just before and at the induction of anaesthesia?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	572	101
No	1585	2123
Not answered	34	17
Measures		
Crystalloid IV fluids	330	71
Colloid IV fluids	246	20
Whole blood transfusion	96	4
Blood components	61	7
Antiarrhythmic drugs	10	3
Cardiac glycoside	35	2
Diuretics	48	-
Vasopressors	50	8
Inotropic drugs	87	4
Other	51	10

THE ANAESTHETIC

Time of start of anaesthetic

The procedure started outside "reasonable" hours, defined for this purpose as 23.00 to 07.30 hours, in 177 of the deaths and 13 of the index cases (information not available in 13 deaths and 155 index cases).

This proportion (8% deaths) is surprisingly and gratifyingly low. We do not know whether or not it represents a change in hospital policy since we have no other data with which to make comparisons.

Table A42 (qs 39 and 41)
Duration of procedure (from time of start of anaesthetic to transfer out of operating room)

	Deaths (*n*=2191)	Index (*n*=2241)
<30 minutes	155	604
>30 minutes - 1 hour	466	637
>1 hour	752	515
>2 hours	457	218
>4 hours	163	50
Not answered	198	217

Table A43 (q42)
Is there an anaesthetic record for this operation in the notes?

	Deaths (*n*=2191)		Index (*n*=2241)	
Yes	2124		2189	
No	64	(2.9%)	50	(2.3%)
Not answered	3		2	

Retrospective review is impossible without proper records. Dynamic events cannot be understood without a contemporary record. Two cases illustrate the problem vividly.

> *The Clinical Assistant anaesthetist (DA, 1979) for a 45-year-old schizophrenic (who died nine days after aspiration of stomach contents at induction of anaesthesia) wrote on the anaesthetic record 'see printout'. However NCEPOD did not receive this. This doctor also reported under monitoring devices that a pulse oximeter was not used but stated that 'oxygen saturation' was, under 'other'. No Consultant Anaesthetist (or Surgeon) was involved at all in the management of the patient in a District General Hospital. The operation lasted 55 minutes. No operating notes, fluid balance charts or post mortem report were sent to NCEPOD.*

These omissions and the quality of completion of the questionnaire make interpretation impossible.

> *A surgical disaster occurred with an elective ASA 1 patient who had a total hip replacement in a District General Hospital. Unrevealed haemorrhage occurred and despite valiant efforts by the anaesthetist (fluids, blood, vasoconstrictor drugs) cardiac arrest developed. The 77-year-old patient was given heparin prophylactically. Resuscitation was impossible. We are told that the notes are lost so a clear description is not available: neither anaesthetic record, nor operation note, nor post mortem report were sent to NCEPOD.*

The presence (97%) of a record in the notes does not indicate its quality. Some respondents failed to send NCEPOD a copy despite a positive answer to this question. Records have improved considerably but the absence of proper detail still inhibits interpretation in many cases.

Table A44 (q 43)
Did the patient receive intravenous fluids *during* the operation?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	2005	903
No	148 (6.7%)	1314 (58.6%)
Not answered	38	24

The absence (58.6%) of the use of intravenous fluids during anaesthesia amongst the *index* cases seems a suprisingly high proportion.

Table A45 (q 43a to c)
Intravenous fluids during operation

	Deaths	Index
Dextrose 5%	146	40
Dextrose 4% saline 0.18%	278	167
Dextrose 10%	37	20
Saline 0.9%	563	135
Hartmann's (compound sodium lactate)	1250	627
Other crystalloid	117	47
Modified gelatin	831	204
Human albumin solution	144	24
Starch (HES)	135	36
Dextran	38	25
Other colloid	39	8
Whole blood	420	91
Red cell component	299	64
Other blood component	164	26

NB - this can be a multiple entry

Overload of the circulation in the perioperative period still occurs. The choice of intravenous fluid is also sometimes difficult to understand.

One 90-year-old patient (45kg, 140cm, ASA 4) was anaesthetized by a Senior Registrar (FFARCS, 1984) in a District General Hospital for the insertion of a dynamic hip screw. Seven litres of fluid (5 litres 0.9% saline) were administered in the immediate perioperative period. The patient developed atrial fibrillation after operation and died 48 hours later. The autopsy showed pulmonary oedema.

MONITORING

Table A46 (q 45)
Were monitoring devices used during the management of this patient?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	2185	2220
No	2	9
Not answered	4	12

Deaths

No monitoring devices at all were used by a Consultant (FFARCS, 1982) for a patient in a District General Hospital who died three days after an oesophagoscopy and insertion of Celestin tube. Tracheal intubation was used and manual ventilation of the lungs employed in an 82-year-old patient. The procedure lasted 15 minutes.

No monitoring devices were used by another Consultant in a moribund ASA 5 patient who had Richard pins inserted into a pathological fracture with the aid of local anaesthesia and ketamine (no doses reported). The patient died from metastatic disease two days later in a District General Hospital.

There were no anaesthetic records available for three cases out of the four in which the question was not answered so there was no extra information available to NCEPOD.

The fourth patient for cystoscopy was anaesthetized by a Consultant Anaesthetist for the 15-minute procedure in a District General Hospital. Atrial fibrillation was present. Spontaneous ventilation was maintained through a Magill system.

Index cases

There were nine index cases for which the anaesthetist did not use any aids to monitoring. All but one of these were for brief procedures and all anaesthetics except one were given by Consultants. There was one anaesthetic which lasted 65 minutes for a correction of a strabismus in a three-year-old child and no monitoring was used by the Consultant in a District General Hospital.

Table A47 (q 45a)
Monitoring devices used

	Deaths (n=2185)			
	Anaesthetic Room		Operating room	
Pulse: manual	1270		1149	
Pulse: meter	325		739	
Indirect BP (non-invasive)	1114	(51.0%)	1834	(83.7%)
Direct arterial BP	140		470	
CVP	191		697	(31.8%)
Pulmonary arterial pressure	27		82	
ECG	1197	(55.1%)	2078	(94.8%)
Pulse oximetry	868	(40.0%)	1952	(89.1%)
Oesophageal or precordial stethoscope	71		85	
Temperature	52		246	
Ventilation volume	217		1216	
Airway pressure	314		1541	
Expired CO_2 partial pressure (concentration)	150	(6.8%)	1352	(61.7%)
O_2 analyser - fresh gas	109		569	
O_2 analyser - inspired gas	130		1021	(46.6%)
Inspired anaesthetic vapour	54		271	
Peripheral nerve stimulator	64		402	
Ventilator alarm disconnect	221		1441	(65.8%)
Urine output	252		1010	
Other	19		91	

The anaesthetic induction room was not used on 374 occasions; presumably induction of anaesthesia was accomplished in the operating room.

It is clear that the use of monitoring devices is often delayed until the operating room is entered. The fact that the anaesthetic room was *not* used was noted in 17.1% cases (deaths). This implies that monitoring devices were attached, and presumably operative, before induction in the operating room. This seems an acceptable practice and if it were widespread some of the problems inherent in the transfer of patients from the anaesthetic room to the operating room would be avoided. The fact that the indirect BP, ECG, oximeter and capnograph were attached in so few cases in the anaesthetic room, but in many more cases in the operating room, implies that the devices are available but that they are not being used to their full potential. The solution seems obvious: more inductions should be done in the operating room (unless the equipment is also made available in the anaesthetic room).

The ten procedures amongst the deaths for which the questionnaires show that the operating room was *not* used were those so-called 'minor' procedures, of bronchoscopy or oesophagoscopy. One case which involved manual removal of faeces is described elsewhere.

Table A48 (q 45a)
Monitoring devices used

	Index cases (n=2220)	
	Anaesthetic Room	Operating Room
Pulse: manual	1547	1089
Pulse: meter	253	677
Indirect BP (non-invasive)	758	1768
Direct arterial BP	63	134
CVP	39	110
Pulmonary arterial pressure	9	30
ECG	964	1999
Pulse oximetry	745	1939
Oesophageal or precordial stethoscope	86	93
Temperature	32	139
Ventilation Volume	98	716
Airway pressure	162	935
Expired CO_2 partial pressure (concentration)	80	1054
O_2 analyser - fresh gas	97	559
O_2 analyser - inspired gas	80	822
Inspired anaesthetic vapour	38	214
Peripheral nerve stimulator	43	268
Ventilator alarm-disconnect	119	906
Urine output	51	201
Other	23	67

The anaesthetic room was not used in 92 index cases; there were 17 procedures for which the operating room was not used; these were relatively minor procedures (manipulations, duct probings). The 92 cases were presumably those patients for whom the anaesthetists wished to induce anaesthesia with the advantages of all the monitoring equipment which was available.

The wisdom of this approach is obvious. The transfer of the patients from the anaesthetic room to the operating room is known to be a hazard (physically awkward, disconnexion of monitors and ventilators) and the increased use of the operating room for induction in appropriate cases seems desirable.

Table A49 (q 46)
Was there any malfunction of monitoring equipment?

	Deaths (*n*=2185)	Index (*n*=2220)
Yes	43	23
No	2122	2181
Not answered	20	16

The malfunctions reported in this question were almost always trivial and explicable and were rectified promptly. None was itself life-threatening.

Table A50 (q 47)
Did anything hinder full monitoring?

	Deaths (*n*=2185)	Index (*n*=2220)
Yes	106	73
No	2044	2128
Not answered	35	19

There were 30 reports amongst the deaths of unavailability of various monitoring devices. Fifty-one of the reports stated difficulties as a result of the clinical condition of the patient (eg intense vasoconstriction, impalpable pulse) and resultant technical failures. Two reports stated that monitoring was impossible because the patient had received spinal anaesthesia and two others implied that there was insufficient time to use the equipment.

> *One patient for a dilatation and curettage (87 years, ASA 3) was anaesthetized by a Registrar with the Part I FCAnaes in a University Hospital. Premedication was with promethazine and pethidine. Propofol (100mg) followed by manual ventilation of the lungs with nitrous oxide and oxygen resulted in cardiac arrest. This appears from the records not to have been recognised until the patient was moved to the operating table. A comment on the questionnaire is instructive "rapid patient turnover necessitated induction in the anaesthetic room under conditions of suboptimal monitoring". The patient finally died two days later.*

> *A retired Consultant Anaesthetist (FFARCS, 1956) anaesthetized a 54-year-old man in an independent hospital for correction of a Dupuytren's contracture and an ulnar nerve transposition. The patient was thought to weigh 90kg; urinalysis but no other tests were done before operation and he was described as ASA 1. Bilateral surgery on the arms prevented their use for monitoring and the pulse oximeter probe did not fit on to the toe. The patient was transferred to an NHS hospital for intensive therapy for unexplained reasons and died there six days later. Neither autopsy nor anaesthetic records were sent to NCEPOD.*

Thirty-eight index cases were used to report the fact that *some monitoring devices were unavailable* to anaesthetists either because the departments did not possess them, because there were insufficient numbers of particular items, or because they were broken and had not been replaced. These items (mainly capnographs and oximeters) are recommended monitors and should be available for use whenever anaesthesia is provided. It may be necessary to induce anaesthesia in theatre should equipment not be available both for the anaesthetic room *and* the operating room).

The widespread use of *pulse oximetry* (89.0% of all deaths; 86.5% of index cases) is evidence that the importance of this monitor is appreciated by anaesthetists. However, oximetry is not always used, even if it may be available. It is also unfortunately the case that not all its users understand its value and its limitations: at least one Registrar thought it was appropriate for use as primary confirmation of correct tracheal placement of a tracheal tube!

> *One 56-year-old man (ASA 1) had a craniotomy for exploration of his posterior fossa in an independent hospital. A Consultant Anaesthetist with 26 years' experience in the grade conducted the anaesthetic for three hours without any invasive monitoring (direct arterial or central venous pressure) and without pulse oximetry although the latter was used for the recovery period in the intensive care unit. The man died within 48 hours of his operation from medullary failure.*

A decision not to use invasive monitoring for this patient might have been taken since full assessment before operation showed that no other medical condition was present.

Modern monitoring devices do help anaesthetists to detect events before they become hazardous.

> *The expiratory valve on a Bain system stuck open in one instance and the anaesthetist concerned reported it because he detected underventilation with the capnometer which was used in a District General Hospital.*

Previous reports of CEPOD[1] and NCEPOD[2] have emphasised the value of *central venous pressure* (CVP) monitoring in the management of fluid replacement. Many of the elderly patients in this series were found at autopsy to have grossly oedematous lungs as a result of overtransfusion with crystalloid fluids often, but by no means always, in association with epidural or spinal anaesthesia. The central venous pressure does not monitor the function of the left ventricle but it may provide some warning of fluid overload. *Octo- and nono-genarians are unlikely to benefit from several litres of crystalloid fluid in a 12-hour period in the absence of fluid loss.*

> *One such patient was anaesthetized by an Associate Specialist with four years' experience and the DA (UK). The patient required a repeat arterial graft to his right femoral artery in a District General Hospital. The 67-year-old patient (ASA 4) had cardiorespiratory disease and received 3.5 litres of fluid; the CVP was not measured and since there were no recovery facilities he was sent directly to the ward after operation.*

Central venous lines are however sometimes *misplaced.*

> *The insertion of a right subclavian line into a 48-year-old patient in a University Hospital who had thrombocytopenia from acute lymphoblastic leukaemia caused a fatal haemopneumothorax.*

> *Another young patient (16-year-old) with gross kyphoscoliosis required a central venous line to monitor fluid balance in the management of intestinal obstruction in a District General Hospital. Autopsy showed that the cannula was misplaced; it had entered the pericardium from the right subclavian vein and also damaged the superior vena cava. The patient died with cardiac tamponade in the intensive care unit.*

Table A51 (q 48)
What type of anaesthetic was used?

	Deaths (*n*=2191)	Index (*n*=2241)
General alone	1824	1884
Local infiltration alone	2	6
Regional alone	61	29
General and regional	159	182
General and local infiltration	35	91
Sedation alone	7	2
Sedation and local infiltration	19	9
Sedation and regional	84	38

General anaesthesia (alone or in combination) was used in 2018 cases amongst the deaths (92%) and in 2157 (96%) index cases. The choice of method of anaesthesia was very similar in the two series of patients. Regional anaesthesia was used by itself in 20% of those who had regional anaesthesia amongst the deaths and 11.6% of index cases. Similarly sedation with regional anaesthesia was chosen in preference to a combination with general anaesthesia amongst the deaths. There is thus little evidence from this enquiry that choice of technique of anaesthesia *per se* influences outcome.

GENERAL ANAESTHESIA

Table A52 (q 49)

Did you take precautions *at induction* to minimise pulmonary aspiration?

	Deaths (*n*=2018)	Index (*n*=2157)
Yes	1076	254
No	905	1901
Not answered	37	2

Precautions

	Deaths (*n*=2018)	Index (*n*=2157)
Cricoid pressure	820	127
Postural changes - head up	43	24
Postural changes - head down	27	7
Postural changes - lateral	14	6
Preoxygenation without inflation of the lungs	835	175
Aspiration of nasogastric tube	344	22
Other	120	19

Table A53 (q 50)

How was the airway established during anaesthesia?

	Deaths (*n*=2018)	Index (*n*=2157)
Face mask (with or without oral airway	182	607
Laryngeal mask	85	303
Orotracheal intubation	1733	1254
Nasotracheal intubation	24	113
Tracheostomy	41	13
Other	43	28
Not answered	11	2

Table A54 (q 51)

What was the mode of ventilation during the operation?

	Deaths (*n*=2018)	Index (*n*=2157)
Spontaneous	227	1054
Controlled	1785	1100
Not answered	6	3

Table A55 (q 52)

If the trachea was intubated, how was the position of the tube confirmed?

	Deaths (*n*=2018)	Index (*n*=2157)
Tube seen passing through cords	1507	996
Chest movement with inflation	1442	937
Auscultation	1195	697
Expired CO_2 monitoring	980	559
Oesophageal detector device	19	4
Other	75	24
Not answered	50	6

Table A56 (q 53)

Were muscle relaxants used during the anaesthetic?

	Deaths (*n*=2018)	Index (*n*=2157)
Yes	1817	1362
No	197	792
Not answered	4	3
Relaxants		
Depolarising	912	496
Non-depolarising	1688	1047
Not answered	9	2

* NB - this can be a multiple entry

Table A57 (q 54)

How was general anaesthesia maintained?

	Deaths (*n*=2018)	Index (*n*=2157)
Nitrous oxide	1874	2092
Volatile agent	1776	2065
Narcotic agent	1469	1165
Intravenous	177	126
Not answered	15	6

Table A58 (q 55)
Were there any problems with airway maintenance or ventilation?

	Deaths (*n*=2018)	Index (*n*=2157)
Yes	80	42
No	1919	2109
Not answered	19	6

The serious problems reported here amongst the deaths were all related to surgical conditions which affected the upper or lower airways (blood, pulmonary oedema) or to explicable events associated with anaesthesia (bronchospasm or difficult tracheal intubation). There was no case of impossible tracheal intubation.

> *The tracheal tube was 'dislodged' from an 86-year-old patient with a perforated gastric ulcer who was anaesthetized by a Senior House Officer without specialist qualifications but with one year's experience. No Consultant (Anaesthetist or Surgeon) was involved and the operation was done by a surgical Registrar. The recovery room in this District General Hospital was not used at night so the patient was returned to the ward: full brain recovery had occurred. The patient died of a proven pulmonary embolus: no prophylaxis was used.*

Table A59 (q 56)
Was the method of airway management changed during the operation?

	Deaths (*n*=2018)	Index (*n*=2157)
Yes	90	60
No	1891	2084
Not answered	37	13

REGIONAL ANAESTHESIA

Table A60 (q 57)
If the anaesthetic included a regional technique, which method was used?

	Deaths (*n*=304)	Index (*n*=249)
Epidural - caudal	12	39
- lumbar	54	31
- thoracic	38	14
Interpleural	-	1
Intravenous regional	1	1
Peripheral nerve block	36	72
Plexus block	13	14
Subarachnoid (spinal)	156	61
Surface	-	12
Not answered	-	3

Spinal and epidural anaesthesia and analgesia

These excellent techniques are sometimes criticised adversely because of the occurrence of death after their use. However, the ensuing death may be fortuitously related to the spinal or epidural, that is to say, death could have happened at any time.

> *The case of a 78-year-old woman with a fractured neck of femur illustrates this point. She was anaesthetized by a Consultant and Registrar in a University Hospital. She was asthmatic and suffered from ischaemic heart disease, hypertension and congestive heart failure (ASA 3). Papaveretum 10mg was given as premedication and full non-invasive monitoring was established before induction in the anaesthetic room. Spinal anaesthesia was given with 3ml 0.5% bupivacaine. Ketamine, to a total of 40mg, and midazolam 1mg were also given. Just as she was moved from the anaesthetic room on to the orthopaedic operating table cyanosis was noticed and cardiac arrest followed. Full cardiac resuscitation was to no avail. The autopsy included estimation of the blood level of bupivacaine (sample from the femoral artery two days after death) which showed less than 0.1 microg/ml from which the pathologist made the surprising deduction that the spinal anaesthetic played no part in the patient's death! It is more pertinent to report that there was some atherosclerosis in the coronary vessels and that the same pathologist stated that death could have occurred at any time.*

> *Another patient was a 71-year-old man who was to have an above knee amputation in a District General Hospital was anaesthetized by a Senior House Officer, assisted later by a Registrar. The Senior House Officer had one year's experience. The patient had generalised atherosclerosis and gangrene was incipient. 3 ml 0.5% bupivacaine was given for spinal anaesthesia after a fluid load (500 ml). Midazolam, to a total of 6 mg, was given for sedation and oxygen was administered. This operation was twice cancelled from a Consultant Anaesthetist's regular list because of pressure of work and eventually was done out of hours on a statutory Bank Holiday. He died during the operation. Severe aortic and coronary athererosclerosis were found on autopsy.*

The temptation is to ascribe these deaths to the administration of a spinal anaesthetic to patients with severely compromised cardiovascular function: there can be no certainty about this conclusion. Similarly, epidural catheter techniques are used both for operation and for pain relief after operation. Some adverse comment was made when these techniques were used for patients with a poor prognosis. Nevertheless a patient's inevitable death (from for example disseminated cancer or sepsis) is made thereby pain free. There were several examples of this but the most outstanding concerns a patient in a University Hospital.

> *A duty Consultant completed a questionnaire on behalf of a Senior Registrar of one year's standing, who anaesthetized a 69-year-old man ASA 5 for a laparotomy for intestinal obstruction. Gangrenous bowel from gall stone ileus was found. The Senior Registrar had no medical assistance (although he did inform the Consultant before and after the operation) and worked with a trainee ODA. The management was heroic; apart from profound hypotension, dehydration and electrolyte imbalance before operation there was possibly aspiration of bile at operation and further hypotension associated with supraventricular tachycardia for which direct current defibrillation was used. A thoracic epidural catheter was inserted before the operation to provide analgesia afterwards. Morphine and midazolam infusions were used in the intensive care unit and controlled ventilation of the lungs was necessary. Death from pneumonia and intractable cardiac arrhythmias occurred four days later.*

Spinals and epidurals may have advantages in very sick surgical patients but the clearest benefits from their use are seen when they are used for otherwise fit patients.

Table A61 (q 58)
Which agent was used?

	Deaths (*n*=304)	Index (*n*=249)
Local	275	233
Narcotic	49	21
Other	9	4
Not answered	2	1

SEDATION

(as opposed to General Anaesthesia)

Table A62 (q 59)
Which sedative drugs were given for this procedure (excluding premedication)?

	Deaths (*n*=110)	Index (*n*=49)
Inhalant	9	3
Narcotic analgesic	16	10
Other	102	45
Not answered	-	3

Table A63 (q 60)
Was oxygen given?

	Deaths (*n*=110)	Index (*n*=49)
Yes	106	40
No	4	6
Not answered	-	3

Indication

	Deaths	Index
Routine	91	35
Otherwise indicated	27	5
Not answered	2	-

NB - this can be a multiple entry.

Choice of anaesthetic technique and/or drugs

The tables above indicate the wide spectrum of clinical practice which occurs in the cases reported. There were four reports amongst the deaths which appear *unusual* and all are worthy of study.

> *Cardiopulmonary bypass was instituted in a District General Hospital to enable a coronary bypass graft in a 64-year-old man with hypertension. It is not known whether or not antihypertensive therapy was continued. Induction of anaesthesia by a Consultant was with cyclopropane and subsequent maintenance was with a methohexitone and papaveretum infusion. The blood pressure increased from 180/95 mmHg (in the anaesthetic room) to 230/165 mmHg after 15 minutes of 5% halothane before bypass. Death occurred 36 hours later after myocardial infarction.*

Did this sequence of events result from failure to control the blood pressure?

> *A Senior House Officer, who consulted a Registrar, anaesthetized an 82-year-old woman (ASA 5) in a District General Hospital. The Senior House Officer did not claim any qualifications whatever (the questionnaire was blank at this point). No premedication was used. Anaesthesia, for suture of a perforated peptic ulcer, was induced with isoflurane in oxygen, the trachea was intubated, after suxamethonium 30mg. An 18-gauge (sic) intravenous cannula was already in place. 50% nitrous oxide and isoflurane was used for maintenance and ventilation was spontaneous. The patient was hypotensive throughout and the oxygen saturation was between 92 and 97% throughout. The procedure started at 0200 hours and lasted about 30 minutes. The patient succumbed 19 hours later; 50mg IM pethidine was prescribed for analgesia. We do not know if a Consultant Anaesthetist saw this questionnaire, because this question is not answered.*

Mortality meetings are held and this case is to be discussed - perhaps the trainees will learn?

An 88-year-old man had a strangulated inguinal hernia. He was graded ASA 4. He had a history of a cerebrovascular accident two years previously, myocardial infarction 12 months earlier and was in congestive cardiac failure. He had cardiomegaly and a pleural effusion. A Consultant Anaesthetist (FFARCS, 1973) in a District General Hospital gave him propofol 50mg, placed a laryngeal mask, and allowed him to breathe isoflurane and 50% nitrous oxide in oxygen spontaneously for the procedure which lasted more than one hour and which was done by a surgical Registrar. The arterial blood pressure before operation is not recorded but it remained about 140 mmHg systolic during the procedure. The oxygen saturation varied around 90% throughout. Supplementary drugs during the operation consisted of alternating doses of doxapram (10mg) and fentanyl (0.025mg) on two occasions each! The anaesthetist reported Cheyne Stokes respiration throughout. The autopsy showed a recent myocardial infarction.

A 66-year-old man (ASA 5) required a laparotomy in a District General Hospital for a perforated gastric ulcer which, it transpired, was neoplastic. A Consultant Anaesthetist, assisted by a Senior House Officer, gave him (weight unknown) 375mg thiopentone, alcuronium, phenoperidine 2mg, halothane, nitrous oxide in oxygen and passed a left-sided Robertshaw tube. "Severe collapse just after intubation" was noted on the anaesthetic record and "dobutamine produced good response". He received 13 litres of intravenous fluids over the perioperative period and died in left ventricular failure on the next morning.

It seems that the advantages of controlled ventilation of the lungs and the wisdom of careful fluid balance in patients as ill as the latter two patients have yet to be recognised even by some Consultants.

RECOVERY FROM ANAESTHESIA

Table A64 (q 61)

Which special care areas are available in the hospital in which the operation took place?

	Deaths (*n*=2191)	Index (*n*=2241)
Recovery area or room	1991	2144
High dependency unit	407	432
Intensive care unit	1686	1378
Other	35	45
Not answered	88	52

NB - this can be a multiple entry

The provision of recovery rooms, for the patients reported to NCEPOD, is reasonable but not yet complete. NCEPOD considers that there should always be a specially designated, equipped and staffed area for the process of recovery from anaesthesia. Absence of this facility was noted and may have contributed to the occurrence of death.

Facilities for special care

Each of these patients reported below was a poor risk. Each of them required some degree of specialised care after operation if the surgery was to be successful. Did the lack of this appropriate care at least accelerate or even cause these deaths? The supervision of care after operation needs some attention. Patients are sometimes sent to intensive care units when high dependency care would be more appropriate and therefore these beds are occupied inappropriately. Seriously ill patients are still discharged to wards where the appropriate standards of care are nowadays not possible. Some hospitals do not have separate areas for high dependency and intensive care and differences in nomenclature may have resulted in imprecise information about this matter.

Deaths from respiratory arrest after narcotics, gross fluid overload or out-of-control diabetes mellitus indicate the urgent need for change. The improvement required is not necessarily expensive or esoteric: the mere concentration of beds for patients who have recently had surgery in one place with suitable medical and nursing supervision would, in many cases, almost solve the organizational problem. Complex surgery and advanced anaesthesia are sometimes followed by ....nothing: death supervenes and it is open at least to question whether better use of available facilities might have encouraged temporary delay in the inevitable.

A 75-year-old woman had a laparotomy for adhesions in an independent hospital. She was already dehydrated and cachectic but was described as ASA 2 by a Consultant Anaesthetist (FFARCS, 1986). The monitoring during operation was inadequate because there was no equipment for central venous manometry, capnometry or direct arterial pressure. Oximetry was used but the patient became and remained hypotensive during this procedure. The bowel was described as friable and considerable soiling occurred. Equipment for central venous monitoring and inotropic drugs had to be obtained from elsewhere. She was then transferred to an NHS hospital for care in an intensive care unit in which she died a few hours later.

A 73-year-old woman had a laparotomy for adhesions in a District General Hospital. She was anaesthetized by a Senior House Officer with one year's experience. A Senior Registrar eventually came to help. Immediately after operation tachycardia developed (verapamil and digoxin were given) but, because of lack of intensive care beds, she was transferred elsewhere to another hospital for high dependency care. A saddle embolus was subsequently removed under local anaesthetic but she died of brain stem infarction.

An 85-year-old lady needed an urgent laparotomy for intestinal obstruction in a District General Hospital. She was anaesthetized by a Senior House Officer (with one year's experience and the part I FCAnaes) after discussion with the Consultant Anaesthetist. The patient was graded as ASA 4 and was in a very poor state: breast carcinoma, pleural effusions, and congestive cardiac failure were present and she received steroids and long-term oral narcotics. She was in hospital for three days before operation and was managed with intravenous fluids and nasogastric suction. Nevertheless the patient's weight was not known and the arterial blood pressure remained low. Surgery lasted two hours in the middle of the night. The patient was seen in the recovery room and, since protective reflexes were present, she was discharged to the ward by the Senior House Officer where she died three hours later of hypoventilation.

A 79-year-old woman had a normal appendix removed in a University Hospital at 0400 hours. Neither the surgical Registrar nor the Registrar anaesthetist, at least until after the operation, consulted their senior colleagues. There was clear evidence (arterial blood gas analysis) of the need for controlled ventilation of the lungs before and after operation but admission to the available intensive care unit was not arranged; the patient was discharged by the Senior House Officer at 0750 hours to a general ward. She died within 12 hours after an acute unexplained episode of apnoea. No post mortem was done.

A 72-year-old man died from hypovolaemia 10 hours after a splenectomy complicated surgically by a laceration of the liver. The high dependency unit in this District General Hospital was closed, it was claimed, for financial reasons.

Death followed aspiration of stomach contents in a 74-year-old patient who was discharged from the recovery room in a District General Hospital to a general ward at 0400 hours by a nurse. The "Ryle's tube was blocked". There were no high dependency or intensive care beds available.

Premature discharge from a high dependency unit in a University Hospital because of "pressure on beds" was associated with a similar sequence of events in another 84-year-old man.

A 74-year-old woman had a large hiatus hernia which needed to be repaired and she also required an anterior resection for a neoplasm in the sigmoid colon. She was described as ASA 1 despite chronic obstructive airways disease and ischaemic heart disease! Consultant staff managed this major double operation in a District General Hospital in which there is no intensive care unit; the patient therefore had special nursing in a general ward after operation but no artificial ventilation of the lungs was provided. She died two days later in congestive cardiac failure.

Would she have survived had the operation been done in a hospital with more appropriate facilities?

A 54-year-old man in a District General Hospital required a circumcision for balanitis. One year previously he had the second of two myocardial infarctions. He suffered from stable angina and received isosorbide, metoprolol and glyceryl trinitrate. A Senior Registrar gave him a general anaesthetic supplemented with a penile block (6 ml 0.5% bupivacaine). Four hours later, on the ward, he had a cardiac arrest and autopsy showed coronary occlusion in two major vessels. The Consultant Surgeon commented that the "absence of a resident anaesthetist contributed to the occurrence of this death".

Why then did he operate on this patient in these unsatisfactory circumstances? Would this patient have benefited from care in a more suitable location?

Table A65 (q62)
After leaving the operating room, did the patient go to a specific recovery area or room?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	1444	2073
No	629	166
Died in theatre	115	2
Not answered	3	-

Table A66 (q 62a)
Where did the patient go on leaving the operating room?

	Deaths (*n*=629)*	Index (*n*=166)*
Ward	39	27
High dependency unit	24	23
Intensive care unit	477	68
Specialised ICU	73	26
Home	-	2
Another Hospital	4	-
Other	7	13
Not answered	5	7

* patients who did not go to a specific recovery area

Table A67 (q 63)

Were monitoring devices used during the management of this patient in the recovery room?

	Deaths (*n*=1444)	Index (*n*=2073)
Yes	1395	1909
No	34	160
Not answered	15	4

The fact that in more than 90% of these patients monitoring was aided by the use of devices is gratifying but what was done for the 8% index cases who were not so monitored?

Table A68 (q 63a)

Monitoring devices used in recovery

	Deaths (*n*=1395)	Index (*n*=2073)
Pulse: manual	1145	1579
Pulse: meter	266	287
Indirect BP (non-invasive)	1329	1613
Direct arterial BP	44	21
CVP	142	21
Pulmonary arterial pressure	3	3
ECG	622	447
Pulse oximetry	724	816
Temperature	165	139
Ventilation volume	27	13
Airway pressure	25	3
Expired CO_2 partial pressure (concentration)	8	8
O_2 analyser - inspired gas	7	6
Peripheral nerve stimulato	13	4
Ventilator alarm/disconnect	14	4
Urine output	375	127
Other	51	95

NB - this can be a multiple entry

Table A69 (q 64)
Who decided that the patient should be discharged from the recovery room?

	Deaths (*n*=1444)	Index (*n*=2073)
The most senior anaesthetist	849	1020
Another anaesthetist	136	87
Surgeon	15	9
Nurse	364	933
Other	11	6
Not applicable*	30	2
Not answered	39	16

* death in recovery room

The decision about discharge of a patient from the recovery room is a medical one, although often it is delegated to an experienced nurse. It is somewhat of an anachronism that patients can have complex anaesthesia with invasive monitoring over several hours and yet can be discharged to a ward by a nurse. There were occasions when this process may have involved an actual threat to life (see synopses on page 73 and 113).

> *A 75-year-old man (ASA 1) was submitted to a laparotomy and Hartmann's procedure in a District General Hospital for faecal peritonitis from a perforated colon. The surgical Registrar, who had three months' experience in the grade, operated for three hours at 2300 hrs after consultation with his (her) Consultant. The unqualified Senior House Officer anaesthetist (19 years' experience outside the UK) did not consult anyone. There was no high dependency bed available and the patient was discharged by a nurse to the ward at 0400 hrs. The nasogastric tube was found to be blocked after the patient had regurgitated and aspirated stomach contents. He died seven hours later.*

The decision to transfer the patient to the ward and his care there could be questioned.

Table A70 (q 66)

Had this patient recovered protective reflexes before discharge from the recovery area?

	Deaths (*n*=1444)	Index (*n*=2073)
Yes	284	2012
No	45	12
Not known	72	42
Not applicable (died in recovery area)	30	2
Not answered	11	5

Table A71 (q 67)

Where did this patient go next (after the recovery area)?

	Deaths (*n*=1444)	Index (*n*=2073)
Ward	1296	1963
High dependency unit	41	32
Intensive care unit	57	12
Specialised ICU	10	4
Home	-	30
Another hospital	1	-
Other	5	22
Not applicable (death in recovery area)	30	2
Not answered	4	8

All the patients (deaths) who did not recover their protective reflexes (45), and those (72) when it was not known if they had (Table A70), are accounted for in Table A71 and most went to other special areas.

CRITICAL INCIDENTS DURING ANAESTHESIA AND RECOVERY

Table A72 (q 68)
Did any untoward incidents, which required specific treatment, occur?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	481	156
No	1688	2080
Not answered	22	5

This question was perhaps misunderstood. A critical incident is an adverse event which did or might lead, *if not corrected* to an adverse outcome. This was not defined on the questionnaire. There were fewer reports than anticipated.

Table A73 (q 68a)
Critical incidents

	Deaths (*n*=481)	Index (*n*=156)
Air embolus	1	-
Airway obstruction	8	15
Anaphylaxis	2	-
Arrhythmia	118	35
Bronchospasm	19	6
Cardiac arrest (unintended)	99	3
Convulsions	2	-
Cyanosis	32	9
Disconnexion of breathing system	-	-
Hyperpyrexia	1	-
Hypoxia	30	11
Misplaced tracheal tube	6	1
Pneumothorax	4	2
Pulmonary aspiration	6	2
Pulmonary oedema	19	2
Respiratory arrest (unintended)	17	3
Total spinal	-	-
Wrong dose or overdose of drug	2	1
Other	249	70

Deaths

Most of the 'other' group were for hypotension: at induction, after release of aortic clamps or at the conclusion of cardiopulmonary bypass. Arrhythmias were commonly sinus bradycardia. The one case coded as *air embolus* is mentioned elsewhere (see page 110).

The eight cases of *airway obstruction* included two patients with surgical causes for the obstruction (haemorrhage, tumour). Two double lumen tubes needed adjustment to correct the temporary airway obstruction. One patient developed serious ventilatory difficulties in association with the insertion of a stent and died shortly afterwards. One patient regurgitated and aspirated stomach contents: this was treated but the patient died later from a pulmonary embolus. Two patients required tracheal suction for airway obstruction but one suffered cardiac arrest and survived for two days.

The two reports of *anaphylaxis* included one which was a reaction to cement during a hip replacement and the other was reported as due to mannitol given in ICU after operation!

The case of *hyperpyrexia* was not as defined in the questionnaire (greater than 40°C) and referred to a patient who developed a temperature of 39°C shortly after cardiopulmonary bypass.

Five of the six reports of *misplaced tracheal tube* were referred to on page 94. The right main bronchus was intubated accidentally elsewhere during resuscitation of a patient with haematemesis. This was noticed when the patient arrived in the operating room.

One of the four reports of *pneumothorax* is presented elsewhere (page 90). One of the other two was consequent upon high ventilation pressures in a patient with adult respiratory distress syndrome and one was a recognised event during the insertion of a central venous catheter.

Four of the six cases in which *pulmonary aspiration* occurred are mentioned elsewhere (pages 74, 83, 102 and 105). One other patient was anaesthetized by a locum Registrar without senior support (because of pressure of work); it is not known when or how aspiration occurred. The patient died with fulminant pulmonary oedema. Aspiration preceded anaesthesia in the other patient who suffered convulsions before craniotomy.

The records of *wrong dose or overdose* referred to a recognised overdose with ketamine which caused no apparent harm in one patient and to a relative overdose (150mg) thiopentone to an 80-year-old who developed systolic hypotension in another.

Index cases

Bronchospasm on two occasions was related to the use of an endobronchial tube but on the other four occasions (with tracheal tubes) it disappeared after injection of aminophylline.

The three cases of *cardiac arrest* followed massive surgical haemorrhage and caused death.

The *misplaced tube* was recognised to be inserted too far and was withdrawn.

One *pneumothorax* was caused surgically and the other was overlooked for two days after the insertion of a central venous line. The two cases of *pulmonary aspiration* were of doubtful significance. An 83-year-old was given what the Consultant Anaesthetist thought was too much intravenous fluid during a cholecystectomy and the patient died eight days later after treatment of pulmonary oedema. The other patient may have absorbed fluid during a transurethral prostatectomy.

The cases of *respiratory arrest* all occurred in the recovery room for unexplained reasons and were without permanent effects.

The report of *wrong dose or overdose of drug* involved an acknowledged error (from which the patient came to no harm) by a Consultant Anaesthetist who confused two syringes which he (she) had clearly labelled!

Table A74 (q 69)
Was there any mechanical failure of equipment (excluding that for monitoring)?

	Deaths (*n*=2191)	Index (*n*=2241)
Yes	8	4
No	2142	2180
Not answered	41	57
Mechanical failure		
Equipment for IPPV	1	-
Suction	-	-
Other	5	3
Not answered	2	1

There was no proper explanation or no answer in seven of these 12 cases of mechanical failure, but none was clearly causative of an unfavourable outcome, but the case report below contains some useful lessons.

A 53-year-old man with a history suggestive of ischaemic heart disease was seen in a pre-anaesthetic assessment clinic in a District General Hospital. He was admitted for laser surgery of his varicose veins. He was given a narcotic and volatile general anaesthetic (by a Senior House Officer and Consultant) which included muscle paralysis and controlled ventilation of the lungs. Oximetry and capnometry were used. Twenty minutes into the operation bradycardia and hypotension were noted. Cyanosis was then observed in the upper half of the body. Cardiac arrest occurred and resuscitation (including direct defibrillation and aspiration of the heart for air) was ineffective. Autopsy showed that "the endotracheal tube was in situ" and the larynx and trachea were described as normal. There was evidence of recent haemorrhage into the wall of the right coronary artery and no evidence of pulmonary embolism (thrombus or air). There were several equipment-related matters of interest in this case. The expiratory valve on the Bain system was found to be jammed open. The capnometer became detached during movement of the laser kit. There was a faulty ventilator alarm. Observation of the patient's colour was limited by the use of eye protection goggles (see also page 270).

POSTOPERATIVE PERIOD

Table A75 (q 70)

Were there early (ie up to 7 days) complications or events after this operation?

	Deaths (n=2046*)	Index (n=2239*)
Yes	1567	200
No	440	2008
Not answered	39	31
Complications or events		
Respiratory problems	698	53
Cardiac problems	819	35
Hepatic failure	69	1
Septicaemia	237	9
Renal failure	363	7
Central nervous system failure	122	9
Other	412	113

* excludes deaths in theatre or recovery area.

NB - this can be a multiple entry

ANALGESIA

Table A76 (q 71)

Were narcotic analgesic drugs given in the first 48 hours after operation?

	Deaths (n=2046)	Index (n=2239)
Yes	1620	1084
No	383	1118
Not answered	43	37

There were no analgesic drugs given to nearly 20% of patients who died. (Some of the prescriptions were parsimonious). The absence of analgesia for index cases is less surprising since many of these procedures were unlikely to be followed by serious pain. There thus seems to be room for an increased response by anaesthetists to this unmet need.

Table A77 (q 72)
Did complications occur as a result of these analgesic methods?

	Deaths (*n*=1620)	Index (*n*=1084)
Yes	54	28
No	1540	1043
Not answered	26	13

Thirty-nine patients (deaths) were reported to have cardiorespiratory or central nervous system depression apparently aggravated by or associated with their analgesic therapy. Most of the complications amongst the index cases were nausea and/or vomiting.

Analgesia after operation

The current emphasis[10] upon the need to improve acute pain services is reflected in reports to NCEPOD. Clinical problems arise in patients who either receive too little analgesia or too much; such problems would be avoided by an increase in the availability of properly equipped and staffed high dependency units; meanwhile teams of nurses and doctors (acute pain teams) to improve provision of analgesia after surgery are being established.

Inadequate analgesia

> *An Associate Specialist in a District General Hospital anaesthetized a 62-year-old diabetic patient, who also had ischaemic heart disease, for a femoropopliteal arterial bypass graft. This lasted two and a half hours. She was discharged to the ward by a nurse. The patient died five hours later on the ward after the spinal anaesthetic. A myocardial infarction was revealed at autopsy. Papaveretum 15 mg IM was prescribed but no analgesic was recorded as administered.*

Did the absence of adequate analgesia contribute to this patient's death?

Overdose of analgesia

> *An 87-year-old woman had an urgent operation in a District General Hospital which revealed an inoperable condition. She failed to recover consciousness, after the brief (30 minutes) operation, and yet a diamorphine infusion was established and she died one hour later.*

> *Another old lady (85 years) was anaesthetized for an abdominoperineal excision of rectum by a Registrar, (7 years' experience, Part I FCAnaes) in a District General Hospital. She was thought to weigh 50kg. There was no consultation with more senior staff and no monitoring devices were used in the anaesthetic room. The operation took three hours and was uncomplicated. Pulse oximetry was not used. The anaesthetist used an epidural combined with general anaesthesia and at the end of surgery 2 mg morphine was administered through the epidural catheter. Ninety minutes afterwards the patient was discharged from the recovery room to the ward by the anaesthetist. Three hours later papaveretum 15mg IM was given! The anaesthetist did not report any adverse event to NCEPOD but the autopsy report revealed that the patient had cardiorespiratory arrest one hour after this last injection. She was resuscitated from this to a persistent vegetative state in which she died 12 days later.*

The large intramuscular dose became an overdose in the presence of epidural morphine.

> *A 76-year-old lady required an above knee amputation in a District General Hospital. A Registrar (3 years' experience, Part II FCAnaes) gave the anaesthetic without the advice of a Consultant. The patient suffered from ischaemic heart disease and diabetes mellitus and was in atrial fibrillation. Temazepam 20 mg was given as premedication and she had a spinal anaesthetic (3 ml heavy bupivacaine) with sedation by 2 mg midazolam. A total of 30 mg ephedrine was required to treat hypotension. She was discharged to the ward by a nurse at 1815 hrs. Two doses (15 mg IM) papaveretum were given after operation. She became comatose after the second dose, despite the use of naloxone. A cerebrovascular accident was diagnosed and she died 24 hours later.*

Table A78 (q 73)

Were other sedative/hypnotic drugs given?

	Deaths (*n*=2046)	Index (*n*=2239)
Yes	558	396
No	1349	766
Not answered	139	77

DEATHS

Table A79 (q 75 deaths)
Time of death

	(*n*=2191)
08.01 to 20.59	1204
21.00 to 08.00	879
Not answered	108

The frequency with which death occurs at night should be noted. It emphasises the need for special monitoring of patients who have recently had surgical operations.

Table A80 (q 76 deaths)
Place of death

	(*n*=2191)
Theatre	115
Recovery area	30
Intensive care unit	559
High dependency unit	33
Ward	1369
Home	15
Another hospital	41
Other	21
Not answered	8

Table A81 (q 77 deaths)
Did organisational factors contribute to the death?

	(*n*=2191)
Yes	59
No	2081
Not answered	51

Scrutiny of the 59 positive answers to this question reveals a series of replies which have similarity to those reported in the index questionnaires. However these replies are more forceful perhaps because the anaesthetists knew that their patient had succumbed. There were reports about the non-availability of special care areas (intensive care and high dependency), the misuse of recovery areas for over 48 hours, the distance between the recovery area and the ward and the premature discharge of patients from intensive care because of shortage of beds. These matters are described in case synopses elsewhere in this report.

There were examples when trainee staff in other disciplines failed to consult anaesthetists appropriately. Clinical mismanagement of several patients resulted; the chagrin of the anaesthetists was accompanied by realisation that the patients already had, for the most part, grave prognoses. There were occasions of failure of blood transfusion and laboratory services to respond with alacrity to an emergency (blood, clotting factors, results of arterial blood gas analyses).

> *An elective aortobifemoral bypass graft was done in a District General Hospital. A solo Consultant Anaesthetist gave the anaesthetic to this 52-year-old ASA 3 man whose ECG showed ischaemic changes. The patient had a combined general and lumbar epidural anaesthetic. He breathed nitrous oxide and enflurane spontaneously through a tracheal tube. 15 litres of colloid and crystalloid solutions and 6 units of plasma reduced blood were administered during the seven hour procedure. A subclavian venous line and an arterial line were established three hours after the operation started. The patient developed ventricular tachycardia, which proceeded to cardiac arrest in the recovery room, and he died during the preparation for transfer to the ward. The organizational deficiencies included the fact that the Consultant General Surgeon operates for one afternoon each week at this hospital, the intensive care units at this and the neighbouring hospital were full, the recovery room closes at 2000 hours, a solo ODA covers three operating rooms after 1700 hours, and the Consultant Anaesthetist had worked 12.5 hours continuously!*

Two other death questionnaires included factors which the anaesthetists considered for no apparent reason to be organizational.

> *An 88-year-old man needed a laparotomy for intestinal obstruction in a District General Hospital. His recovery was delayed and he required a tracheostomy. The immediately apparent cause of death was related to the presence of a nasogastric tube in the respiratory tract. The coroner's autopsy was not released to the clinicians and an inquest is pending.*

> *Three days after resection of an abdominal aortic aneurysm the nasogastric tube was found in the right main bronchus of a 64-year old man. Aspiration pneumonia developed and he died eight days later in a University Hospital.*

The absence of proper nursing care in these two cases was considered to be an organizational matter because the anaesthetists believed that deployment of skilled nurses to these patients would have resulted in the earlier discovery of this complication.

Table A82 (q 78 deaths)
Do you have morbidity/mortality review meetings in your department?

	(*n*=2191)
Yes	2032
No	137
Not answered	22

This case discussed at departmental meeting?

Yes	622
No	1374
Not answered	36

The case report below includes a number of points which could be discussed at a meeting and mechanisms for improvement at least suggested.

> *A locum Senior House Officer anaesthetized an 89-year-old man in a District General Hospital. There was no consultation before, during or after the operation which took place between 2335 and 0300 hours. The Registrar surgeon consulted his Consultant before performing a hemicolectomy. The patient died within 24 hours in cardiac failure. Morbidity and mortality meetings are not held.*

How will the department ever realise its deficiencies?

Table A83
Hospital type in which deaths occurred but which did not hold morbidity/mortality meetings

	(*n*=137)
District General Hospital	103
University Hospital	19
Single Surgical Specialty	3
Defence Medical Services	1
Independent	7
Other	4

Most of these hospitals (ie excluding the independent ones) should not be approved for training by the College of Anaesthetists: maybe they are not. (NCEPOD does not know what proportion of all hospitals these reports represent).

INDEX CASES

Table A84 (q 75 index)
Was the date of discharge later than anticipated?

	(*n*=2241)
Yes	127
No	1977
Not yet discharged	13
Not applicable (died)	24
Not answered	100

Table A85 (q 76 index)
To which destination was the patient discharged?

	(*n*=2241)
Home	2065
Another hospital	36
Convalescent home	20
Rehabilitation	3
Other	18
Not yet discharged	13
Not applicable (died)	24
Not answered	62

The death rate amongst index cases was just over 1% which is, considering the nature of the population of index cases, somewhat higher than might be expected.

Table A86 (q 77 index)
Were there problems of organization in connexion with this case?

	(*n*=2241)
Yes	51
No	2073
Not answered	117

The brief accounts (42) given by anaesthetists in connexion with the 51 positive answers are very revealing. Many of them are long-standing problems which have ceased to exist in hospitals elsewhere. Nevertheless they still have irritating effects on professionals and inhibit their efficient work. They must be serious if anaesthetists want to report them to NCEPOD.

The arbitrary *modification of published lists* resulted in some anaesthetists being unable to visit their patients before operation. Operating lists should not be amended after publication and distribution except in dire emergencies[11]. Some lists were not published until one hour before the time of commencement. A variation on the theme of late arrivals of surgeons was the observation that one Consultant Surgeon was unavailable during office hours: a case was done out of hours and as a result the anaesthetist had to work without any assistance, not even an automatic ventilator!

Another organizational defect confirmed by this report is the necessity for anaesthetists and surgeons to *travel some distance* between hospitals during the day. Periodically lists start late as a result of this and, more importantly, some patients are ill-prepared for anaesthesia because no-one has been able to see them beforehand.

The *absence of interpreters* and the consequent difficulty with assessment was mentioned on three occasions. Operations were *cancelled* because of lack of ward beds or beds on intensive care unit. *Sluggish delivery* of blood for transfusion or of results of laboratory tests were also noted.

Table A87 (q 78 index)
Do you have audit meetings in your department?

	(*n*=2241)
Yes	1960
No	237
Not answered	44

Table A88 (q 79 index)
Do you have meetings combined with other disciplines?

	(*n*=2241)
Yes	1375
No	816
Not answered	50

Sixty-one per cent of respondents to questionnaires stated that there are combined meetings in their hospital. There are probably many cases of double reporting of *hospitals*; nevertheless this is an encouraging trend.

DISCUSSION

The Report confirms the high quality overall of the provision of anaesthesia in the United Kingdom. The emphasis on avoidable features in the management of individual patients may cause the unwary reader to conclude that the standards of anaesthesia are unsatisfactory. This is *not* the case: it must be remembered constantly that the overall death rate in this series is probably similar to that reported by CEPOD (0.7%)[1]. Any failures of the delivery of anaesthesia form a small proportion of this total: about 1.5% of deaths reported in detail to NCEPOD form the bases for the vignettes with this report.

The risk of death was very high for most, but not all, of the patients who did indeed die. Direct comparison between hospitals is impossible (see page 49) and reference to the results of previous reports is not strictly valid.

Anaesthetists can be proud of the way their discipline is changing. The fact that 50% anaesthetics are conducted in the precise knowledge and (or) presence of a Consultant Anaesthetist may be acceptable to some but it is not yet ideal. The fact that more than 90% patients are seen by anaesthetists before operation must mean that the possibility of good quality medical care exists.

The apparently great improvements in the provision of equipment for monitoring patients during anaesthesia is reflected in the widespread availability of all these devices and the *cris de coeur* by anaesthetists when they are not. The routine use of those anaesthetic rooms without facilities for adequate monitoring however should be reviewed and induction of anaesthesia in operating rooms should be considered for all seriously ill patients. Improvements in anaesthetic record keeping does appear to be happening but there is still some way to go.

There is a serious need for departments (directorates, divisions) of anaesthesia to improve their organization so that the staff available is more appropriately matched to the condition of patients. It is not acceptable that very junior anaesthetists are allowed to undertake anaesthesia for very sick elderly patients. If elderly patients are to have the benefit of modern medicine and surgery then this should be provided by those most experienced in anaesthesia and surgery. In addition no ASA 4 or 5 patient should receive anaesthesia from an anaesthetist who has to work alone. Poor risk patients aged 80 years or more should be managed *as if* they were ASA 4.

Many of the less-than-satisfactory events reported here have to be mentioned in connexion with decisions by management and central authorities. These include the need for more Consultant posts in anaesthesia, the provision of special care facilities (recovery rooms, high dependency units) and the concentration of services upon one site. Unless and until these deficiencies are made good, trainees will continue to be exploited (in that too frequently they work unsupervised at a distance from their seniors) and the care of patients after surgery will be suboptimal (particularly the provision of effective analgesia). Each of these features of the provision of high quality anaesthesia have financial implications which are not part of the remit of NCEPOD but must, nevertheless, be acknowledged.

There are still hospitals which do not have audit or mortality meetings and it is to be hoped that recent events will encourage a change in attitudes so that these useful discussions occur everywhere.

One hundred per cent cooperation, that is by all anaesthetists, with NCEPOD is desirable: the fact that the overall response rate is less than this is a matter for sincere regret. Anaesthetists could perhaps encourage their colleagues (surgeon and pathologist) so that no death after operation is unreported and that for all such deaths questionnaires are completed and considered at local audit meetings. The potential use in audit meetings of items revealed in questionnaires could be exploited more widely. If this were done the degree of completion of questionnaires might also be expected to improve.

SURGERY

SURGICAL DATA ANALYSIS

The logistics of collecting the surgical data have been described in the preceding section. As the data accumulated, they were reviewed by advisers relevant to the specialty involved. The assistance of these advisers (listed on pages 25 and 26) is gratefully acknowledged.

The decision as to which advisers should review the questionnaire was dictated by the final operation reported. However, this operation, as reported to NCEPOD, is often the last in a series of multiple procedures. The first operation and its subsequent complications may have precipitated the sequence but, unfortunately, the design of the 1990 questionnaire is such that this information is not provided. A Consultant Surgeon wrote to the Enquiry regarding a death under his care and stated that,

> *".......Tracheostomy was carried out perfectly well by the registrar. It was the preceding Consultant operation which was the cause of death"*

It was sometimes necessary for more than one specialist group to review the case, where there was an obvious sequence of events involving multiple operations and different specialties.

This section of the report deals with the replies received. The pertinent information relating to each specialty has been abstracted from the questionnaires and is presented as a commentary for each discipline (see Contents list, page 129). As a result of this approach, only relevant tables are included.

Reviews of operation notes and post mortem records are handled in two separate sections.

Introduction

The aim of NCEPOD is to enquire into clinical practice and identify remediable factors in the practice of anaesthesia and surgery (Protocol, Appendix B). Our intention is to identify deficiencies in patient care and encourage improvement where indicated.

Our conclusions and recommendations are only as good as the information received. The majority of questionnaires submitted have been diligently completed. Unfortunately a small proportion of questionnaires has been found to be inadequately completed and to be accompanied by remarks which suggest that the surgeons resent the paperwork. Audit is an activity to be fitted into an already busy timetable. National CEPOD stands separately from other local and national audit programmes and inevitably adds to the Consultant workload. Despite this the majority of Consultants participate in NCEPOD.

Reports from NCEPOD are designed to produce changes which will improve clinical care and benefit our patients. Surgeons and anaesthetists will feel more commitment to NCEPOD, and ownership of the conclusions and recommendations contained in this report, if they recognise that the report is based on the analysis of their own honest information. The production of this report has been guided by surgical and anaesthetic peers recommended from within the profession. This national, confidential audit belongs to our profession and with its support we hope to continue to encourage and promote the maintenance of a standard of care in which we all feel pride.

General comments on remediable factors in clinical practice

Throughout this report remediable factors in clinical practice have been identified. However, there is no instant panacea for these problems. It is necessary to remember that surgeons and anaesthetists are human beings and suffer from human frailties. Thus errors of judgement and mistakes will be made - they are a fact of life. A fact that should be borne in mind before leaping to conclusions and criticisms. Surgery and anaesthesia might be a more exact science but for the limitations of human performance. Most surgeons have shown their competence many times over and this is borne out by the figures in this report.

More detailed analysis of the facts in this report shows that a small number of deaths occurred when:

a) Surgeons were operating outside their field of expertise.
b) Inexperienced and too junior surgeons were operating without adequate supervision.
c) Patients were in an inappropriate unit and should have been referred.
d) Action was taken too hastily or, conversely, too late.
e) The surgeon demonstrated poor judgement either in the assessment of the patient or during the operation and subsequent events leading to the death. Judgement in patient care is based on knowledge, skill and experience (which stems from regular exposure to the management of the disease). A confusion of any of these factors will contribute to poor judgement. Thus an inappropriate grade of surgeon or a surgeon operating beyond his competence will carry a higher risk of an unsatisfactory outcome. Judgement can also be influenced by stress and human traits such as personality, temperament and other behavioural aspects. These are difficult to audit but explain many of the wide variations in approaches and outcome.

Examples of poor judgement would include;

* intervening unnecessarily.
* doing too much or too little.
* reacting too late or too early.
* inactivity when action was needed.
* attempting a complicated procedure when a simpler procedure might be life-saving and humane.
* allowing others to pressurise the surgeon.

f) The surgical procedure was, in the opinion of our advisers, inappropriate. By this we mean that;

* the wrong procedure was chosen for the condition.
* the operation was unnecessary as the condition was not severe enough to warrant it.
* the operation was bound to be unsuccessful as the disease process was too advanced.
* the operation was unsafe as the risks were unacceptably high.
* in the circumstances, there was unwarranted use of resources.

g) Supporting facilities on the chosen site were inadequate.

CONTENTS - SURGERY

The data are presented in tables which refer to the question number in the surgical questionnaire (reproduced as Appendix D).

OPERATION NOTES

Medical records and operation notes are fundamental for surgical care and the audit of surgical services.

A random selection of 1028 surgical questionnaires (40% of the total number received) was used to review the content of the operation notes submitted and to compare these with the recommendations made by the Clinical Audit and Quality Assurance Committee of the Royal College of Surgeons of England[12].

Table S1
Copy of operation notes returned with surgical questionnaire (deaths)

	(*n*=1028)	
Yes	989	(96%)
No	39	(4%)

Table S2
Analysis of operation notes

	(*n*=989)		
	Yes	No	Not applicable
Name of operating surgeon	851	138	-
Name of anaesthetist	686	295	8
Name of Consultant responsible	434	555	-
Diagnosis	457	532	-
Procedure performed	966	23	-
Description of findings	877	112	-
Details of tissue removed, altered or added	794	87	108
Details/serial number of prosthesis	124	166	699
Details of sutures/staples	721	166	102
Description of difficulties/ complications	747	225	17
Immediate postoperative instructions	389	557	43
Identifiable signature	733	256	-

Results

Four per cent of the questionnaires reviewed were not accompanied by operation notes although invariably the answer to Question 97 "Have you enclosed a copy of the surgical operation notes?" was ticked in the affirmative. It may be that the task of photocopying the operation notes was delegated to a secretary or junior surgeon. Ultimately, however, it must be the responsibility of the Consultant in charge to check that all documents are included for return to NCEPOD. The notes were assessed for the following content:

The name of the operating surgeon/s

This is essential for medicolegal reasons and also for the completion of log books by the trainees. Fourteen per cent (138) operation notes did not identify the name of the operating surgeon.

Name of anaesthetist

The surgical authors of this report did not look further into the anaesthetic notes but recommendations regarding essential information and content of these was made in the document referred to above[12]. Thirty per cent of surgical operation notes failed to name the anaesthetist involved.

The name of the Consultant responsible for the case

Again the necessity for this information is self-evident. However in 30% of cases the Consultant in charge was not identified.

The clinical diagnosis made

This could either be a statement of the indication for surgery or a clear and separate recording of the established operative diagnosis. Less than half the notes (46%) contained a clear statement which indicated the diagnosis. With a little imagination and creativity it was possible to arrive at a diagnosis but such an approach is liable to wide error - even in the hands of experienced coding clerks!

The procedure performed

An accurate description of the procedure done is important for continuity of patient management, coding, subsequent clinical review and surgical audit. This was usually well documented (98%).

A description of the findings at operation

The findings were often vividly and artistically described. However it was noticeable that certain specialties had a tendency to curt and uninformative operation notes.

Description of tissue removed, altered or added

Details of tissue sent for histology or microbiology, anatomical rearrangements, transplants etc were reasonably well described.

The details and, where applicable, serial numbers of prostheses

There were 290 cases where prosthetic details might reasonably have been recorded. In only 124 (43% of the relevant group) operation notes was there any record. We were very lenient here. Simple descriptions of plates and screws (eg hexagonal or Phillips) were acceptable. For individual prostheses e.g. cardiac valves and vascular prostheses, details of type, construction and the manufacturer's "peel-off" stickers were all acceptable. If prosthetic complications or manufacturing problems arise then the operating record and/or theatre operation log book may be the only source of information regarding specific prostheses.

Details of sutures/staples used

The majority of surgeons recorded the materials used but often emphasis was given to skin closure with little or no detail of the methods used for anastomoses or repairs.

An accurate description of any difficulties or complications encountered and how these were overcome

The majority (75%) of notes contained good descriptions of problems or complications.

Immediate postoperative instructions

Written instructions on the operation notes may be the only permanent communication between the surgeon and ward team (especially during busy and emergency sessions). These instructions lay down a policy for the management of the patient and should not be overlooked. The low percentage (39%) of operation notes containing details for the subsequent management of a patient is alarming. This is an area in which there could be improvement.

A signed note

A quarter of operation notes were unsigned.

An omission

The recommendations of the Royal College of Surgeons do not list inclusion of the *date* of operation. It is clearly an essential piece of information and all operation notes must be accurately dated.

Conclusions

There was considerable variability in quality; cardiothoracic notes being exemplary whereas some orthopaedic/trauma notes were untidy one-liners. There is scope for improving the manner in which operative intervention is documented. In particular there is need for improved communication and the provision of concise instructions for the postoperative care of patients.

REVIEW OF SAMPLED DEATHS

National CEPOD received notification of 18817 deaths. The deaths selected for more detailed study were a random sample of one in five cases. The tables which follow summarise data from the 2558 surgical questionnaires reviewed. The questionnaire is reproduced in Appendix C.

Table S3 (q 1)

Specialty of Consultant Surgeon in charge at time of operation.

	(*n*=2558)
Accident and Emergency	6
Cardiothoracic surgery	73
General surgery	1623
Gynaecology	141
Neurosurgery	94
Ophthalmology	6
Oral/Maxillofacial	3
Orthopaedic and trauma surgery	414
Otorhinolaryngology	29
Plastic surgery	11
Urology	107
Not answered	51

The definition of the surgeon's specialty or special interest can be very difficult.

The table above shows a preponderance of general surgeons. This hides the fact that many general surgeons have a special interest eg vascular surgery, colorectal surgery. In many cases, these special interests are based on informal training, as at present no specialist sub-divisions of general surgery are officially recognised. The tables at the beginning of each sub-section will give a clearer indication of the manner in which surgeons perceive their special interests.

Table S4 (q 2)

In which type of hospital did the last operation take place?

	(*n*=2558)
University	449
District General (with undergraduate teaching)	1276
District General	717
Community	3
Specialty	66
Defence Medical Services	11
Independent	29
Other	7*

* Other acute general (3)
Regional departments (2)
Special Health Authority
Surgical nursing home

This table should not be considered out of context for two reasons. First, the cases analysed were a random sample and, second, the number of deaths depends on the quantity and workload of each type of hospital.

Table S5 (q 4)

Age at final operation

(The sample excluded patients below the age of 11 years.)

	(*n*=2558)
11 to 19	19
20 to 29	20
30 to 39	32
40 to 49	76
50 to 59	191
60 to 69	563
70 to 79	847
80 to 89	661
90 to 99	146
100	3

Sixty-five per cent of cases were over 70 years of age. The surgical procedures involved are listed in detail in the relevant specialty sections.

Table S6 (q 5)
Sex of patient

	(*n*=2558)
Male	1408
Female	1150

Table S7 (q 8)
To which ethnic group did the patient belong?

	(*n*=2558)	
White	2517	(98%)
West Indian/Guyanese	9	
Indian/Pakistani/Bangladeshi	17	
Chinese	-	
African	-	
Arab	3	
Mixed origin	2	
Other	2	
Not answered	8	

This table shows no surprises in view of the racial mix in the United Kingdom. There would appear to be no excess morbidity among the non-white population.

Table S8 (q 9)
Did any outpatient investigations impose an undesirable delay in setting a date for surgery?

(Elective admissions only)

	(*n*=718)
Yes	13
No	696
Not answered	9

The necessity for outpatient investigations imposed an undesirable delay in less than 2% of cases. In no case did the advisers feel that such delay contributed to an unfavourable outcome.

Table S9 (q 10)
Initial admission intention for the last operation performed.

	(*n*=2558)
Elective	718
Urgent	507
Emergency	1326
Not answered	7

As expected, urgent and emergency admissions leading to death within 30 days constitute a significant workload for surgeons. Seventy-two per cent of patients in this sample were admitted urgently or as emergencies.

Table S10 (q 11)
Source of referral

	(*n*=2558)
General Practitioner	1067
A/E department	471
Self-referral by patient	25
Transfer from - other specialty	589
- own specialty	99
- other hospital	224
Other	65
Not answered	18

Table S11 (q 17)
Day of admission

	(*n*=2558)
Weekday (ie Monday to Friday)	2002
Weekend (ie Saturday or Sunday)	485
Admission date not answered	71
Public Holiday	26
Extra-statutory Holiday (NHS)	1

The number of admissions during weekends and holidays is proportionately smaller than during weekdays. Nevertheless surgeons wrote in highlighting problems which had occurred during such periods. These are discussed in the appropriate specialty sections.

Table S12 (q 18)
Was the patient transferred from another department within the hospital where the operation took place?

	(*n*=2558)
Yes	629
No	1919
Not answered	10

This highlights the fact that at least 25% of patients requiring acute surgical care originate in non-surgical wards.

Table S13 (q 19)
If this was an urgent or emergency case, was there any delay in referral on this occasion?

	(*n*=1833)
Yes	67
No	1610
Not answered	56
Delay	
Doctor related	85
Patient related	58
Other	26

NB - this can be a multiple entry

There was a delay in referral for surgery in 9% of cases. Of these, 51% were due to a doctor related delay (often a failure by other specialties to recognise the urgency of an acute surgical problem).

Table S14 (q 20)
Was there any delay in *admitting* the patient?

	(*n*=2558)
Yes	84
No	2416
Not answered	58
Delay	
Lack of resources	36
Surgical staff committed elsewhere	4
Non-medical staff shortages	3
Other	44
Did this delay affect the outcome?	
Yes	25
No	56
Not answered	3

The main single reason for delayed admission was lack of beds. This was a factor in the poor outcome in only 25 cases.

Table S15 (q 21)
Had this patient's admission ever been cancelled on a previous occasion as a result of a lack of resources (i.e. not a patient imposed delay)?

	(*n*=2558)
Yes	13
No	2347
Not answered	198

Table S16 (q 22)
Was the outcome in this case altered by the time spent on the waiting list?

(Elective admissions only)

	(*n*=718)
Yes	10
No	624
Not answered	84

Nine of the patients in the positive answers were waiting for coronary artery bypass grafts. The clinician commented in each case that the patient's myocardial status had deteriorated during the waiting time (up to 10 months).

Table S17 (q 23)
If the admission was from a waiting list, was the patient's category or degree of urgency appropriate (bearing in mind subsequent events)?

(Elective admissions only)

	(*n*=718)
Yes	363
No	26
Not answered	329

Table S18 (q 25)
Was the patient transferred as an inpatient from another hospital?

	(*n*=2558)
Yes	313
No	2238
Not answered	7

From

non-NHS hospital	8
same District (or Health Board)	153
same Region	104
outside Region	18
overseas	2
other	5
Not answered	23

Table S19 (q 26)
Type of referring hospital (transferred cases only)

	(*n*=313)
University	33
District General (with undergraduate teaching)	94
District General	95
Community	36
Specialty	19
Defence Medical Services	3
Independent	6
Other	14
Not answered	13

It is frequently necessary to transfer patients to specialist units or to those with better facilities e.g. an intensive care unit. When we look at the deaths sampled, 12% (313) were transferred.

Table S20 (q 28)
Did the patient's condition deteriorate during transfer?

	(*n*=313)
Yes	23
No	276
Not answered	14

The transfer of unstable, ill patients is always difficult. The fact that only 7% (23) patients deteriorated during transfer is a credit to all involved, bearing in mind the severity of the conditions necessitating referral and the likelihood that these patients would not have survived otherwise.

Table S21 (q 31)

To what type of area was the patient first admitted?

	(*n*=2558)
Medical ward	402
Surgical ward	1494
Mixed medical/surgical ward	38
Gynaecological/obstetric ward	36
Admission ward	33
Day unit	3
High dependency unit	28
Intensive care unit	63
A/E holding area	163
Direct to theatre	81
Other	173
Not answered	44

Table S22 (q 32)

Was the site of admission appropriate for the patient's condition?

	(*n*=2558)
Yes	2460
No	77
Not answered	21

See comments for individual specialties.

Table S23 (q 33)
Was care undertaken on a formal shared basis with another specialty?

	(*n*=2558)
Yes	609
No	1911
Not answered	38

This attempted to answer the question: "How much medical input is there in the care of surgical patients?". The question cannot be answered definitely for all surgical situations but there are circumstances in which advice from other doctors might supplement that from anaesthetists and surgeons with a commensurate improvement in outcome (e.g. see orthopaedic surgery section).

Table S24 (q 34)
Who made the working diagnosis?

	(*n*=2558)	(Locums)
General Practitioner	423	(5)
House Officer	439	(8)
Senior House Officer	825	(21)
Registrar	1025	(55)
Senior Registrar	360	(27)
Associate Specialist	72	(8)
Consultant	1535	(36)
Other	47	(1)
Not answered	22	

Table S25 (q 35)
Which grade of surgeon made the final decision to operate?

	(*n*=2558)	(Locums)
Senior House Officer	34	(-)
Registrar	361	(24)
Senior Registrar	214	(21)
Associate Specialist	35	(2)
Consultant	1894	(60)
Other	9	(-)
Not answered	11	

Consultants were involved in the decision-making in 74% of cases. The involvement of experienced surgeons increases to 83% if Senior Registrars are included.

Table S26 (q 36)

Grade of the most senior surgeon consulted before operation.

	(*n*=2558)	(Locums)
Senior House Officer	11	(-)
Registrar	186	(11)
Senior Registrar	151	(15)
Associate Specialist	35	(1)
Consultant	2143	(67)
Other	6	(-)
Not answered	26	

Experienced opinion was sought from Consultants in 84% of cases. Conversely there were 242 (9%) operations undertaken without Consultants or Senior Registrars being consulted pre-operatively.

Table S27 (q 37)

Please record all surgical staff who took history before operation but after admission.

	(*n*=2558)	(Locums)
House Officer	1465	(17)
Senior House Officer	1512	(20)
Registrar	1460	(57)
Senior Registrar	514	(34)
Associate Specialist	85	(10)
Consultant	1456	(45)
Other	38	(1)
Not answered	20	

Table S28 (q 38)

Please record all surgical staff who examined the patient before operation but after admission.

	(*n*=2558)	(Locums)
House Officer	1447	(16)
Senior House Officer	1566	(22)
Registrar	1587	(58)
Senior Registrar	583	(36)
Associate Specialist	96	(8)
Consultant	1701	(54)
Other	30	(-)
Not answered	14	

Table S29 (q 41)
Other identified diagnoses at time of final surgery.

	(*n*=2558)
Respiratory	874
Cardiac	1180
Neurological	378
Endocrine	241
Alimentary	406
Renal	350
Musculoskeletal	305
Haematological	234
Psychiatric	152
Alcohol-related problems	47
Drug addiction	9
Other	381
Not known	59
None	306

Table S30 (q 42)
ASA Class

	(*n*=2558)
1	135
2	628
3	669
4	723
5	213
Not answered	190

Table S31 (q 42)
ASA Class by specialty of procedure

	ASA Class					
Specialty	**1**	**2**	**3**	**4**	**5**	**Not answered**
Cardiac	8	16	18	46	10	5
General	47	276	321	358	107	79
Gynaecology	4	19	12	7	-	2
Neurosurgery/spinal	10	23	9	23	24	8
Opththalmology	1	1	-	-	-	4
Oral/Maxillofacial	1	1	-	-	-	-
Orthopaedic	34	145	122	59	9	51
Otorhinolaryn'y	5	6	9	13	1	2
Plastic	2	1	5	2	-	1
Thoracic	4	15	6	11	4	1
Urology	14	48	51	35	4	9
Vascular	5	76	116	169	55	28

The ASA class expresses the physical condition of the patient. Patients in ASA classes 1 and 2 should survive surgery, patients in ASA 5 have a very small chance of survival. Sixty-three per cent of patients were in ASA classes 3 to 5. These patients were also elderly (65% over 70 years of age, Table S5) and suffering from serious acute illnesses. Thus in many cases death was inevitable. It is of concern that patients in ASA classes 1 and 2 died, but these deaths must be interpreted in the light of the severity of the presenting disease. ASA classes are defined in the glossary (Appendix A). A comparison of ASA classes between the two disciplines is shown in the anaesthesia section (page 79).

Table S32 (qs 42/43)
ASA Class/Anticipated risk of death

	ASA Class					
	1	**2**	**3**	**4**	**5**	**Not answered**
Risk						
Not expected	76	144	55	36	7	37
Small, significant risk	33	281	196	71	5	40
Definite risk	21	185	394	532	77	77
Expected	3	2	8	70	122	17
Not answered	2	16	16	14	2	19

The majority of patients had poor ASA classes and definite risks attached to the proposed surgery.

Table S33 (qs 42/54)
ASA Class/Classification of operation

Classification of operation	**ASA Class** **1**	**2**	**3**	**4**	**5**	**Not answered**
Emergency	11	39	52	187	129	37
Urgent	20	216	341	325	61	81
Scheduled	58	272	239	185	22	49
Elective	46	100	35	24	-	21
Not answered	-	1	2	2	1	2

Table S34 (q 43)
What was the anticipated risk of death related to the proposed operation?

	(*n*=2558)
Not expected	355
Small but significant risk	626
Definite risk	1286
Expected	222
Not answered	69

Nine per cent (222 cases) of the survey were expected to die at the time of the surgery and 213 were described as ASA 5. What was the expected benefit in these cases?

Table S35 (q 44)

What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=2558)
Pulse rate recording	2524
Blood pressure recording	2517
Respiratory rate recording	2080
Temperature	2396
Central venous pressure measurement	608
Gastric aspiration	797
Intravenous fluid	1781
Correction of hypovolaemia	1085
Blood transfusion	560
Antibiotics	1510
Oxygen therapy	957
Airway protection ie in head injuries	87
Tracheal intubation	441
Mechanical ventilation	362
Stabilisation of fractures	173
Stabilisation of cervical spine	16
Nutritional support	154
Vitamin K	96
DVT prophylaxis	682
Others	242
None	18

Table S36 (q 45)

Do you think the patient's medication (excluding premedication) was relevant to the outcome?

	(*n*=2558)
Yes	140
No	2352
Not answered	66

Despite the 140 positive replies, the advisers did not feel that further general comment was required. Some specific comments are made in the clinical vignettes given for individual specialties.

Table S37 (q 46)
Day of operation.

	(*n*=2558)
Monday	384
Tuesday	438
Wednesday	449
Thursday	453
Friday	420
Saturday	234
Sunday	180
Public holiday	36
Extra-statutory holiday (NHS)	8

Deaths are recorded after surgery on every day of the week and at weekends.

Table S38 (q 47)
Grade of the most senior operating surgeon

	(*n*=2558)	(Locums)
House Officer	1	(-)
Senior House Officer	88	(2)
Registrar	702	(67)
Senior Registrar	366	(43)
Associate Specialist	40	(4)
Consultant	1341	(60)
Other	14	(-)
Not answered	6	

Table S39 (q 49)
If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=1217)
Yes	387
No	799
Not answered	31

Consultants or Senior Registrars operated in 67% (1707) cases. This is an improvement on the figures in the CEPOD report[1] which reported that 47% of procedures were performed by Consultants. In addition a more senior surgeon was immediately available in a further 387 cases, bringing the involvement of experienced surgeons to 82 per cent.

The House Officer (in Table S38) performed a thoracic paracentesis supervised by a Consultant.

Consultant availability is desirable, even in the presence of well-trained and experienced surgical trainees. This comment is particularly pertinent for revisional surgery and complex procedures in patients with severe clinical problems. The expertise is only found at Consultant and Senior Registrar level. Even if well-trained juniors are operating, the Consultant still carries the responsibility for treatment and should be able to provide adequate cover and supervision for his trainees[13]. To do this the Consultant must ensure he is easily accessible to give advice and help.

Table S40 (q 54)

Classification of the operation (percentage)

	(*n*=2558)	
Emergency	455	(18)
Urgent	1044	(41)
Scheduled	825	(32)
Elective	226	(9)
Not answered	8	

Most deaths are recorded after emergency and urgent operations. True emergency surgery for conditions requiring immediate intervention eg ruptured aortic aneurysms or abdominal trauma, accounts for 18% of the total surgical workload sampled. Urgent work accounts for 41 per cent. Taken together 59% of all surgery requires expeditious access to an operating theatre. These are similar percentages to those reported by CEPOD[1].

Delay in operation

There were 171 positive responses to question 55 commenting that delays were due to factors other than clinical. Further comment is included, where appropriate, in the sections on specialties.

Table S41 (q 58)

Was the time taken acceptable?

	(*n*=2558)
Yes	2411
No	45
Not answered	102

Table S42 (q 59)

Were there any unanticipated intra-operative problems?

	(*n*=2558)
Yes	479
No	2041
Not answered	38

Table S43 (q 60)

Was local/regional anaesthesia or sedation administered by a surgeon at any time during this operation?

	(*n*=2558)
Yes	204
No	2346
Not answered	8

Table S44 (q 61)

If local/regional anaesthesia was administered by a surgeon, was any other drug administered with the local anaesthetic?

	(*n*=204)
Yes	75
No	117
Not answered	12

Table S45 (q 62)

If the procedure was performed *solely* **under local anaesthetic or sedation** *administered by the surgeon*, **which of the following were recorded during or immediately after the procedure?**

	(*n*=163)
Blood pressure	128
Pulse	143
ECG	70
Pulse oximetry	72
Other	7
None	9

Forty-four of the cases in table S45 were femoral embolectomies; 35 were endoscopies.

Table S46 (q 63)

Were facilities for resuscitation, including airway management, immediately available during this procedure?

	(*n*=163)
Yes	155
No	1
Not answered	7

The use of monitoring during procedures under local or regional anaesthesia (with or without sedation) is to be recommended. This is still not the practice of all surgeons.

Table S47 (q 64)
Which of the following are available in the hospital in which the operation took place?

	(*n*=2558)
Theatre recovery room	2330
Adult intensive care unit	2208
Adult high dependency unit	683
Not answered	32

Most hospitals reported having facilities for some physiological support and high dependency care. However, surgeons are still required to deal with seriously ill patients in hospitals without *adequate* provision. Cases highlighting deficiencies and problems are detailed in the specialty sections.

Table S48 (q 65)
Was the patient admitted *immediately* to an ICU or HDU postoperatively?

	(*n*=2386)*
Intensive care unit	776
High dependency unit	124
Neither	1484
Not answered	2

* excludes patients who died in theatre or the recovery area.

Table S49 (q 65A)
Were the ICU/HDU facilities adequate?

	(*n*=900)
Yes	859
No	11
Not answered	30

Table S50 (q 66)
Were you at any time unable to transfer the patient into an ICU/HDU within the hospital in which the surgery took place?

	(*n*=1486)
Yes	54
No	1350
Not answered	82

Many of the cases where Consultants were unable to transfer a patient to an intensive care unit or high dependency unit are discussed elsewhere in the report. The important point is that more and more patients are needing such services but the provision does not appear to be expanding parallel to the increasing requirements of surgeons and anaesthetists.

Table S51 (q 67)
What were the indications for the admission to ICU/HDU?

	(*n*=900)
Specialist nursing	668
Presence of experienced intensivists	483
General monitoring	758
Metabolic monitoring	293
Ventilation	624
Surgical complications	112
Anaesthetic complications	78
Coincident medical diseases	262
Inadequate nursing on general wards	59
Transfer from hospital without facilities	17
Other	57
Not answered	2

The need for specialist nursing skills highlights the requirement for an increased number of high dependency units (HDUs).

Table S52 (q 68)
Discharge from ICU/HDU due to:

	(*n*=900)
Elective transfer to ward	260
Pressure on beds	14
Deaths	609
Other	10
Not answered	7

Table S53 (q 60)
Was the patient subsequently ***re-admitted*** **to an ICU/HDU?**

	(*n*=119)*
Yes	63
No	56

* excludes patients who died in theatre, recovery area or ICU/HDU to which admitted immediately postoperatively.

Table S54 (q 70)
Was the postoperative period complicated by:

	(*n*=2386)*
Haemorrhage/postoperative bleeding requiring transfusion	266
Upper respiratory obstruction	42
Respiratory distress	805
Generalised sepsis	349
Wound infection	108
Wound dehiscence	58
Anastomotic failure	54
Low cardiac output	796
Hepatic failure	141
Renal failure	574
Endocrine system failure	32
Stroke or other neurological problems other than head injury	171
Persistent coma	110
Other organ failure	151
Problems with analgesia	34
DVT and/or pulmonary embolus	129
Fat embolus	2
Orthopaedic prosthetic complications	9
Pressure sores	73
Peripheral ischaemia	88
Urinary tract infection	71
Urinary retention	60
Nutritional problems	160
Other problems	338
None of the above	363

* excludes patients who died in theatre or the recovery area.

It must be appreciated that deep venous thromboses and pulmonary embolism are two distinct entities and that the ability to detect and prevent venous thromboses may have little bearing on the incidence of pulmonary emboli. The questionnaire did not distinguish between the two.

Confirmed thromboembolic problems occurred in less than 1% (129) of cases.

Table S55 (q 71)
Was mechanical ventilation employed?

	(*n*=2386)
Yes	776
No	1539
Not answered	71

Complications

	(*n*=776)
Yes	25
No	729
Not answered	22

Table S56 (q 72A)
Day of death

	(*n*=2558)
Weekday	1839
Weekend	702
Public holiday	16
Extra-statutory holiday (NHS)	1

Table S57 (q 73)
Place of death

	(*n*=2558)
Theatre	132
Recovery area	40
Ward	1583
ICU/HDU	709
Home	19
Another hospital	47
Other	20
Not answered	8

Table S58 (q 74)
Was cardiopulmonary resuscitation attempted?

	(*n*=2386)*
Yes	457
No	1902
Not answered	27

*excludes patients who died in theatre or recovery area.

Resuscitation was not attempted in many cases due to a prior clinical decision regarding the futility of such action.

Table S59 (q 88)

Has this death been considered at a local audit/quality control meeting?

	(*n*=2558)
Yes	1635
No	403
Not answered	520

Sixty-four per cent of deaths were discussed at audit meetings. This is a considerable improvement on the situation in 1985/86 when approximately 46% were discussed[1].

Table S60 (q 89)

Was there a shortage of personnel in this case?

	(*n*=2558)
Yes	121
No	2437
Personnel	
Consultant surgeons	5
Trainee surgeons	13
Consultant anaesthetists	25
Trainee anaesthetists	11
Skilled assistants	19
Nurses	32
Operating Department Assistants	32
Porters	22
Other	12

Shortages of personnel occurred in 121 cases. Some discussion of these problems is contained in the specialty sections.

Table S61 (q 91)

Did any organisational aspects, lack of resources or any other non-clinical factors contribute to the fatal outcome?

	(*n*=2558)
Yes	95
No	2287
Not answered	176

Table S62 (q 92)
Who completed this questionnaire?

	(*n*=2558)
House Officer	61
Senior House Officer	343
Registrar	742
Senior Registrar	276
Associate Specialist	27
Consultant	1076
Other	14
Not answered	19

Despite the suggestion that juniors should complete the form as a training exercise, 1076 Consultants (42%) felt sufficiently involved to enter the data personally. Some Consultants commented that the junior staff involved in the cases were no longer working at the hospital.

Table S63 (q 93)
Did you have any problems in obtaining the patient's notes?

	(*n*=2558)
Yes	246
No	2289
Not answered	23

Table S64 (q 94)
Were all the notes available?

	(*n*=2558)
Yes	2155
No	372
Not answered	31

Part unavailable

Pre-operative notes	17
Operative notes	27
Postoperative notes	19
Death certificate book	218
Other notes	142
Not answered	30

Table S65 (q 95)
Were the nursing notes available?

	(*n*=2558)
Yes	2305
No	101
Not answered	152

The difficulties of obtaining case notes are commented on in the first section of this report.

Problems were experienced in retrieval of notes in 10% of cases. Deficiencies and problems with storage, movement and retrieval of deceased patients' notes were highlighted in the 1987 CEPOD report[1] and again in the 1989 NCEPOD report[2]. Authorities are again urged to continuously monitor, and improve where necessary, the provision of adequate record services to support clinical and quality assurance programmes.

INDEX CASES

The data on index cases have not been divided by specialty of the procedure but are analysed in total (2680 cases). The specialties represented are:

Cardiothoracic Surgery	72
General Surgery - oesophageal	38
- abdominal	31
- hepatopancreaticobiliary	72
- colorectal	110
- hernia	115
- miscellaneous	169
Gynaecology	449
Neurosurgery (including spinal surgery)	74
Ophthalmology	245
Oral/Maxillofacial Surgery	119
Orthopaedic Surgery	461
Otolaryngology	256
Plastic Surgery	75
Urology	279
Vascular Surgery	115

Table S66 (q 1)

Specialty of Consultant Surgeon in charge at time of operation.

	(*n*=2680)
Accident and Emergency	53
Cardiothoracic surgery	78
General surgery	738
Gynaecology	443
Neurosurgery	54
Ophthalmology	243
Oral/Maxillofacial	121
Orthopaedic/Trauma surgery	432
Otorhinolaryngology	244
Paediatric surgery	36
Plastic surgery	79
Urology	133
Not answered	30

NB - this can be a multiple entry

Due to the manner by which index cases were selected (see page 24) the variety of procedures was quite different from those reported in the deaths sample e.g. the common operations in general surgery were excision of breast lump, cholecystectomy and repair of inguinal hernias. This contrasts considerably with the type of cases found in the sample of deaths. The index case sample includes 26 patients who died, giving an approximate overall death rate of less than one per cent.

Table S67 (q 2)

In which type of hospital did the operation take place?

	(*n*=2680)
University	513
District General (with undergraduate teaching)	996
District General	737
Community	21
Specialty	209
Defence Medical Services	37
Independent	94
Other	9
Not answered	64

The spread of reporting hospitals is very similar to those reporting deaths. It is pleasing to note the participation of Consultants working in independent hospitals.

Table S68 (q 4)
Age at final operation

	(*n*=2680)
Less than 1 year	51
1 to 10	360
11 to 19	173
20 to 29	286
30 to 39	315
40 to 49	321
50 to 59	301
60 to 69	393
70 to 79	337
80 to 89	133
90 to 99	10

Eighteen per cent of cases were over the age of 70 compared with 65% in the group who died.

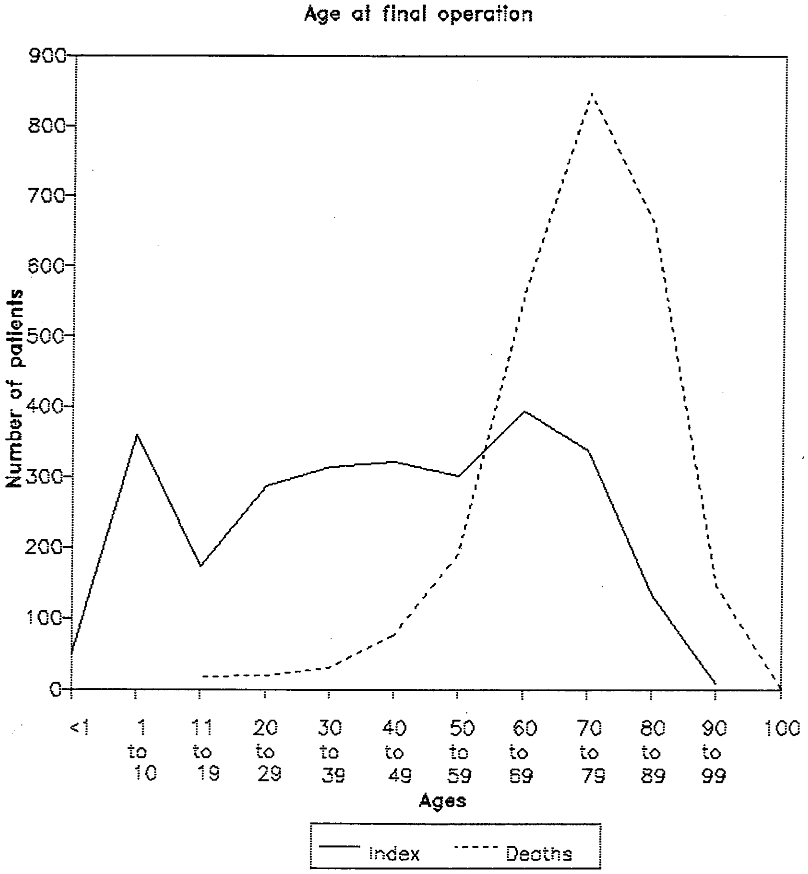

Table S69 (q 5)
Sex of patient

	(*n*=2680)
Male	1200
Female	1480

Table S70 (q 8)
To which ethnic group did the patient belong?

	(*n*=2680)
White	2542
West Indian/Guyanese	23
Indian/Pakistani/Bangladeshi	59
Chinese	3
African	3
Arab	9
Mixed origin	10
Other	15
Not answered	16

Table S71 (q 9)
Did any outpatient investigations impose an undesirable delay in setting a date for surgery?

(Elective admissions only)

	(*n*=2362)
Yes	40
No	2317
Not answered	5

Delays were mainly due to the treatment of medical conditions.

Table S72 (q 10)
Initial admission intention for the last operation performed

	(*n*=2680)
Elective	2362
Urgent	110
Emergency	200
Not answered	8

Only 12% of patients were admitted urgently or as emergencies.

Table S73 (q 11)

Source of referral

	(*n*=2680)
General Practitioner	1702
A/E department	182
Self-referral by patient	58
Other specialty	331
Own specialty	180
Transfer from other hospital	65
Other	146
Not answered	16

Table S74 (q 17)

Day of admission

	(*n*=2680)
Weekday (ie Monday to Friday)	2033
Weekend (ie Saturday or Sunday)	621
Extra-statutory holiday (NHS)	1
Admission date not answered	25

Table S75 (q 18)

Was the patient transferred from another department within the hospital where the operation took place?

	(*n*=2680)
Yes	126
No	2540
Not answered	14

Table S76 (q 19)

If this was an urgent or emergency case, was there any delay in referral on this occasion?

	(*n*=310)
Yes	27
No	262
Not answered	21

Delay

Doctor related	9
Patient related	9
Other	7
Not answered	2

NB - this can be a multiple entry

Table S77 (q20)
Was there any delay in *admitting* the patient?

	(*n*=2680)
Yes	323
No	2149
Not answered	208

Delay

Lack of resources	156
Surgical staff committed elsewhere	9
Non-medical staff shortages	10
Other	160
Not answered	5

Did this delay affect the outcome?

Yes	17
No	298
Not answered	8

The main single factor delaying admission was lack of resources. Irrespective of inconvenience and suffering for the patient, this delay actually affected the outcome in 5% of cases (17 out of 323), including two deaths. One patient ruptured an abdominal aortic aneurysm on the ward whilst awaiting elective surgery (there was insufficient operating theatre space). The other patient had an inoperable cerebral tumour and referral to the neurosurgeons was delayed.

Table S78 (q 21)
Had this patient's admission ever been cancelled on a previous occasion as a result of a lack of resources (ie not a patient imposed delay)?

	(*n*=2680)
Yes	43
No	2419
Not answered	218

Table S79 (q 22)
Was the outcome in this case altered by the time spent on the waiting list?

(Elective admissions only)

	(*n*=2362)
Yes	24
No	2196
Not answered	142

Table S80 (q 23)

If the admission was from a waiting list, was the patient's category or degree of urgency appropriate (bearing in mind subsequent events)?

(Elective admissions only)

	(*n*=2362)
Yes	1725
No	66
Not answered	571

Table S81 (q 24)

Was this patient initially intended as an elective day case?

(Elective admissions only)

	(*n*=2362)
Yes	545
No	1768
Not answered	49

Table S82 (q 25)

Was the patient transferred as an inpatient from another hospital?

	(*n*=2680)
Yes	56
No	2616
Not answered	8
From	
non-NHS hospital	4
same District (or Health Board)	22
same Region	20
outside Region	4
overseas	3
Not answered	3

Table S83 (q 26)

Type of referring hospital.

	(*n*=56)
University	7
District General (with undergraduate teaching)	20
District General	19
Community	1
Specialty	3
Independent	4
Other	1
Not answered	1

Table S84 (q 28)
Did the patient's condition deteriorate during transfer?

	(*n*=56)
Yes	1
No	53
Not answered	2

The patient who deteriorated was a 12-day-old child with a congenital diaphragmatic hernia. These children should be stabilised before transfer[2].

Table S85 (q 31)
To what type of area was the patient first admitted?

	(*n*=2680)
Medical ward	61
Surgical ward	1418
Mixed medical/surgical ward	151
Gynaecological/obstetric ward	345
Admission ward	19
Day unit	259
High dependency unit	10
Intensive care unit	4
A/E holding area	61
Direct to theatre	12
Other	250
Not answered	90

Table S86 (q 32)
Was the site of admission appropriate for the patient's condition?

	(*n*=2680)
Yes	2606
No	32
Not answered	42

In 12 cases, no explanation was given. Day case surgery would have been more appropriate in 40% of the remainder. Surgeons wrote in to emphasise the fact that, had a service been available, patients could have been admitted to a designated Day Case Unit.

Table S87 (q 33)
Was care undertaken on a formal shared basis with another specialty?

	(*n*=2680)
Yes	207
No	2417
Not answered	56

Table S88 (q 34)
Who made the working diagnosis?

	(*n*=2680)	(Locums)
Surgeons		
House Officer	83	(2)
Senior House Officer	386	(10)
Registrar	432	(29)
Senior Registrar	167	(12)
Associate Specialist/Staff Grade	80	(4)
Consultant	1875	(47)
General Practitioner/General Dental Practitioner	648	(5)
Optician/Orthoptist	16	(-)
Radiologist	4	(-)
Cardiologist	1	(-)
Physician	3	(1)
Other	47*	(-)
Not answered	29	

* Clinical Assistant/Hospital Practitioner 40
Patient's mother/Spouse 3
School Medical Officer/Occupational Health 3
Midwife 1

NB - this can be a multiple entry

Seventy per cent of diagnoses were made by Consultant Surgeons and 24% by General Practitioners.

Table S89 (q 35)
Which grade of surgeon made the final decision to operate?

	(*n*=2680)	(Locums)
House Officer	1	(1)
Senior House Officer	96	(4)
Registrar	199	(18)
Senior Registrar	111	(6)
Associate Specialist/Staff Grade	39	(-)
Consultant	2188	(41)
Clinical Assistant	27	(-)
Other	1*	(-)
Not answered	18	

* Senior Community Dental Officer

Consultants made the decision to operate in 82% of cases. This increases to 86% if Senior Registrars (as experienced surgeons) are included. The House Officer was involved with a dental trauma case, for which surgery was performed by a Registrar with Consultant supervision.

Table S90 (q 36)

Grade of the most senior surgeon consulted before operation

	(*n*=2680)	(Locums)
Senior House Officer	59	(3)
Registrar	132	(12)
Senior Registrar	97	(9)
Associate Specialist/Staff Grade	28	(-)
Consultant	2305	(47)
Clinical Assistant	18	(-)
Other	1*	(-)
Not answered	40	

* Senior Community Dental Officer

Experienced opinion was sought from Consultants in 86% of cases (90% if Senior Registrars are included).

Table S91 (q 37)

Please record all surgical staff who took history before operation but after admission

	(*n*=2680)	(Locums)
House Officer	941	(15)
Senior House Officer	1634	(28)
Registrar	716	(25)
Senior Registrar	321	(12)
Associate Specialist	57	(1)
Consultant	1120	(27)
Other	88	(-)
Not answered	34	

Table S92 (q 38)

Please record all surgical staff who examined the patient before operation but after admission

	(*n*=2680)	(Locums)
House Officer	925	(16)
Senior House Officer	1683	(25)
Registrar	867	(30)
Senior Registrar	390	(15)
Associate Specialist	67	(2)
Consultant	1418 (53%)	(24)
Other	87	(-)
Not answered	25	

NB - this can be a multiple entry

The range of surgical grades involved in pre-operative assessment is gratifying.

Table S93 (q 41)
Other identified diagnoses at time of final surgery

	(*n*=2680)
Respiratory	227
Cardiac	327
Neurological	111
Endocrine	145
Alimentary	114
Renal	62
Musculoskeletal	184
Haematological	59
Psychiatric	46
Alcohol-related problems	15
Drug addiction	3
Other	193
Not known	248
None	1432

The incidence of comorbidity is low in these index patients.

Table S94 (q 42)
ASA Class

	(*n*=2680)
1	1677
2	585
3	105
4	35
5	8
Not answered	270

Unlike the cases in which deaths occurred, only 6% were in ASA classes 3 to 5.

Table S95 (qs 42/43)
ASA Class/Anticipated risk of death

	ASA Class					
	1	**2**	**3**	**4**	**5**	**Not answered**
Risk						
Not expected	1536	415	38	4	1	205
Small, significant risk	57	137	37	8	-	21
Definite risk	8	12	24	20	5	5
Expected	1	-	1	1	2	-
Not answered	75	21	5	2	-	39

Table S96 (q 43)

What was the anticipated risk of death related to the proposed operation?

	(*n*=2680)
Not expected	2199
Small but significant risk	260
Definite risk	74
Expected	5
Not answered	142

The majority of these index cases were clearly in good physical condition.

Table S97 (q 44)

What precautions or therapeutic manoeuvres were undertaken preoperatively to ensure adequate physiological function?

	(*n*=2680)
Pulse rate recording	2554
Blood pressure recording	2344
Respiratory rate recording	1627
Temperature	2373
Central venous pressure measurement	79
Gastric aspiration	66
Intravenous fluids	318
Correction of hypovolaemia	71
Blood transfusion	68
Antibiotics	551
Oxygen therapy	107
Airway protection ie in head injuries	4
Tracheal intubation	172
Mechanical ventilation	122
Stabilisation of fractures	34
Stabilisation of cervical spine	6
Nutritional support	20
Vitamin K	12
DVT prophylaxis	371
Others	219
None	94

The use of DVT prophylaxis in this group was low.

Table S98 (q 47)

Grade of the most senior operating surgeon

	(*n*=2680)	(Locums)
Senior House Officer	187	(7)
Registrar	451	(40)
Senior Registrar	230	(21)
Associate Specialist/Staff Grade	69	(3)
Consultant	1699	(50)
Clinical Assistant	42	(-)
Other	1*	(-)
Not answered	1	

* District Dental Officer

Table S99 (q 49)

If the most senior operating surgeon was *not* a consultant, was a more senior surgeon *immediately available*, i.e. in the operating room/suite?

	(*n*=983)
Yes	544
No	425
Not answered	14

Consultants or Senior Registrars operated in 72% of cases (1929). In addition a more senior surgeon was immediately available in a further 544 cases, bringing the involvement of experienced surgeons to 92 per cent.

Table S100 (qs 42/54)

ASA Class/Classification of operation

	ASA Class					
Classification of operation	**1**	**2**	**3**	**4**	**5**	**Not answered**
Emergency	15	8	2	5	5	4
Urgent	92	45	19	6	1	14
Scheduled	283	197	47	18	1	56
Elective	1281	331	36	6	1	195
Not answered	6	4	1	-	-	1

Table S101 (q 54)
Classification of the operation

	(*n*=2680)
Emergency	39
Urgent	177
Scheduled	602
Elective	1850
Not answered	12

The majority of work done, at the time selected for the identification of index cases, was elective. The selection method for these cases is described on page 24.

Table S102 (q 55)
In view of your answer to question 54, was there any delay due to factors other than clinical?

	(*n*=2680)
Yes	287
No	2238
Not answered	155

Table S103 (q 58)
Was the time taken acceptable?

	(*n*=2680)
Yes	2590
No	27
Not answered	63

Table S104 (q 59)
Were there any unanticipated intra-operative problems?

	(*n*=2680)
Yes	125
No	2537
Not answered	18

Table S105 (q 60)
Was local/regional anaesthesia or sedation administered by a surgeon at any time during this operation?

	(*n*=2680)
Yes	356
No	2321
Not answered	3

Table S106 (q 61)

If local/regional anaesthesia was administered by a surgeon, was any other drug administered with the local anaesthetic?

	(*n*=356)
Yes	133
No	206
Not answered	17

Table S107 (q 62)

If the procedure was performed *solely* **under local anaesthetic or sedation** *administered by the surgeon*, **which of the following were recorded during or immediately after the procedure?**

	(*n*=187)
Blood pressure	84
Pulse	95
ECG	35
Pulse oximetry	42
Other	3
None	79

Table S108 (q 63)

Were facilities for resuscitation, including airway management, immediately available during this procedure?

	(*n*=187)
Yes	183
No	3
Not answered	1

Mishaps can occur when using local or regional anaesthesia (with or without sedation) and the availability of monitoring and resuscitation facilities is recommended.

Table S109 (q 64)

Which of the following are available in the hospital in which the operation took place?

	(*n*=2680)
Theatre recovery room	2577
Adult intensive care unit	1898
Adult high dependency unit	729
Not answered	20

Table S110 (q 65)
Was the patient admitted *immediately* to an ICU or HDU postoperatively?

	(*n*=2680)
Intensive care unit	123
High dependency unit	90
Neither	2464
Not answered	3

Table S111 (q 65A)
Were the ICU/HDU facilities adequate?

	(*n*=213)
Yes	205
No	1
Not answered	7

Lack of physiological measuring equipment was the explanation in the single negative response.

Table S112 (q 66)
Were you at any time unable to transfer the patient into an ICU/HDU within the hospital in which the surgery took place?

	(*n*=2467)
Yes	60
No	1791
Not answered	616

Transfer to an intensive care unit or high dependency unit was impossible in 60 cases where the beds were full or a unit was not available on site.

Table S113 (q 67)
What were the indications for the admission to ICU/HDU?

	(*n*=213)
Specialist nursing	162
Presence of experienced intensivists	64
General monitoring	183
Metabolic monitoring	34
Ventilation	86
Surgical complications	8
Anaesthetic complications	7
Coincident medical diseases	24
Inadequate nursing on general wards	18
Other	28

This again illustrates the need for an expansion of the provision of high dependency units (see page 153).

Table S114 (q 68)
Discharge from ICU/HDU due to:

	(*n*=213)
Elective transfer to ward	191
Pressure on beds	3
Other	11*
Not answered	8

* Elective transfer from ICU to HDU
Radiation protection
Transfer to an independent hospital
Discharge home

Seven patients died in the intensive care or high dependency unit.

Table S115 (q 69)
Was the patient subsequently *re-admitted* **to an ICU/HDU?**

	(*n*=206)*
Yes	7
No	191
Not answered	8

* excludes patients who died in the ICU/HDU

Table S116 (q 70)

Was the postoperative period complicated by:

	(*n*=2680)
Haemorrhage/postoperative bleeding requiring transfusion	50
Upper respiratory obstruction	2
Respiratory distress	31
Generalised sepsis	12
Wound infection	61
Wound dehiscence	17
Anastomotic failure	4
Low cardiac output	21
Hepatic failure	2
Renal failure	20
Endocrine system failure	5
Stroke or other neurological problems other than head injury	6
Persistent coma	4
Other organ failure	10
Problems with analgesia	14
DVT and/or pulmonary embolus	17
Orthopaedic prosthetic complications	5
Pressure sores	9
Peripheral ischaemia	4
Urinary tract infection	37
Urinary retention	48
Nutritional problems	13
Other problems	152
None of the above	2289

Table S117 (q 71)

Was mechanical ventilation employed?

	(*n*=2680)
Yes	286
No	2000
Not answered	394

Complications

	(*n*=286)
Yes	1
No	272
Not answered	13

Table S118 (q 73)

Destination on discharge

	(*n*=2654)*
Own home	2486
Relatives' or friend's home	39
Convalescent home	26
Another hospital	42
Terminal care/hospice accommodation	3
Other	29
Not discharged	10
Not answered	19

* excludes 26 patients who *died*

Table S119 (q 74)

Does your hospital/unit hold local audit/quality control meetings?

	(*n*=2680)
Yes	2308
No	341
Not answered	31
Duration of the meetings	
Less than 1 hour	439
1 to 2 hours	1336
More than 2 hours	508
Not answered	25
Frequency of the meetings	
Weekly	400
Fortnightly	141
Monthly	1507
Other	237
Not answered	23
Will this patient be considered at such a meeting?	
Yes	643
No	1606
Not answered	59

Clearly a considerable amount of time is now devoted to formal audit/quality control. Nevertheless 341 (13%) of Consultants reported from hospitals where no such meetings occurred. This, however, reflects the situation in 1990 and many Consultants commented that the organisation of audit meetings was under way.

Table S120 (q 76)

Was there a shortage of personnel in this case?

	(*n*=2680)
Yes	256
No	2424
Personnel	
Consultant surgeons	16
Trainee surgeons	43
Consultant anaesthetists	65
Trainee anaesthetists	31
Skilled assistants	30
Nurses	53
Operating department assistants	57
Porters	83
Other	3

Personnel shortages were identified in 10% of cases. The list above is self-explanatory.

Table S121 (q 79)

Who completed this questionnaire?

	(*n*=2680)
House Officer	30
Senior House Officer	410
Registrar	550
Senior Registrar	245
Associate Specialist	34
Consultant	1368
Other	31
Not answered	12

Table S122 (q 80)

Did you have any problems in obtaining the patient's notes?

	(*n*=2680)
Yes	193
No	2473
Not answered	14

This highlights the difficulties in obtaining patient's notes.

Table S123 (q 81)

Were all the notes available?

	(*n*=2680)
Yes	2569
No	96
Not answered	15

Part unavailable

Pre-operative notes	19
Operative notes	5
Postoperative notes	11
Other notes	45
Not answered	16

Table S124 (q 82)

Were the nursing notes available?

	(*n*=2680)
Yes	2348
No	180
Not answered	152

GENERAL SURGERY

This specialty has been broken down into narrower groups, according to the procedures performed, in order to analyse the data further. These groups were loosely created on the basis of pathology or where a particular subset of patients appeared interesting e.g. patients with complications of peptic ulceration. It is, however, possible to make some broad observations applicable to the specialty as a whole.

Provision of essential services

Accessibility of emergency operating theatres remains a cause for the failure of timely intervention. Also, surgeons are still required to perform emergency surgery in hospitals without the support of an intensive care unit or where the unit is inadequately staffed. Emergency general and gastrointestinal surgery, like any other branch of surgery, requires the support of comprehensive services, such as pathology, radiology and intensive care. If such facilities are not provided or are not available on site then consideration should be given to a transfer elsewhere.

> *A Registrar in a District General Hospital was called to see a 74-year-old man with peritonitis secondary to perforated diverticular disease. He did not consult a senior surgeon but decided to operate. Surgery was delayed because there was a long list of orthopaedic cases in the same theatre. The anaesthetic was given by an unsupervised Senior House Officer. A Hartmann's procedure was done which took three hours. There was no intensive care unit or high dependency unit. The patient was nursed on the general surgical ward but died following aspiration of vomited gastric contents.*

This case highlights many of the problems drawn up in the conclusions: lack of supervision, lack of consultation, lack of essential services on site and very poor judgement by the doctors concerned.

> *A 72-year-old man, with known chronic obstructive airways disease, underwent a successful gastrectomy for a bleeding gastric ulcer. The patient failed to breath adequately postoperatively and remained intubated. There was no intensive care unit at the hospital. He was nursed on a general ward with a tracheal tube in situ but died 24 hours later.*

Site of admission and pre-operative preparation

Medical or other non-surgical wards are not usually places for the active pre-operative preparation of surgical cases. Errors of communication occur and the carers are less experienced in the surgical management of patients.

> *A 73-year-old man was admitted to a medical ward as a result of bleeding from a duodenal ulcer. He had significant heart disease for which he required anticoagulants. The Consultant Surgeon involved asked his medical colleagues to stop warfarin therapy and believed, mistakenly, that this was done. Nobody checked! The patient remained anticoagulated and continued to bleed. There was then a delay due to the lack of an emergency theatre but eventually a gastrectomy was done. Considerable bleeding occurred and the surgery was technically difficult. The patient died of multi-organ failure secondary to hypotension.*

There was a failure of communication here and the operation was of an inappropriate magnitude.

> *It was Christmas. In the geriatric ward of a University Hospital, a 95-year-old lady began to vomit due to malignant pyloric obstruction. She was seen by the surgical team who agreed to operate after the holiday period and requested that the geriatricians prepare the patient. The lady continued to vomit and received inadequate preparation. At the time of surgery (gastrojejunostomy) she already had an established chest infection and the electrolytic imbalances were imperfectly corrected. She died 19 days later from respiratory failure.*

Holidays
Services are often closed or reduced during holiday periods. Reductions in services can be detrimental to patient care.

> *Not only was it Christmas but also the Consultant on call was ill. There was a relatively inexperienced locum Consultant Surgeon and a locum surgical Registrar. An elderly inpatient, awaiting surgery for a carcinoma of the rectum, deteriorated and developed obstruction, septicaemia and pneumonia. Little was done over the holiday until a second Consultant Surgeon intervened and decided to operate, although by now the patient was very ill. She died from pneumonia.*

Continuity of care suffered due to the illness of the Consultant and the presence of a locum Consultant and a locum Registrar. This lady might have survived if the deterioration had been detected earlier.

Delays in referral
There is little that a surgeon can do when presented with a delayed referral and advanced disease or comorbidity.

> *Eight days after admission to a geriatric unit an 89-year-old man was referred to a surgeon. The patient was vomiting, dehydrated and had a malignant mass in the pelvis. The Consultant Surgeon acknowledged that he had yielded to pressure from the geriatricians and operated. During an attempted Hartmann's procedure there was a cardiac arrest and the patient died.*

Why did the Consultant agree to operate?

> *There was a large sacral pressure sore present when an 84-year-old lady, from a medical ward, was referred to a surgeon. A carcinoma of the caecum was successfully treated with a right hemicolectomy. However the patient died 29 days later with septicaemia related to the huge sacral ulcer. The surgeon involved felt that an earlier referral might have helped and commented that the pressure sore reflected inadequate levels of nursing staff.*

The advisers agreed with the surgeon's comment.

Delay in operating

Previous reports have criticised the regrettable haste with which some patients are rushed to the operating theatre. However, undue delay can sometimes be equally detrimental.

> *A 77-year-old woman presented with profuse melaena. It was a Sunday and there were difficulties in organising the arteriogram which the surgeons decided was necessary. It was clear that the patient was deteriorating; over 20 units of blood had been transfused in 12 hours. The anaesthetic Senior Registrar showed considerable frustration and anxiety and urged the surgeon to intervene. However, the surgeon refused to move until the arteriogram was done. Eventually a diagnosis of a solitary caecal diverticulum was made angiographically but it was too late. The patient died on the operating table. The cause of death was acute coronary artery thrombosis precipitated by hypovolaemia.*

Inappropriate specialty

There were few cases where the interests of the surgeon were inappropriate for the pathology involved. Oesophageal surgery poses particular problems, which are discussed elsewhere in the report.

> *A 56-year-old man underwent surgery for an oesophageal diverticulum and oesophagobronchial fistula. This was done by a general surgeon with a gastroenterological interest. An oesophageal fistula resulted and two further operations (including a further thoracotomy) were done by an Associate Specialist before the patient died.*

The initial operation may well have been appropriate but once complications arose these might have been better handled by a thoracic or specialised oesophageal surgeon. The difficult surgery for established complications should not have been delegated.

Inappropriate grade of surgeon

Lack of supervision or improper delegation can result in junior and inexperienced surgeons doing inappropriate surgery. The patient's demise was directly related to this in 18 cases.

> *One case involves the management of a 76-year-old lady with a bleeding duodenal ulcer who presented on a bank holiday. After satisfactory resuscitation the Registrar operated with a view to under-running the bleeding ulcer and performing a truncal vagotomy and pyloroplasty. The bleeding was successfully arrested. During mobilisation of the vagal trunks, the Registrar perforated the oesophagus. He recognised this complication and, reasonably, called for help. He was told to "sort it out" by the Consultant Surgeon who seemed most unwilling to attend the operating theatre. The Registrar repaired the oesophagus to the best of this ability. He then requested that the patient was admitted to the intensive care unit but this request was refused. The patient died 25 days later with septicaemia due to persistent oesophageal fistula.*

Surgical trainees often exhibit a "knee-jerk" reflex to operate. This may be brought about by organisational pressures and the lack of emergency theatre space. Whatever the cause for this haste, junior surgeons should be reminded that a patient's condition can often be improved by resuscitation and more careful planning, and that they must inform a Consultant before any operation is carried out[13].

> *A 71-year-old man was admitted as an emergency with a perforated carcinoma of the sigmoid colon, a paracolic abscess and peritonitis. Four hours after admission, without adequate resuscitation or discussion with a Consultant, a Registrar operated. A Hartmann's procedure was done but the patient died with septicaemia.*

> *An 83-year-old woman presented three days after her duodenal ulcer had perforated. She was frail, elderly and dying. Without consultation and with only mediocre resuscitation she was taken to theatre at 0200 hrs for a laparotomy. She succumbed within 24 hours.*

A Consultant Urologist was nominally in charge of the following case although there was no Consultant involved in the final operation.

> *The patient, a 75-year-old man, underwent a repair of a recurrent left inguinal hernia. Two weeks later he had a transurethral prostatectomy. Eight days after this he developed an acute abdominal problem which was diagnosed as "obstruction" by a junior Registrar. Without intravenous fluids, antibiotics or prophylaxis against thromboembolic problems, the patient was taken to the operating theatre. At the laparotomy, which lasted 2.5 hours, he was found to have biliary peritonitis secondary to a perforated gall bladder. A cholecystostomy was done. The patient failed to recover and died four weeks later. The cause of death was given as bronchopneumonia.*

Inappropriate operation

The choice of surgical technique was inappropriate in 42 instances.

Table S125
Conditions for which inappropriate operations were done (general surgery)

Jaundice	18
Oesophageal carcinoma	5
Peptic ulcer	4
Colonic pseudo-obstruction	4
Gallstones	3
Colorectal carcinoma	3
Gastric carcinoma	2
Sigmoid volvulus	1
Malignant lymphoma	1
Pseudomembranous colitis	1

> *Severe back pain caused the admission of a 79-year-old man to an orthopaedic ward. A general surgical Registrar was called as the patient also complained of pain in the left iliac fossa. No Consultant was involved. The same day (at 23.30hrs) the Registrar performed a laparotomy. The indication for this intervention is not recorded. According to the operation note nothing was found. The patient deteriorated and died. A post mortem revealed an extensive malignant lymphoma with retroperitoneal infiltration and large para-aortic nodes.*

Without consultation this junior surgeon operated precipitately and out of routine hours on an elderly patient and then missed the diagnosis.

Further detailed comments on some of these areas will be made later in the text relating to individual subspecialties.

Incorrect diagnosis

Errors can occur despite all reasonable attempts to arrive at an accurate diagnosis. There is little comment to make other than to highlight those mistakes which are commonly repeated. Examples include: overlooking the acute abdominal presentation of diabetes mellitus and acute pulmonary infections, the insidious presentation of tuberculosis, fungal septicaemia and other opportunistic infections and the embolic complications of bacterial endocarditis.

> *A Registrar decided to operate on a jaundiced 73-year-old man. The indications for surgery are not recorded but the laparotomy was reported as normal. In fact the diagnosis was subacute bacterial endocarditis. The patient died with acute hepatic necrosis.*

> *A 71-year-old man had a laparotomy, the purpose of which was to identify a cause for his sepsis. The laparotomy was normal. The final diagnosis was candida septicaemia.*

Laparotomy alone, without specific investigations, seems a very crude manoeuvre by which to attempt a diagnosis in the presence of an acute septic focus.

Thromboembolic phenomena

The incidence of pulmonary embolism in NCEPOD cases is unknown. The reasons for this uncertainty include the low post mortem rate and poor return of post mortem reports. Despite this, the Enquiry continues to be concerned about the incidence of pulmonary emboli and the sporadic use of prophylaxis, especially in emergency cases where prophylaxis is easily forgotten.

There were 11 cases in general surgery where death was definitely due to a pulmonary embolus. Only two of these had received any form of prophylaxis.

> *A succesful radical gastrectomy was done on a 73-year-old man. No prophylaxis against thromboembolism was given. The patient died at home following a confirmed pulmonary embolus.*

> *An operation for gastro-oesophageal reflux was done on a 77-year-old woman. No prophylaxis against thromboembolism was given. She died on the eighth postoperative day with a massive pulmonary embolus. Interestingly, the House Officer gave the cause of death as a myocardial infarction. Following a post mortem, the cause of death was revised.*

Lack of communication, and sometimes confusion, surround the management of pulmonary embolism.

> *A general surgeon with a urological interest operated on a 70-year-old man who had an inguinal hernia and a contralateral hydrocele. Subcutaneous heparin was used as thromboembolic prophylaxis. The patient was at home when he experienced pleuritic chest pain 19 days after surgery. The General Practitioner treated the patient at home for three days before referring him to a physician. The patient died 22 days after surgery. The cause of death at post mortem was a pulmonary embolus.*

This patient was well managed during his hospital stay, but a problem of communication occurred after discharge. The Consultant Surgeon was oblivious of the complication, the referral to another specialty and the subsequent death until the NCEPOD questionnaire arrived. He was understandably upset.

Unexplained deaths

Occasionally, the quality of information given in the questionnaires, and the very design of the questionnaires themselves, tantalisingly fails to explain a patient's death. The inadequate information often relates to a failure to perform a post mortem and a surprising lack of surgical curiosity.

> *A 38-year-old man had surgery for a carcinoma of the oesophagogastric junction. This involved an oesophagogastrectomy, splenectomy and distal pancreatectomy. The surgeon involved was an experienced Consultant in general surgery. The patient developed haemorrhagic shock and died in the intensive care unit on the fourth postoperative day. A post mortem was not done and the case was not reported to the coroner. The cause of death was given as "cardiac arrest".*

An explanation is needed as to why a 38-year-old man should bleed to death after an apparently uneventful operation. The case was considered at a surgical audit meeting but no information other than the questionnaire was provided to the Enquiry.

Surgical mishaps

Surgical mishaps as a result of technique do occur. They are rare however. There were three cases in general surgery/gastroenterology where death appears to be directly related to technical failure.

> *An acute relapse of acute lymphoblastic leukaemia meant that a 48-year-old man required the insertion of a Hickman line for platelet infusions to correct his thrombocytopaenia. He was graded ASA 4. The Hickman line was misplaced causing haemorrhage which could not be controlled.*

Had the bleeding not occurred then the outcome might have been different.

> *After an abdominal hysterectomy for a uterine malignancy an 85-year-old patient developed necrosis of the anterior rectal wall. She became septic and an emergency Hartmann's operation failed to save her life. She died in the recovery room.*

Taking "the noble risk"

It would seem inappropriate to operate on moribund patients with a very poor chance of survival in those cases where there is known widespread malignancy (sometimes called "the noble risk"). Nevertheless such cases continue to be reported to NCEPOD. At least 40 cases were identified where over-enthusiastic and unkind surgery had taken place within the specialty of general surgery.

> *An 82-year-old lady weighing 42kg was known to have a poorly differentiated carcinoma of the lower oesophagus and a malignant lymphoma. She was graded as ASA 4. Nevertheless a five hour oesophagogastrectomy was done; at the operation it was noted that there was involvement of the spleen and lymph nodes. The patient died with respiratory failure.*

It is regrettable that an opportunity to palliate this lady's symptoms was lost and her life shortened.

> *In another case carcinoma of the cardia of the stomach was diagnosed in a 67-year-old man. He was known to have ischaemic heart disease and liver disease. He had previously undergone a coronary artery bypass graft. Liver metastases and involved nodes were found at laparotomy. (NCEPOD has no information as to how the patient was investigated or why these metastases were not detected pre-operatively). Despite the advanced stage of the disease the general surgeon involved did a transhiatal oesophagectomy. The patient died 18 days later with septicaemia secondary to an anastomotic leak.*

> *A 73-year-old man presented with an acute abdomen and a clinical diagnosis of perforated diverticular disease. He was also known to have an untreatable bronchial carcinoma, hepatic cirrhosis and a poor quality of life. Despite this information, a Registrar operated and took 2.5 hours to do a laparotomy and a transverse loop colostomy.*

Why was the decision made to operate at all? A good case could be made for symptomatic treatment only.

In all there were 25 cases who received inappropriate surgery in the face of known widespread or locally advanced malignancy.

In the absence of malignancy, heroic operations were carried out on patients suffering from diverse pathology and comorbidity e.g. superior mesenteric artery occlusion, perforated peptic ulcers, perforated diverticular disease, intestinal obstruction, abdominal aortic occlusion and necrotising pancreatitis.

> *A Senior Registrar at a University Hospital operated, with Consultant approval, on a 69-year-old woman with a large perforated duodenal ulcer. The operation started at 0200 hrs on a Saturday. He did a partial gastrectomy but was unable to close the duodenal stump which was therefore intubated and drained. There was no ICU bed and it was necessary to ventilate the lungs mechanically overnight in the recovery room. She was then returned to the ward but, due to deteriorating respiratory and cardiac function she was admitted to the intensive care unit four days postoperatively. She died in heart failure. Unfortunately this patient had a carcinoma of bronchus which was missed on a pre-operative chest radiograph. There were also cerebral metastases.*

The Enquiry has the benefit of hindsight and post mortem information. Was the bronchial carcinoma visible on the chest X-ray?

OESOPHAGEAL SURGERY

Table S126

Procedures in oesophageal surgery (may be multiple and includes coincidental procedures undertaken simultaneously)

Oesophagectomy (all approaches for malignant disease)	37
Open insertion of oesophageal tube	17
Endoscopic dilatation and intubation (carcinoma)	16
Oesophagoscopy and dilatation	13
Oesophagoscopy and biopsy only	10
Repair of oesophageal perforation/rupture	3
Oesophageal transection of oesophageal varices	3
Removal of oesophageal tube	3
Endoscopic laser-resection of oesophageal tumour	2
Repair aorto-oesophageal fistula	2
Laparotomy for anastomotic leak after oesophagectomy	1
Surgery for hiatus hernia	1
Laryngo-pharyngo-oesophagectomy	1
Retrosternal oesophageal bypass	1
Drainage of para-oesophageal abscess	1
Tracheostomy	1

Table S127 (q 1)

Specialty of Consultant Surgeon in charge at time of operation.

	(*n*=113)
General	11
General with special interest in	
- Gastroenterology	56
- Vascular surgery	7
- Oncology	2
- Endocrinology	1
- Urology	1
Cardiothoracic - Adult	18
- Adult and paediatric	8
Thoracic	6
Not answered	3

The important factor is the surgeon undertaking the surgery. While we do not know the annual caseload of the surgeons performing oesophageal surgery, there is no place for the occasional oesophageal surgeon. Unless a surgeon is performing six or more oesophageal resections for carcinoma per annum, results will continue to be poor. It seems therefore that oesophageal resections should only be performed in centres where there is a large volume of work, whether this is a general *or* thoracic surgery department. There is a need to re-think the provision of surgery for oesophageal disease[14,15].

Table S128 (q 4)

Age at final operation.

	(*n*=113)
11 to 19	1
20 to 29	1
30 to 39	3
40 to 49	1
50 to 59	9
60 to 69	42
70 to 79	39
80 to 89	15
90 to 99	2

Fifty per cent of these patients were over 70 years of age.

Table S129 (q 5)

Sex of patient.

	(*n*=113)
Male	82
Female	31

Table S130 (q 10)

Initial admission intention for the last operation performed.

	(*n*=113)
Elective	71
Urgent	15
Emergency	27

Only 37% of these patients were admitted as urgent or emergency cases.

Table S131 (q 31)

To what type of area was the patient first admitted?

	(*n*=113)
Medical ward	11
Surgical ward	90
Mixed medical/surgical ward	2
Intensive care unit	2
A/E holding area	1
Other	3
Not answered	4

Table S132 (q 32)

Was the site of admission appropriate for the patient's condition?

	(*n*=113)
Yes	112
No	1

Table S133 (q 33)

Was care undertaken on a formal shared basis with another specialty?

	(*n*=113)
Yes	25
No	86
Not answered	2

Table S134 (q 35)

Which grade of surgeon made the final decision to operate?

	(*n*=113)	(Locums)
Senior House Officer	1	(-)
Registrar	1	(-)
Senior Registrar	1	(1)
Consultant	110	(2)

Table S135 (q 36)

Grade of the most senior surgeon consulted before operation

	(*n*=113)	(Locums)
Senior House Officer	1	(-)
Senior Registrar	2	(1)
Consultant	109	(2)
Not answered	1	

Tables S134 and S135 show that Consultants were involved in the pre-operative decision-making in 97% of cases.

Table S136 (q 41)

Other identified diagnoses at time of final surgery

	(*n*=113)
Respiratory	40
Cardiac	38
Neurological	9
Endocrine	6
Alimentary	24
Renal	6
Musculoskeletal	6
Haematological	4
Psychiatric	3
Alcohol-related problems	2
Other	8
Not known	1
None	29

Table S137 (q 42)
ASA Class

	(*n*=113)
1	10
2	39
3	15
4	30
5	9
Not answered	10

Forty-eight per cent of cases were in ASA classes 3 to 5.

Table S138 (qs 42/43)
ASA Class/Anticipated risk of death

	ASA Class					
	1	**2**	**3**	**4**	**5**	**Not answered**
Risk						
Not expected	2	7	1	2	1	2
Small, significant risk	5	16	7	3	1	2
Definite risk	3	16	6	21	6	4
Expected	-	-	-	3	1	1
Not answered	-	-	1	1	-	1

Table S139 (q 43)
What was the anticipated risk of death related to the proposed operation?

	(*n*=113)
Not expected	15
Small but significant risk	34
Definite risk	56
Expected	5
Not answered	3

Table S140 (q 44)

What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=113)
Pulse rate recording	110
Blood pressure recording	108
Respiratory rate recording	95
Temperature	100
Central venous pressure measurement	28
Gastric aspiration	15
Intravenous fluids	70
Correction of hypovolaemia	36
Blood transfusion	23
Antibiotics	50
Oxygen therapy	33
Tracheal intubation	20
Mechanical ventilation	13
Nutritional support	18
Vitamin K	1
DVT prophylaxis	35
Others	9
None or not answered	3

Table S141 (q 46)

Day of operation

	(*n*=113)
Monday	22
Tuesday	14
Wednesday	18
Thursday	35
Friday	17
Saturday	5
Sunday	2
Public holiday	1

Table S142 (qs 42/54)

ASA Class/Classification of operation

	ASA Class					
Classification of operation	**1**	**2**	**3**	**4**	**5**	**Not answered**
Emergency	-	3	-	2	2	1
Urgent	2	3	2	8	1	1
Scheduled	6	25	13	18	6	6
Elective	2	8	-	2	-	2

Table S143 (q 47)
Grade of the most senior operating surgeon.

	(*n*=113)	(Locums)
Registrar	6	(-)
Senior Registrar	11	(1)
Consultant	96	(2)

Consultants performed 85% of the surgery.

Table S144 (qs 47/54)
Grade of operating surgeon/Classification of operation

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Registrar	2	2	1	1
Senior Registrar	1	1	7	2
Consultant	5	14	66	11

Table S145 (q 49)
If the most senior operating surgeon was *not* a consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=17)
Yes	9
No	7
Not answered	1

Table S146 (q 54)
Classification of the operation

	(*n*=113)
Emergency	8
Urgent	17
Scheduled	74
Elective	14

Table S147 (q 70)
Was the postoperative period complicated by:

	(*n*=108)*
Haemorrhage/postoperative bleeding requiring transfusion	8
Upper respiratory obstruction	2
Respiratory distress	56
Generalised sepsis	21
Wound infection	4
Wound dehiscence	1
Anastomotic failure	10
Low cardiac output	22
Hepatic failure	7
Renal failure	15
Stroke or other neurological problems other than head injury	5
Persistent coma	1
Other organ failure	4
Problems with analgesia	1
DVT and/or pulmonary embolus	3
Pressure sores	1
Urinary tract infection	2
Urinary retention	2
Nutritional problems	14
Other problems	11

* excludes patients who died in theatre or the recovery area.

Table S148 (q 88)
Has this death been considered at a local audit/quality control meeting?

	(*n*=113)
Yes	70
No	13
Not answered	30

Sixty-two per cent of cases were considered at audit meetings.

Problems in oesophageal surgery

The advisers identified various problems which had occurred in the 113 cases undergoing oesophageal surgery. These are listed below.

Table S149

Problems in oesophageal surgery

Inappropriate operation	12
Delayed referral	1
Incorrect postoperative management	1
Inadequate pre-operative assessment/preparation	2
Inappropriate specialty of surgeon	11
Inappropriate grade of surgeon	1
Failure to refer to coroner	1

One example of an inappropriate operation follows.

> *An 80-year-old woman was suffering from a carcinoma of the oesophagus. She was dehydrated, malnourished and classed as ASA 4. She died three days after a palliative transthoracic oesophagectomy.*

Endoscopic treatment by intubation or laser resection may have offered better palliation.

Incorrect postoperative management

> *A Consultant General Surgeon of 20 years experience performed a transhiatal oesophagectomy for a carcinoma of the cardia in a 78-year-old man (ASA 2). The patient was nursed on the intensive care unit postoperatively but his lungs were not ventilated. He died from bronchopneumonia eight days after the surgery. The cause of death was confirmed by post mortem.*

The Consultant informed the Enquiry that, as a result of local discussion of this case, all subsequent patients were to receive mechanical ventilation of their lungs after oesophageal resection.

ABDOMINAL SURGERY

Table S150 (q 51)
Procedures in abdominal surgery
(may be multiple and includes coincidental procedures undertaken simultaneously)

"Open and shut" laparotomy for widespread malignancy	68
68 Laparotomy for acute mesenteric ischaemia with/without small bowel resection	43
Laparotomy for adhesive obstruction with/without small bowel resection	26
Laparotomy and small bowel resection (other than malignancy, adhesions and ischaemia)	25
Laparotomy for multiple trauma/haemorrhage	21
Gastroscopy	17
Partial gastrectomy for carcinoma	14
Closure of small bowel fistula or perforation	13
Gastroenterostomy	13
Negative laparotomy	13
Drainage of intra-abdominal abscess (all sites)	10
Closure of perforated gastric carcinoma	5
Splenectomy	5
Total gastrectomy	4
Resuture abdominal wall dehiscence	4
Laparotomy for primary peritonitis	3
Miscellaneous	21

The need for exploratory laparotomy should be receding as modern imaging techniques and laparoscopy become more widely available. An exception might be gynaecological malignancies where debulking procedures, if feasible, are done prior to initiating chemotherapy.

Table S141 (q 1)
Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=299)
General	76
General with special interest in	
- Gastroenterology/colorectal surgery	118
- Vascular surgery	57
- Urology	19
- Endocrinology	7
- Transplantation	6
- Oncology	4
- Breast surgery	2
- Thoracic surgery	1
Cardiothoracic	1
Gynaecology	3
Neurosurgery	1
Urology	3
Spinal injuries	1
Not answered	9

NB - this can be a multiple entry

Table S152 (q 4)
Age at final operation.

	(*n*=299)
11 to 19	3
20 to 29	2
30 to 39	5
40 to 49	9
50 to 59	34
60 to 69	63
70 to 79	110
80 to 89	65
90 to 99	7
100	1

This group was old, ill and at risk.

Sixty-one per cent of the patients were aged over 70 years. Table S154 also shows 80% were admitted as urgent cases or emergencies. The ASA Class was three or higher in 73% and an extensive range of comorbidity was present (S159). In 67% surgery was considered to carry a definite risk (table S163).

Table S153 (q 5)
Sex of patient.

	(*n*=299)
Male	164
Female	135

Table S154 (q 10)
Initial admission intention for the last operation performed

	(*n*=299)
Elective	58
Urgent	60
Emergency	180
Not answered	1

Table S155 (q 31)
To what type of area was the patient first admitted?

	(*n*=299)
Medical ward	66
Surgical ward	176
Mixed medical/surgical ward	2
Gynaecological/obstetric ward	2
Day unit	1
High dependency unit	2
Intensive care unit	7
A/E holding area	17
Direct to theatre	7
Other	15
Not answered	4

Table S156 (q 32)
Was the site of admission appropriate for the patient's condition?

	(*n*=299)
Yes	288
No	9
Not answered	2

See the comments on page 184.

Table S157 (q 36)
Grade of the most senior surgeon consulted before operation.

	(*n*=299)	
Senior House Officer	1	(-)
Registrar	18	(-)
Senior Registrar	15	(1)
Associate Specialist	2	(-)
Consultant	260	(8)
Not answered	3	

Table S158 (q 35)
Which grade of surgeon made the final decision to operate?

	(*n*=299)	
Senior House Officer	3	(-)
Registrar	44	(5)
Senior Registrar	28	(2)
Associate Specialist	1	(-)
Consultant	223	(8)

Consultants or Senior Registrars were involved in the decision-making in 84% of cases and were consulted at some time before surgery in 92 per cent. This represents an excellent standard of care.

Table S159 (q 41)

Other identified diagnoses at time of final surgery

	(*n*=299)
Respiratory	115
Cardiac	122
Neurological	37
Endocrine	24
Alimentary	84
Renal	47
Musculoskeletal	28
Haematological	34
Psychiatric	14
Alcohol-related problems	4
Drug addiction	2
Other	43
Not known	4
None	47

Table S160 (q 42)

ASA Class

	(*n*=299)
1	6
2	54
3	90
4	92
5	36
Not answered	21

Table S161 (qs 42/54)

ASA Class/Classification of operation.

	ASA Class					
Classification of operation	**1**	**2**	**3**	**4**	**5**	**Not answered**
Emergency	-	4	7	25	22	4
Urgent	-	20	49	49	13	7
Scheduled	6	28	33	15	1	8
Elective	-	1	-	3	-	2
Not answered	-	1	1	-	-	-

Table S162 (qs 42/43)

ASA Class/Anticipated risk of death

	ASA Class					
	1	**2**	**3**	**4**	**5**	**Not answered**
Risk						
Not expected	4	13	10	5	-	4
Small but significant risk	2	22	22	5	1	3
Definite risk	-	16	55	70	17	8
Expected	-	-	1	11	17	6
Not answered	-	3	2	1	1	-

Table S163 (q 43)

What was the anticipated risk of death related to the proposed operation?

	(*n*=299)
Not expected	36
Small but significant risk	55
Definite risk	166
Expected	35
Not answered	7

Thirty-five patients (12%) had surgery when they were expected to die. Yet again the question must be asked: "What was the expected benefit of surgery in such circumstances?"

Table S164 (q 44)

What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=299)
Pulse rate recording	294
Blood pressure recording	294
Respiratory rate recording	245
Temperature	284
Central venous pressure measurement	98
Gastric aspiration	191
Intravenous fluids	269
Correction of hypovolaemia	195
Blood transfusion	75
Antibiotics	187
Oxygen therapy	132
Tracheal intubation	58
Mechanical ventilation	49
Stabilisation of fractures	4
Stabilisation of cervical spine	4
Nutritional support	28
Vitamin K	13
DVT prophylaxis	117
Others	31
None	2

Table S165 (q 47)

Grade of the most senior operating surgeon

	(*n*=299)	(Locums)
Senior House Officer	6	(-)
Registrar	81	(8)
Senior Registrar	52	(7)
Consultant	158	(9)
Clinical Assistant	1	(-)
Not answered	1	

Table S166 (q 49)

If the most senior operating surgeon was *not* a consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=141)
Yes	42
No	95
Not answered	4

Table S167 (qs 47/54)
Grade of operating surgeon/Classification of operation.

Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Senior House Officer	-	5	1	-
Registrar	19	42	20	-
Senior Registrar	14	22	13	2
Consultant	29	68	57	4
Other	-	1	-	-

NB - Classification of operation not answered in 2 cases.

Consultants were directly involved (with operating or supervising) in 67% of these operations. If Senior Registrars are included, then the involvement of experienced surgeons rises to 84 per cent.

Table S168 (q 54)
Classification of the operation

	(*n*=299)
Emergency	62
Urgent	138
Scheduled	91
Elective	6
Not answered	2

Table S169 (q 70)
Was the postoperative period complicated by:

	(*n*=273)*
Haemorrhage/postoperative bleeding requiring transfusion	21
Upper respiratory obstruction	1
Respiratory distress	93
Generalised sepsis	55
Wound infection	10
Wound dehiscence	8
Anastomotic failure	12
Low cardiac output	85
Hepatic failure	15
Renal failure	68
Endocrine system failure	3
Stroke or other neurological problems other than head injury	7
Persistent coma	14
Other organ failure	14
Problems with analgesia	3
DVT and/or pulmonary embolus	8
Fat embolus	1
Pressure sores	5
Peripheral ischaemia	3
Urinary tract infection	6
Urinary retention	5
Nutritional problems	25
Other problems	37
None	60

* excludes patients who died in theatre or the recovery area.

This range of complications appears appropriate for the conditions encountered.

Table S170 (q 88)
Has this death been considered at a local audit/quality control meeting?

	(*n*=299)
Yes	209
No	38
Not answered	52

Seventy per cent of cases were considered at audit meetings.

SURGERY FOR COMPLICATIONS OF PEPTIC ULCER

Table S171
Procedures for complicated peptic ulcer disease
(may be multiple and includes concidental procedures undertaken simultaneously)

Bleeding gastric ulcer	
Partial gastrectomy	6
Truncal vagotomy and pyloroplasty	2
Under-running of bleeding ulcer	2
Perforated gastric ulcer	
Biopsy or excision and simple closure	15
Partial gastrectomy	4
Bleeding duodenal ulcer	
Truncal vagotomy and pyloroplasty	14
Under-running of bleeding ulcer	12
Partial gastrectomy	8
Truncal vagotomy and gastroenterostomy	5
Perforated duodenal ulcer	
Oversewing and/or omental patch	32
Truncal vagotomy and pyloroplasty	4
Partial gastrectomy	3
Truncal vagotomy and gastroenterostomy	2
Gastroenterostomy (alone)	2
Miscellaneous	
Gastroscopy	5
Choledochojejunostomy	1
Appendicectomy	1
Suture perforation of oesophagus	1
Truncal vagotomy and pyloroplasty for pyloric stenosis	1
Laparotomy/thoracotomy - "open and close"	1
Right hemicolectomy	1
Tracheostomy	1
Negative laparotomy	1

Inappropriate operation
The choice of surgical technique was inappropriate in four instances.

These four patients were all elderly, aged between 72 and 83 years. Two were bleeding from duodenal ulcers and one from a gastric ulcer. The fourth patient had a perforated gastric ulcer. All these patients were treated by partial gastrectomy where a lesser procedure would have been appropriate. The following two vignettes illustrate the problem.

A frail 72-year-old lady had a perforated gastric ulcer measuring 8mm in diameter. A Senior Registrar embarked on a partial gastrectomy. The patient died 11 days later from pneumonia.

Another patient, a frail, senile 83-year-old man (classed as ASA 4), presented with a bleeding gastric ulcer. At laparotomy an unsuspected caecal carcinoma was found. A partial gastrectomy and a right hemicolectomy were done. The patient died on the third postoperative day.

Inappropriate use of resources

Thirteen litres of blood were transfused into a 79-year-old man, who had been expected to die (ASA 5). During partial gastrectomy his cirrhotic liver was torn.

What anticipated benefit of surgery could justify the use of such quantities of blood?

Table S172 (q 1)
Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=120)
General	32
General with special interest in	
- Gastroenterology	44
- Vascular surgery	24
- Urology	8
- Endocrinology	5
- Paediatric surgery	2
- Colorectal surgery	1
- Oncology	1
- Pancreaticobiliary surgery	1
- Transplantation	1
Vascular surgery	1
Urology	1
Not answered	4

NB - this may be a multiple entry

Table 173 (q 4)

Age at final operation

	(*n*=120)
30 to 39	1
40 to 49	1
50 to 59	8
60 to 69	21
70 to 79	46
80 to 89	41
90 to 99	2

Seventy-four per cent of these patients were over 70 years of age and, as would be expected, their admissions with complications of peptic ulcer surgery were mainly urgent or emergencies (97%).

Table S174 (q 5)

Sex of patient

	(*n*=120)
Male	66
Female	54

Table S175 (q 10)

Initial admission intention for the last operation performed

	(*n*=120)
Elective	4
Urgent	22
Emergency	94

Table S176 (q 35)
Which grade of surgeon made the final decision to operate?

	(*n*=120)	(Locums)
Registrar	43	(1)
Senior Registrar	23	(3)
Consultant	53	(2)
Clinical Assistant	1	(-)

Table S177 (q 36)
Grade of the most senior surgeon consulted before operation

	(*n*=120)	(Locums)
Registrar	24	(1)
Senior Registrar	18	(1)
Consultant	75	(4)
Clinical Assistant	1	(-)
Not answered	2	

Consultants made the decision to operate in only 44% of cases. If Senior Registrars are included as experienced opinions, the percentage rises to 63.

Consultants were contacted for discussion in only 63% of cases, despite the age and morbidity of the patients[13,16].

Table S178 (q 41)
Other identified diagnoses at time of final surgery.

	(*n*=120)
Respiratory	51
Cardiac	58
Neurological	16
Endocrine	20
Alimentary	25
Renal	19
Musculoskeletal	38
Haematological	14
Psychiatric	9
Alcohol-related problems	6
Other	23
Not known	2
None	9

Table S179 (q 42)
ASA Class

	(*n*=120)
1	-
2	18
3	40
4	45
5	12
Not answered	5

Eighty-one per cent of cases had an ASA class of 3 or over and surgery was judged to carry a distinct risk in 80% of cases (table S182).

Table S180 (qs 42/43)
ASA Class/Anticipated risk of death

	ASA Class					
Risk	**1**	**2**	**3**	**4**	**5**	**Not answered**
Not expected	-	3	1	2	-	-
Small, significant risk	-	4	9	4	-	-
Definite risk	-	11	28	30	3	5
Expected	-	-	1	9	9	-
Not answered	-	-	1	-	-	-

Table S181 (qs 42/54)
ASA Class/Classification of operation

	ASA Class					
Classification of operation	**1**	**2**	**3**	**4**	**5**	**Not answered**
Emergency	-	8	9	14	7	2
Urgent	-	8	29	31	5	3
Scheduled	-	2	2	-	-	-
Elective	-	-	-	-	-	-

Table S182 (q 43)
What was the anticipated risk of death related to the proposed operation?

	(*n*=120)
Not expected	6
Small but significant risk	17
Definite risk	77
Expected	19
Not answered	1

Table S183 (q 44)
What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=120)
Pulse rate recording	119
Blood pressure recording	119
Respiratory rate recording	102
Temperature	110
Central venous pressure measurement	53
Gastric aspiration	88
Intravenous fluids	116
Correction of hypovolaemia	108
Blood transfusion	63
Antibiotics	73
Oxygen therapy	71
Tracheal intubation	13
Mechanical ventilation	10
Stabilisation of fractures	1
Stabilisation of cervical spine	1
Nutritional support	2
Vitamin K	3
DVT prophylaxis	26
Others	9

Table S184 (q 46)
Day of operation

	(*n*=120)
Monday	14
Tuesday	18
Wednesday	17
Thursday	16
Friday	20
Saturday	15
Sunday	20

Table S185 (q 47)
Grade of the most senior operating surgeon

	(*n*=120)	(Locums)
Senior House Officer	1	(-)
Registrar	52	(5)
Senior Registrar	28	(2)
Associate Specialist	1	(-)
Consultant	36	(2)
Clinical Assistant	1	(-)
Not answered	1	

Table S186 (qs 47/54)

Grade of operating surgeon/Classification of operation

Grade	Classification Emergency	Urgent	Scheduled	Elective
Senior House Officer	-	1	-	-
Registrar	15	35	2	-
Senior Registrar	11	17	-	-
Associate Specialist	1	-	-	-
Consultant	12	22	2	-
Other	-	1	-	-
Not answered	1	-	-	-

Table S187 (q 49)

If the most senior operating surgeon was *not* **a Consultant, was a more senior surgeon** *immediately* **available, i.e. in the operating room/suite?**

	(*n*=84)
Yes	14
No	70

Consultants operated on 30% of these sick patients and were only available to supervise in an additional 12% (S187). The majority of the cases were emergencies or urgent and the workload was shared between Registrars, Senior Registrars and Consultants.

Table S188 (q 54)

Classification of the operation

	(*n*=120)
Emergency	40
Urgent	76
Scheduled	4
Elective	-

Table S189 (q 70)

Was the postoperative period complicated by:

	(*n*=115)*
Haemorrhage/postoperative bleeding requiring transfusion	17
Respiratory distress	55
Generalised sepsis	25
Wound infection	7
Wound dehiscence	4
Anastomotic failure	2
Low cardiac output	60
Hepatic failure	7
Renal failure	41
Endocrine system failure	3
Stroke or other neurological problems other than head injury	6
Other organ failure	4
Problems with analgesia	2
DVT and/or pulmonary embolus	8
Pressure sores	1
Peripheral ischaemia	2
Urinary tract infection	2
Urinary retention	2
Nutritional problems	9
Other problems	13

* excludes patients who died in theatre or the recovery area.

Table S190 (q 88)

Has this death been considered at a local audit/quality control meeting?

	(*n*=120)
Yes	92
No	8
Not answered	20

Over 75% of these deaths were considered in audit meetings.

HEPATOPANCREATICOBILIARY SURGERY

There were 128 deaths after hepatopancreaticobiliary surgery.

Table S191 (q 51)
Procedures in hepatopancreaticobiliary surgery
(may be multiple and includes coincidental procedures undertaken simultaneously)

Cholecystectomy (all indications)	35
Laparotomy only (with/without biopsy of metastases)	23
Bypass surgery for malignant obstructive jaundice	20
Exploration of common bile duct	9
Choledochoduodenostomy	9
Peritoneal lavage/drainage (acute pancreatitis)	7
ERCP with/without sphincterotomy and/or stenting	6
Pancreatic necrosectomy	4
Liver transplantation	5
Drainage of pancreatic abscess	3
Pancreatic biopsy	3
Splenectomy	3
Right hemihepatectomy	3
Packing intra-abdominal cavity	2
Drainage of subhepatic biliary collection	2
Miscellaneous	20

Table S192 (q 1)
Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=131)
General	21
General with special interest in	
- Gastroenterology/colorectal surgery	50
- Vascular surgery	31
- Urology	7
- Transplantation	5
- Paediatric surgery	3
- Endocrinology	2
- Breast disease	1
- Hepatobiliary surgery	1
- Oncology	1
Cardiothoracic - Adult	1
- Adult and paediatric	1
Gynaecology	1
Transplantation	2
Urology	1
Not answered	4

NB - this can be a multiple entry

Table S193 (q 4)
Age at final operation

	(*n*=131)
11 to 19	1
20 to 29	4
30 to 39	2
40 to 49	5
50 to 59	13
60 to 69	41
70 to 79	43
80 to 89	20
90 to 99	2

Fifty per cent of patients were over the age of 70 years.

Table S194 (q 5)
Sex of patient

	(*n*=131)
Male	61
Female	70

Table S195 (q 35)
Which grade of surgeon made the final decision to operate?

	(*n*=131)	(Locums)
Registrar	8	(-)
Senior Registrar	3	(-)
Consultant	117	(4)
Clinical Assistant	1	(-)
Not answered	2	

Consultants were involved in the decision-making in 89% of cases.

Table S196 (q 36)
Grade of the most senior surgeon consulted before operation.

	(*n*=131)	(Locums)
Senior House Officer	1	(-)
Registrar	5	(-)
Senior Registrar	1	(-)
Consultant	121	(4)
Clinical Assistant	1	(-)
Not answered	2	

Consultants were approached in 92% of cases.

Table S197 (q 41)

Other identified diagnoses at time of final surgery

	(*n*=131)
Respiratory	44
Cardiac	46
Neurological	15
Endocrine	16
Alimentary	39
Renal	27
Musculoskeletal	6
Haematological	23
Psychiatric	8
Alcohol-related problems	10
Other	17
Not known	4
None	22

Table S198 (q 42)

ASA Class

	(*n*=131)
1	7
2	29
3	28
4	44
5	14
Not answered	9

Sixty-six per cent of cases were in ASA classes 3 to 5.

Table S199 (q 43)

What was the anticipated risk of death related to the proposed operation?

	(*n*=131)
Not expected	16
Small but significant risk	26
Definite risk	75
Expected	13
Not answered	1

Surgeons thought that there was a likelihood of death following surgery in 67% (88 cases).

Table S200 (qs 42/43)

ASA Class/Anticipated risk of death

	ASA Class					
Risk	**1**	**2**	**3**	**4**	**5**	**Not answered**
Not expected	6	5	2	1	-	2
Small, significant risk	1	13	9	1	-	2
Definite risk	-	11	17	37	6	4
Expected	-	-	-	4	8	1
Not answered	-	-	-	1	-	-

Table S201 (qs 42/54)

ASA Class/Classification of operation

	ASA Class					
Classification of operation	**1**	**2**	**3**	**4**	**5**	**Not answered**
Emergency	2	1	3	6	4	3
Urgent	1	6	9	16	9	1
Scheduled	3	16	15	20	1	4
Elective	1	6	1	2	-	1

These grids show that there was a large group of ill patients (ASA Classes 4 to 5) who were judged to be at considerable risk. It was possible, however, to operate on the majority of these cases in an elective or scheduled manner.

Table S202 (q 44)

What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=131)
Pulse rate recording	131
Blood pressure recording	131
Respiratory rate recording	112
Temperature	129
Central venous pressure measurement	37
Gastric aspiration	68
Intravenous fluids	107
Correction of hypovolaemia	76
Blood transfusion	35
Antibiotics	101
Oxygen therapy	59
Tracheal intubation	38
Mechanical ventilation	36
Stabilisation of fractures	3
Nutritional support	20
Vitamin K	51
DVT prophylaxis	62
Others	15

Table S203 (q 47)

Grade of the most senior operating surgeon

	(*n*=131)	(Locums)
Registrar	24	(1)
Senior Registrar	13	(2)
Consultant	93	(3)
Clinical Assistant	1	(-)

Table S204 (qs 47/54)

Grade of operating surgeon/Classification of operation

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Registrar	5	9	7	3
Senior Registrar	1	4	5	3
Consultant	12	29	47	5
Clinical Assistant	1	-	-	-

Table S205 (q 49)
If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=38)
Yes	14
No	23
Not answered	1

Consultants operated personally, or supervised the surgery, in 82% of the cases. Consultants were involved in the surgery of 67% of the emergency or urgent cases.

Table S206 (q 70)
Was the postoperative period complicated by;

	(*n*=128)*
Haemorrhage/postoperative bleeding requiring transfusion	23
Upper respiratory obstruction	1
Respiratory distress	43
Generalised sepsis	34
Wound infection	2
Wound dehiscence	1
Anastomotic failure	1
Low cardiac output	41
Hepatic failure	32
Renal failure	55
Endocrine system failure	1
Stroke or other neurological problems other than head injury	6
Persistent coma	8
Other organ failure	13
Problems with analgesia	2
DVT and/or pulmonary embolus	4
Pressure sores	1
Urinary tract infection	4
Urinary retention	2
Nutritional problems	12
Other problems	17
None	17

* excludes patients who died in theatre or the recovery area.

Many of the patients were ill, jaundiced and suffering pancreatic malignancy. Multi-organ failure and generalised sepsis were common modes of death.

Closure of colostomy	3
Cholecystectomy	3
Resuture of abdominal dehiscence	3
Panproctocolectomy and ileostomy	2
Reversal of Hartmann's procedure	2
Closure of caecostomy	2
Tracheostomy	2
Miscellaneous	13

Table S209 (q 1)

Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=423)
General	113
General with special interest in	
- Gastroenterology/colorectal surgery	148
- Vascular surgery	81
- Urology	43
- Oncology	9
- Endocrinology	8
- Paediatric surgery	5
- Breast surgery	4
- Transplantation	4
Urology	8
Transplantation	1
Colorectal	1
Vascular	1
Not answered	4

NB - this can be a multiple entry

The spread of interests illustrates the arrangements for emergency cover which are provided in our hospitals. Most surgeons are required to provide cover for emergencies outside their main area of interest. There is evidence that the management of patients with colorectal emergencies differs between firms headed by specialist and non-specialist Consultants[19].

Table S210 (q 4)

Age at final operation

	(*n*=423)
11 to 19	1
20 to 29	1
30 to 39	-
40 to 49	8
50 to 59	29
60 to 69	81
70 to 79	162
80 to 89	126
90 to 99	14
100	1

Seventy-one per cent of the patients who died were over 70 years of age and referral to table S212 shows that the same percentage presented urgently or as emergencies.

Table S211 (q 5)

Sex of patient

	(*n*=423)
Male	201
Female	222

Table S212 (q 10)

Initial admission intention for the last operation performed

	(*n*=423)
Elective	118
Urgent	70
Emergency	233
Not answered	2

Table S213 (q 25)

Was the patient transferred as an inpatient from another hospital?

	(*n*=423)
Yes	30
No	393

From

non-NHS hospital	2
same District (or Health Board)	22
same Region	3
outside Region	2
Not answered	1

Table S214 (q 26)

Type of referring hospital

	(*n*=30)
University	1
District General Hospital (with undergraduate teaching)	7
District General Hospital	7
Community	8
Specialty	5
Independent	2

Table S215 (q 28)

Did the patient's condition deteriorate during transfer?

	(*n*=30)
Yes	1
No	28
Not answered	1

Transfer seems to have been wholly appropriate; the reason was often the need to move ill patients to hospitals with intensive care facilities. General surgeons are still being asked to provide emergency reception facilities at hospitals without adequate resources. Transferring the patients did not appear to cause widespread problems with deterioration of the patient's condition.

Table S216 (q 31)
To what type of area was the patient first admitted?

	(*n*=423)
Medical ward	73
Surgical ward	294
Mixed medical/surgical ward	3
Gynaecological/obstetric ward	3
Admission ward	5
Day unit	1
High dependency unit	1
Intensive care unit	2
A/E holding area	19
Other	12
Not answered	10

The majority of the patients on medical wards were, in fact, on geriatric units.

The day case was admitted for examination under anaesthesia and transferred to a surgical ward for treatment of carcinoma of the rectum.

Table S217 (q 32)
Was the site of admission appropriate for the patient's condition?

	(*n*=423)
Yes	404
No	17
Not answered	2

The difficulties of managing surgical patients in non-surgical areas have already been alluded to.

Table S218 (q 35)

Which grade of surgeon made the final decision to operate?

	(*n*=423)	(Locums)
Senior House Officer	2	(-)
Registrar	84	(7)
Senior Registrar	35	(5)
Associate Specialist	2	(-)
Consultant	299	(15)
Clinical Assistant	1	(-)

Table S219 (q 36)

Grade of the most senior surgeon consulted before operation

	(*n*=423)	(Locums)
Senior House Officer	2	(-)
Registrar	36	(5)
Senior Registrar	21	(4)
Associate Specialist	2	(1)
Consultant	359	(18)
Clinical Assistant	1	(-)
Not answered	2	

Tables S218 and S219 show that Consultants were involved in 85% of decision-making prior to surgery. However, in 7% of cases there was no involvement of a Consultant or Senior Registrar before operation. The Enquiry and its advisers realize that there are some Senior House Officers and Registrars who are well trained and very experienced (with an FRCS). Nonetheless a Consultant should be informed and consulted prior to any surgery.

Table 220 (q 41)

Other identified diagnoses at time of final surgery.

	(*n*=423)
Respiratory	139
Cardiac	194
Neurological	46
Endocrine	39
Alimentary	90
Renal	51
Musculoskeletal	41
Haematological	46
Psychiatric	20
Alcohol-related problems	10
Drug addiction	1
Other	67
Not known	6
None	51

The age of these patients, coupled with the morbidity listed above, illustrates the difficulties, risks and anticipated postoperative problems encountered by surgeons.

Table S221 (q 42)
ASA Class

	(*n*=423)
1	13
2	108
3	130
4	119
5	31
Not answered	22

Thirty-five per cent of the cases presenting with colorectal diseases were in classes 4 and 5 before surgery (severe systemic disorders that are life-threatening or in a moribund condition) and a further 31% were in class 3.

Table S222 (q 43)
What was the anticipated risk of death related to the proposed operation?

	(*n*=423)
Not expected	48
Small but significant risk	94
Definite risk	244
Expected	28
Not answered	9

Sixty-four per cent of the patients were judged to be at considerable risk at the time of surgery.

Table S223 (qs 42/43)
ASA Class/Anticipated risk of death

	ASA Class					
	1	**2**	**3**	**4**	**5**	**Not answered**
Risk						
Not expected	8	25	4	4	1	6
Small, significant risk	5	47	34	3	1	4
Definite risk	-	34	88	100	12	10
Expected	-	-	1	9	17	1
Not answered	-	2	3	3	-	1

Table S224 (qs 42/54)
ASA Class/Classification of operation

Classification of operation	ASA Class 1	2	3	4	5	**Not answered**
Emergency	5	7	11	19	11	9
Urgent	1	38	81	80	14	8
Scheduled	3	52	34	17	6	4
Elective	4	11	4	3	-	1

Table S225 (q 44)
What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=423)
Pulse rate recording	419
Blood pressure recording	419
Respiratory rate recording	342
Temperature	412
Central venous pressure measurement	86
Gastric aspiration	227
Intravenous fluids	348
Correction of hypovolaemia	244
Blood transfusion	80
Antibiotics	323
Oxygen therapy	148
Tracheal intubation	51
Mechanical ventilation	41
Nutritional support	20
Vitamin K	8
DVT prophylaxis	203
Others	33
None	1

Table S226 (q 54)
Classification of the operation

	(*n*=423)
Emergency	62
Urgent	222
Scheduled	116
Elective	23

Sixty-seven per cent of cases were dealt with under conditions of urgency or emergency.

Table S227 (q 47)

Grade of the most senior operating surgeon

	(*n*=423)	(Locums)
Senior House Officer	12	(1)
Registrar	154	(16)
Senior Registrar	56	(9)
Associate Specialist/Staff Grade	5	(1)
Consultant	195	(12)
Not answered	1	

Table S228 (q 49)

If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=228)
Yes	65
No	158
Not answered	5

Table S229 (qs 47/54)

Grade of operating surgeon/Classification of operation

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Senior House Officer	1	10	1	-
Registrar	24	96	30	3
Senior Registrar	10	34	11	1
Associate Specialist/Staff Grade	-	4	1	-
Consultant	27	77	72	19
Not answered	-	-	1	-

Consultants only operated on 46% of cases in total, and 37% of the emergency or urgent cases. When junior or trainee staff were operating there was no immediate supervision in 69% of cases. Five of the cases dealt with by Senior House Officers alone were major emergency or urgent cases involving left-sided colonic pathology. It is inappropriate for this grade of surgeon to be left unsupervised in this type of case.

Table S230 (q 70)

Was the postoperative period complicated by:

	(*n*=411)*
Haemorrhage/postoperative bleeding requiring transfusion	27
Upper respiratory obstruction	10
Respiratory distress	168
Generalised sepsis	109
Wound infection	28
Wound dehiscence	17
Anastomotic failure	19
Low cardiac output	167
Hepatic failure	25
Renal failure	117
Endocrine system failure	7
Stroke or other neurological problems other than head injury	22
Persistent coma	8
Other organ failure	22
Problems with analgesia	10
DVT and/or pulmonary embolus	21
Fat embolus	1
Pressure sores	14
Peripheral ischaemia	2
Urinary tract infection	7
Urinary retention	6
Nutritional problems	48
Other problems	40
None	40

* excludes patients who died in theatre or the recovery area.

Respiratory, cardiac and infective complications were common in this elderly, ill group.

Table S231 (q 88)

Has this death been considered at a local audit/quality control meeting?

	(*n*=423)
Yes	304
No	31
Not answered	88

At least 72% of cases have been discussed at audit meetings.

Specific problems

Colonic pseudo-obstruction

There were seven such cases in the sample. This is a condition which can be diagnosed endoscopically and radiologically. Surgery is often not required and it is of concern that laparotomies were performed where this diagnosis had not been considered.

Perforated diverticular disease

This was the commonest disease other than malignancy. The specialist advisers were concerned about the management of many of these cases. In the absence of any consensus statements on management of diverticular disease, it seems that a wider review of this subject is necessary.

HERNIA SURGERY

There were 52 deaths associated with hernia surgery.

Table S232 (q 51)
Procedures in hernia surgery
(may be multiple and includes coincidental procedures undertaken simultaneously)

Uncomplicated unilateral inguinal hernia repair	12
Bilateral inguinal hernia repair	5
Recurrent inguinal hernia repair	3
Irreducible inguinal hernia repair	3
Strangulated inguinal hernia repair	3
Uncomplicated femoral hernia repair	3
Strangulated femoral hernia repair (all approaches)	13
Incisional hernia repair	5
Paraumbilical hernia repair	3
Lumbar hernia repair	1
Epigastric hernia repair	1
Resection of gangrenous small bowel	9
Appendicectomy	2
Caecostomy	1
Excision gangrenous omentum	1
Orchidectomy	3
Evacuation of haematoma (incisional hernia repair)	1
Cholecystectomy	1

Table S233 (q 1)
Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=52)
General	8
General with special interest in	
- Vascular surgery	18
- Gastroenterology	18
- Urology	6
- Endocrinology	1
Not answered	1

Table S234 (q 4)
Age at final operation

	(*n*=52)
50 to 59	1
60 to 69	5
70 to 79	23
80 to 89	15
90 to 99	8

Table S235 (q 5)

Sex of patient

	(*n*=52)
Male	36
Female	16

Table S236 (q 10)

Initial admission intention for the last operation performed

	(*n*=52)
Elective	19
Urgent	7
Emergency	26

Eighty-eight per cent of cases were over 70 years of age. Sixty-three per cent presented with some degree of urgency or as an emergency.

Table S237 (q 36)

Grade of the most senior surgeon consulted before operation

	(*n*=52)	(Locums)
Registrar	9	(1)
Senior Registrar	4	(-)
Consultant	37	(1)
Not answered	2	

Table S238 (q 41)

Other identified diagnoses at time of final surgery

	(*n*=52)
Respiratory	23
Cardiac	26
Neurological	5
Endocrine	4
Alimentary	13
Renal	4
Musculoskeletal	6
Haematological	1
Psychiatric	6
Other	8
None	4

Table S239 (q 42)
ASA Class

	(*n*=52)
1	8
2	18
3	9
4	9
5	3
Not answered	5

Table S240 (q 42/43)
ASA Class/Anticipated risk of death

	ASA Class					
Risk	**1**	**2**	**3**	**4**	**5**	**Not answered**
Not expected	7	6	2	-	-	2
Small, significant risk	-	6	1	2	-	1
Definite risk	-	4	6	6	1	2
Expected	-	-	-	1	2	-
Not answered	1	2	-	-	-	-

Despite age and comorbidity, 50% of the cases were in good ASA classes with minimal anticipated risk. Those in ASA class 5 were accurately assessed by the surgeons, in that they were expected to die. What benefit was expected from the surgery?

Table S241 (q 42/54)
ASA Class/Classification of operation.

	ASA Class					
Classification of operation	**1**	**2**	**3**	**4**	**5**	**Not answered**
Emergency	-	2	-	3	1	-
Urgent	2	7	8	5	2	3
Scheduled	-	1	-	1	-	1
Elective	6	8	1	-	-	1

Table S242 (q 44)
What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=52)
Pulse rate recording	52
Blood pressure recording	51
Respiratory rate recording	39
Temperature	52
Central venous pressure measurement	5
Gastric aspiration	19
Intravenous fluids	25
Correction of hypovolaemia	17
Blood transfusion	2
Antibiotics	21
Oxygen therapy	17
Tracheal intubation	5
Mechanical ventilation	4
Vitamin K	1
DVT prophylaxis	17
Others	2

Thromboembolic prophylaxis was used in 33% of cases.

Table S243 (q 47)
Grade of the most senior operating surgeon

	(*n*=52)	(Locums)
Senior House Officer	2	(-)
Registrar	25	(4)
Senior Registrar	3	(-)
Consultant	22	(1)

Consultants operated on 42% of these cases; the majority (52%) were operated on by Senior House Officers and Registrars.

Table S244 (q 47/54)
Grade of operating surgeon/Classification of operation

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Senior House Officer	1	-	-	1
Registrar	2	19	1	3
Senior Registrar	1	1	-	1
Consultant	2	7	2	11

Although 33 (63%) cases presented with some degree of urgency or as emergencies, and thus were the sicker patients, Consultants only operated on nine of these cases.

Table S245 (q 49)

If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=30)
Yes	12
No	18

Are junior surgeons being actively taught the management of patients with complications of hernias?

Table S246 (q 56)

Time of start of operation (not including anaesthetic time)

	(*n*=52)
08.00 to 18.00	30
18.01 to 23.00	11
23.01 to 07.59	6
Not answered	5

At least 33% of cases were operated on "out of hours".

Table S257 (q 70)

Was the postoperative period complicated by:

	(*n*=50)*
Upper respiratory obstruction	1
Respiratory distress	22
Generalised sepsis	5
Low cardiac output	18
Hepatic failure	1
Renal failure	8
Stroke or other neurological problems other than head injury	1
Other organ failure	3
DVT and/or pulmonary embolus	7
Urinary tract infection	2
Urinary retention	1
Other problems	8
None	9

* excludes patients who died in theatre or the recovery area.

Respiratory and cardiac problems were the main complications in this elderly group.

Table S248 (q 88)

Has this death been considered at a local audit/quality control meeting?

	(*n*=52)
Yes	39
No	6
Not answered	7

Seventy-five per cent of the deaths were discussed at audit meetings.

The management of strangulated hernia will be reviewed specifically in the 1991/1992 NCEPOD enquiry.

GENERAL SURGERY - MISCELLANEOUS

Table S249 (q 51)
Miscellaneous primary procedures in general surgery

Excision biopsy of lymph node (all sites)	11
Incision and drainage of superficial abscess	9
Insertion of Hickman line	6
Tracheostomy	5
Debridement of wounds	5
Biopsy of tumour mass	3
Abdominal paracentesis	2
Needle biopsy of liver	2
Parathyroidectomy	1
Thyroid biopsy	1
Thyroid isthmectomy	1
Bilateral mastectomy	1
Unilateral mastectomy	1
Excision of tumour and block dissection of nodes	1
Thoracic paracentesis	2

Table S250 (q 1)
Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=50)
General	12
General with special interest in	
- Gastroenterology	18
- Vascular surgery	10
- Urology	5
- Endocrinology	3
- Breast surgery	1
Oral/Maxillofacial	1
Transplantation	1
Urology	1
Not answered	1

NB - this can be a multiple entry

Table S251 (q 4)
Age at final operation.

	(*n*=50)
30 to 39	3
40 to 49	5
50 to 59	6
60 to 69	12
70 to 79	10
80 to 89	12
90 to 99	2

Table S252 (q 5)

Sex of patient.

	(*n*=50)
Male	23
Female	27

Table S253 (q 10)

Initial admission intention for the last operation performed

	(*n*=50)
Elective	19
Urgent	14
Emergency	17

Sixty-two per cent of cases were admitted as emergencies or with some urgency.

Table S254 (q 25)

Was the patient transferred as an inpatient from another hospital?

	(*n*=50)
Yes	3
No	47

From

non-NHS hospital	1
same District (or Health Board)	1
same Region	1

Table S255 (q 26)

Type of referring hospital (transferred patients only)

	(*n*=3)
University	1
District General Hospital	1
Independent	1

None of the patients deteriorated during transfer (question 28).

Table S256 (q 31)

To what type of area was the patient first admitted?

	(*n*=50)
Medical ward	14
Surgical ward	29
Mixed medical/surgical ward	1
Gynaecological/obstetric ward	1
Intensive care unit	1
Direct to theatre	2
Other	2

Table S257 (q 32)

Was the site of admission appropriate for the patient's condition?

	(*n*=50)
Yes	47
No	2
Not answered	1

Table S258 (q 33)

Was care undertaken on a formal shared basis with another specialty?

	(*n*=50)
Yes	20
No	30

Table S259 (q 34)

Who made the working diagnosis?

	(*n*=50)	(Locums)
Surgeons		
House Officer	10	(-)
Senior House Officer	10	(-)
Registrar	19	(1)
Senior Registrar	2	(-)
Associate Specialist	1	(-)
Consultant	37	(-)
General Practitioner	8	(-)
Consultant Physician	1	(-)
Not answered	2	

NB - this can be a multiple entry

Table S260 (q 35)
Which grade of surgeon made the final decision to operate?

	(*n*=50)	(Locums)
Registrar	10	(-)
Senior Registrar	2	(-)
Consultant	38	(-)

Table S261 (q 36)
Grade of the most senior surgeon consulted before operation.

	(*n*=50)	(Locums)
Registrar	6	(-)
Senior Registrar	1	(-)
Consultant	43	(1)

Consultants were involved in decision-making in 76% of cases and consulted prior to surgery in 86% of cases.

Table S262 (q 37)
Surgical staff who took history before operation but after admission

	(*n*=50)	(Locums)
House Officer	30	(1)
Senior House Officer	23	(-)
Registrar	35	(2)
Senior Registrar	7	(-)
Consultant	36	(-)
Not answered	1	

NB - this can be a multiple entry

Table S263 (q 38)
Surgical staff who examined the patient before operation but after admission

	(*n*=50)	(Locums)
House Officer	31	(1)
Senior House Officer	26	(-)
Registrar	36	(2)
Senior Registrar	8	(-)
Consultant	35	(-)
Not answered	1	

NB - this can be a multiple entry

Table S264 (q 41)
Other identified diagnoses at time of final surgery.

	(*n*=50)
Respiratory	19
Cardiac	16
Neurological	9
Endocrine	2
Alimentary	7
Renal	8
Musculoskeletal	4
Haematological	5
Psychiatric	1
Other	9
Not known	2
None	3

Table S265 (q 42)
ASA Class

	(*n*=50)
1	3
2	10
3	9
4	19
5	2
Not answered	7

Sixty per cent of cases were ASA classes 3 to 5.

Table S266 (qs 42/43)
ASA Class/Anticipated risk of death

	ASA Class					
Risk	**1**	**2**	**3**	**4**	**5**	**Not answered**
Not expected	3	5	6	6	1	4
Small but significant risk	-	4	3	5	-	1
Definite risk	-	-	-	6	1	1
Expected	-	-	-	2	-	-
Not answered	-	1	-	-	-	1

Table S267 (qs 42/54)

ASA Class/Classification of operation

	ASA Class					
Classification of operation	**1**	**2**	**3**	**4**	**5**	**Not answered**
Emergency	-	-	-	-	-	-
Urgent	1	5	3	7	1	2
Scheduled	2	5	5	10	1	3
Elective	-	-	1	2	-	2

Table S268 (q 43)

What was the anticipated risk of death related to the proposed operation?

	(*n*=50)
Not expected	25
Small but significant risk	13
Definite risk	8
Expected	2
Not answered	2

Table S269 (q 44)

What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=50)
Pulse rate recording	49
Blood pressure recording	49
Respiratory rate recording	42
Temperature	49
Central venous pressure measurement	5
Gastric aspiration	8
Intravenous fluids	23
Correction of hypovolaemia	11
Blood transfusion	8
Antibiotics	22
Oxygen therapy	17
Tracheal intubation	9
Mechanical ventilation	5
Nutritional support	4
Vitamin K	1
DVT prophylaxis	9
Others	6
None	1

Table S270 (q 46)

Day of operation

	(*n*=50)
Monday	9
Tuesday	9
Wednesday	11
Thursday	7
Friday	12
Saturday	2
Sunday	-
Public holiday	1

Table S271 (q 47)

Grade of the most senior operating surgeon

	(*n*=50)	(Locums)
House Officer	1	(-)
Senior House Officer	5	(-)
Registrar	21	(2)
Senior Registrar	5	(-)
Consultant	18	(1)

Table S272 (qs 47/54)

Grade of operating surgeon/Classification of operation

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
House Officer	-	1	-	-
Senior House Officer	-	4	-	1
Registrar	-	11	8	2
Senior Registrar	-	-	4	1
Consultant	-	3	14	1

NB - Classification of operation not answered in 1 case.

Table S273 (q 49)

If the most senior operating surgeon was *not* **a Consultant, was a more senior surgeon** *immediately* **available, i.e. in the operating room/suite?**

	(*n*=32)
Yes	12
No	19
Not answered	1

Consultant surgeons operated on 36% of cases. Consultants were involved in the surgery in 60% of cases, if their availability is also taken into account.

Table S274 (q 70)

Was the postoperative period complicated by:

	(*n*=49)*
Haemorrhage/postoperative bleeding requiring transfusion	2
Upper respiratory obstruction	1
Respiratory distress	10
Generalised sepsis	6
Wound infection	3
Anastomotic failure	1
Low cardiac output	7
Hepatic failure	3
Renal failure	11
Endocrine system failure	1
Stroke or other problems problems other than head injury	5
Persistent coma	3
Other organ failure	3
DVT and/or pulmonary embolus	2
Pressure sores	2
Urinary tract infection	1
Nutritional problems	3
Other problems	10
None of the above	16

* excludes patients who died in theatre or the recovery area.

Table S275 (q 88)

Has this death been considered at a local audit/quality control meeting?

	(*n*=50)
Yes	32
No	9
Not answered	9

Sixty-four per cent of cases were considered at audit meetings.

VASCULAR SURGERY

There were 449 forms relating to deaths in vascular surgery. The age distribution and incidence of diseases is shown in tables S279 and S294, illustrating the advanced age of patients suffering with vascular disease and the extent of their comorbidity. The final surgical procedures which led to the patient's death are shown in table S276. Some of these procedures were bilateral and, due to the nature and design of the questionnaire, it is apparent that the *final* operation is often not the most relevant in determining the outcome for the patient. The most common procedures leading to death were surgery for ruptured aortic aneurysm and above knee amputation (for whatever reason). These patients have generalised arterial disease.

Table S276 (q 51)
Vascular Surgery Procedures
(may be multiple and includes coincidental procedures undertaken simultaneously)

Abdominal aortic aneurysm surgery
(including iliac aneurysm and thoracic aneurysm presenting to vascular or general surgeons)

Leaking (ruptured) aortic aneurysm	224
Leaking iliac aneurysm	3
Urgent/elective surgery for non-leaking abdominal aortic aneurysms	26
False aneurysm of abdominal aorta	2
Leaking thoraco-abdominal aneurysm	2
Dissecting thoracic aneurysm	1

Aorto-iliac surgery for occlusive disease

Elective aortic by-pass surgery	16
Revisional surgery for occluded aortic bypass graft	9
Removal of infected aortofemoral graft	2
Embolectomy for saddle embolus	8
Axillo femoral bypass	8
Thrombectomy for occluded axillofemoral graft	3
Femoro-femoral cross-over graft	9
Repair iliac artery trauma	2
Ilio-distal bypass	2

Peripheral Vascular Surgery

Femoropopliteal bypass	12
Thrombectomy of femoropopliteal graft	1
Femorodistal bypass	7
Femoral endarterectomy and profundoplasty	6
Resection of femoral artery aneurysm	3
Ligation of common femoral artery	1
Reexploration for bleeding after femoropopliteal bypass	2
Femoral thromboembolectomy	54
Brachial embolectomy	3

Amputation Surgery

Amputation of arm above elbow	1
Disarticulation of the hip (for ischaemia)	5
Unilateral above knee amputation	71
Bilateral above knee amputation	3
Gritti-Stokes amputation	5
Through knee amputation	3
Below knee amputation	31
Forefoot amputation	1
Amputation of toes	7
Debridement/refashioning of amputation stumps	7
Debridement ulcerated foot	3

Miscellaneous

Exploratory laporatomy for bleeding after aortic surgery	5
Tracheostomy (following previous vascular surgery)	3
Varicose vein surgery	2
Iliac angioplasty	1
Accidental ligation of abdominal aorta	1
Repair aorto-jejunal fistula	1
Lumbar chemical sympathectomy	1
Ligation external iliac artery	1
Repair iliac vein trauma	1
Exploration of neck for bleeding after cervical sympathectomy	1

Table S277 (q 1)

Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=449)
Vascular	13
General	53
General with special interest in	
- Vascular surgery	282
- Gastroenterology/colorectal surgery	46
- Urology	18
- Endocrinology	4
- Oncology	3
- Transplantation	3
- Paediatric surgery	3
- Hepatobiliary surgery	1
- Parotid surgery	1
Cardiothoracic	1
Orthopaedic	2*
Plastic	1
Transplantation	1
Urology	2
Not answered	15

* Amputations for vascular complications of orthopaedic diagnoses.

The majority of deaths (66%) were reported either by general surgeons who expressed an interest in vascular surgery or by vascular surgeons. Thus it appears that, within general surgery, a considerable degree of specialization exists. However it is evident that, in order to provide workable emergency rotas, surgeons with interests other than vascular surgery are being required to deal with vascular emergencies.

Inappropriate Specialty

> *"It is certain that this operation would have been performed more quickly and better by a vascular rather than a gastroenterological surgeon".*

Thus writes a surgeon after grappling with a difficult leaking aortic aneurysm in an 83-year-old man who died three days later. Had this surgeon been experienced in the appropriate specialty he might have reconsidered the indication to operate in the first place. The specialist advisers felt that there were seven other cases where the special interests of the operating surgeons were inappropriate and represented an avoidable and detrimental factor in the patient's management. It is also of concern that referral and transfer to a specialised vascular unit was not considered.

> *A 69-year-old woman with a leaking abdominal aortic aneurysm presented to a locum Consultant General Surgeon with no vascular experience. He allowed the Registrar to perform the surgery as the Registrar professed himself to be competent in this form of surgery. The patient died on the table.*

Table S278 (q 2)

In which type of hospital did the last operation take place?

	(*n*=449)
University	91
District General (with undergraduate teaching)	253
District General	101
Defence Medical Services	2
Independent	2

Table S279 (q 4)

Age at final operation

	(*n*=449)
30-39	1
40-49	4
50-59	25
60-69	128
70-79	171
80-89	105
90-99	15

Table S280 (q 5)
Sex of patient

	(*n*=449)
Male	316
Female	133

Table S281 (q 10)
Initial admission intention for the last operation performed

	(*n*=449)
Elective	97
Urgent	73
Emergency	277
Not answered	2

As expected, emergency admissions, 62%, constitute a significant workload in vascular surgery. Amongst the reported deaths in vascular surgery, only 22% followed elective surgery.

Table S282 (q 17)
Day of admission

	(*n*=449)
Weekday	347
Saturday or Sunday	89
Public Holiday	5
Admission date not answered	8

Holiday periods

> *A 74-year-old man was admitted urgently to a District General Hospital under the care of an experienced vascular surgeon. The patient had a limb-threatening iliac artery occlusion and was a known sufferer of chronic obstructive airways disease. He underwent an uneventful vascular reconstruction on Christmas Eve. Postoperatively he developed an acute respiratory problem which was not diagnosed promptly; subsequent treatment was inadequate due to a depleted physiotherapy service and he died in respiratory failure.*

This case illustrates the difficulties of operating and of delivering postoperative care over a holiday period.

Table S283 (q 18)

Was the patient transferred from another department within the hospital where the operation took place?

	(*n*=449)
Yes	123
No	326

Surgeons received 27% of their vascular cases via internal referrals. The specialist advisers felt that these may represent the more difficult cases.

Table S284 (q 19)

If this was an urgent or emergency case, was there any *delay in referral* on this occasion?

	(*n*=350)
Yes	35
No	303
Not answered	12
Delay	
Doctor related	17
Patient related	14
Other	2
Not answered	2

Table S285 (q 20)

Was there any *delay in admitting* the patient?

	(*n*=449)
Yes	8
No	433
Not answered	8
Reason for delay	
Lack of resources	3
Surgical staff committed elsewhere	1
Other	4

Table S286 (q 25)

Was the patient transferred as an inpatient from another hospital?

	(*n*=449)
Yes	37
No	407
Not answered	5

From

same District (or Health Board)	23
same Region	11
outside Region	2
Not answered	1

Table S287 (q 26)

Type of referring hospital.

	(*n*=37)
University	5
District General Hospital (with undergraduate teaching)	12
District General Hospital	12
Community	4
Specialty	1
Other	2
Not answered	1

Table S288 (q 28)

Did the patient's condition deteriorate during transfer?

	(*n*=37)
Yes	6
No	29
Not answered	2

Fewer patients were transferred than might have been expected, given the specialized nature of vascular surgery. Deterioration during transfer was reported in six cases despite precautions to manage these patients correctly during their transfer. Most of these people were old and desperately ill with little chance of survival without transfer.

Table S289 (q 31)

To what type of area was the patient first admitted?

	(*n*=449)
Medical ward	65
Surgical ward	249
Admission ward	10
High dependency unit	5
Intensive care unit	7
A/E holding area	31
Direct to theatre	59
Other	19
Not answered	4

Table S290 (q 34)

Who made the working diagnosis?

	(*n*=449)	(Locums)
Surgeons		
House Officer	114	(-)
Senior House Officer	146	(3)
Registrar	198	(12)
Senior Registrar	95	(-)
Associate Specialist/Staff Grade	11	(-)
Consultant	268	(10)
General Practitioner	101	(1)
Consultant Cardiologist	1	(-)
Consultant Radiologist	1	(-)
Not answered	1	

NB - this can be a multiple entry

Table S291 (q 37)

Surgical staff who took history before operation but after admission

	(*n*=449)	(Locums)
House Officer	308	(-)
Senior House Officer	239	(1)
Registrar	257	(10)
Senior Registrar	115	(2)
Associate Specialist/Staff Grade	17	(1)
Consultant	256	(9)
Other	5*	

NB - this can be a multiple entry

* Other - Student
- Clinical Assistant
- Nil, patient collapsed
- Unspecified (2)

Table S292 (q 38)
Surgical staff who examined the patient before operation but after admission

	(*n*=449)	(Locums)
House Officer	302	(-)
Senior House Officer	258	(2)
Registrar	288	(12)
Senior Registrar	130	(3)
Associate Specialist/Staff Grade	14	(1)
Consultant	320	(10)
Clinical Assistant	2	(-)

NB - this can be a multiple entry

It is pleasing to note that more than one member of the surgical team examined the patients.

Table S293 (q 35)
Which grade of surgeon made the final decision to operate?

	(*n*=449)	(Locums)
Senior House Officer	4	(-)
Registrar	42	(5)
Senior Registrar	54	(3)
Associate Specialist	4	(-)
Consultant	345	(12)

It is clearly satisfactory to be able to report that the decision to operate was taken by a Consultant or a Senior Registrar in 89% of cases. Similarly, reference to tables S290, S291, S292 and S293 shows the considerable involvement of senior surgeons in the care of these ill patients with vascular disease.

Table S294 (q 41)
Other identified diagnoses at time of final surgery.

	(*n*=449)
Respiratory	152
Cardiac	295
Neurological	71
Endocrine	66
Alimentary	35
Renal	58
Musculoskeletal	37
Haematological	25
Psychiatric	11
Alcohol-related problems	5
Drug addiction	4
Other	63
Not known	17
None	41

Table S295 (q 43)

What was the anticipated risk of death related to the proposed operation?

	(*n*=449)
Not expected	21
Small but significant risk	91
Definite risk	265
Expected	61
Not answered	11

Table S296 (q 42)

ASA Class

	(*n*=449)
1	5
2	76
3	116
4	169
5	55
Not answered	28

Table S297 (q 44)

What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=449)
Pulse rate recording	446
Blood pressure recording	445
Respiratory rate recording	363
Temperature	397
Central venous pressure measurement	148
Gastric aspiration	88
Intravenous fluids	318
Correction of hypovolaemia	175
Blood transfusion	113
Antibiotics	285
Oxygen therapy	231
Airway protection i.e. in head injuries	9
Tracheal intubation	71
Mechanical ventilation	53
Stabilisation of fractures	1
Nutritional support	6
Vitamin K	5
DVT prophylaxis	70
Others	51
Not answered or none	3

Table S298 (q 46)
Day of operation

	(*n*=449)
Monday	67
Tuesday	75
Wednesday	79
Thursday	81
Friday	64
Saturday	47
Sunday	36
Public holiday	7
Extra-statutory holiday (NHS)	2

Table S299 (qs 46/54)
Day of operation/Classification of operation

	Classification			
Day	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Monday	32	17	14	4
Tuesday	22	18	27	8
Wednesday	24	29	22	4
Thursday	26	22	28	5
Friday	23	19	18	4
Saturday	25	15	4	1
Sunday	19	15	1	-
	171	135	114	26

NB - Classification of operation not answered in 3 cases.

The definitions of Emergency, Urgent, Scheduled and Elective are in the glossary (Appendix A). Most deaths are recorded after Emergency and Urgent operations and these took place every day of the week and at weekends.

Table S300 (q 56)
Time of start of operation (not including anaesthetic time)

	(*n*=449)
08.00 to 18.00	281
18.01 to 23.00	84
23.01 to 07.59	49
Not answered	35

Table S301 (q 47)

Grade of the most senior operating surgeon

	(*n*=449)	(Locums)
House Officer	-	(-)
Senior House Officer	18	(1)
Registrar	98	(11)
Senior Registrar	74	(4)
Associate Specialist	5	(-)
Consultant	254	(13)

Senior House Officers did 14 amputations, three thromboembolectomies and one chemical sympathectomy.

Table S302 (qs 47/54)

Grade of most senior operating surgeon/Classification of operation.

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Senior House Officer	1	12	4	1
Registrar	17	47	32	1
Senior Registrar	32	26	12	4
Associate Specialist	2	-	2	1
Consultant	119	50	64	19

NB - Classification of operation not answered in three cases

Consultants and Senior Registrars are heavily involved in emergency and urgent surgery. This is most appropriate in view of the complexity of the cases.

Table S303 (q 49)

If the most senior operating surgeon was *not* a consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=195)
Yes	59
No	130
Not answered	6

Inappropriate grade of operating surgeon

This appears to be much less of a problem than suggested in the 1987 CEPOD report[1]. Clearly, if experienced Consultants in other specialties encounter difficulties with vascular surgery, then surgeons in training will have similar problems and should certainly not be left unsupervised. This applies both to the decision-making and the operative phase of the patient's care. Problems have arisen in the failure to differentiate between thrombosis and embolism, failure to assess the adequacy of surgery, inappropriate level selection for amputation and misguided, heroic and over-enthusiastic surgery.

> *An 84-year-old man presented with an "aortic saddle embolus". The Consultant Surgeon in charge was not consulted at any stage (a Senior Registrar was consulted). A Registrar with seven months experience in this grade did bilateral femoral embolectomies but was unable to remove any clot. The patient died. No post mortem was done.*

This was an inadequate operation. The treatment of acutely ischaemic legs is not simply the passage of an embolectomy catheter.

Table S304 (q 64)
Which of the following are available in the hospital in which the operation took place?

	(*n*=449)
Theatre recovery room	392
Adult intensive care unit	394
Adult high dependency unit	91
Not answered	11

Table S305 (q 65)
Was the patient admitted immediately to an ICU or HDU postoperatively?

	(*n*=376)*
Intensive care unit	161
High dependency unit	19
Neither	196

* excludes patients who died in theatre or the recovery area.

Table S306 (q 65)
Were these facilities adequate?

	(*n*=180)
Yes	174
No	1
Not answered	5

Table S307 (q 66)
Were you at any time unable to transfer the patient into an ICU/HDU etc within the hospital in which the surgery took place?

	(*n*=375)
Yes	14
No	353
Not answered	8

Table S308 (q 67)
What were the indications for the admission to ICU/HDU?

	(*n*=180)
Specialist nursing	139
Presence of experienced intensivists	124
General monitoring	159
Metabolic monitoring	53
Ventilation	134
Surgical complications	23
Anaesthetic complications	22
Co-existing medical diseases	66
Inadequate nursing on general wards	17
Transfer from hospital without facilities	1
Other	7

Inadequate intensive care or high dependency facilities

Vascular expertise must be available in hospitals where seriously ill or injured patients are received. Clearly this is true for hospitals with Trauma Units and Accident and Emergency Departments. Vascular surgeons are also likely to make major demands on radiological and anaesthetic departments, intensive care units and pathology services. The Enquiry received several reports describing situations where vascular surgeons are expected to undertake critical surgery in units which are provided with inadequate facilities and divorced from supporting services. The following cases illustrate these problems.

> *An 83-year-old man underwent a successful repair of a leaking abdominal aortic aneurysm by a vascular surgeon with 20 years experience. The patient was nursed on a surgical ward which was understaffed (despite bed closures). The patient died following cardiac problems. This surgeon also wrote to the Enquiry deploring the inadequate provision of intensive care beds and the poor staffing levels.*

> *A patient died after an attempt to repair a leaking suprarenal abdominal aortic aneurysm was abandoned. The surgeon took the opportunity to complain about the organisation of services. He states, "... it is nonsense to have vascular surgery in a unit with no Accident and Emergency and no ICU. Despite years of trying to get management to do something, nothing changes!"*

Under these circumstances, when asked to provide a vascular service, the surgeons should say "No".

Table S309 (q 70)

Was the postoperative period complicated by;

	(*n*=376*)
Haemorrhage/postoperative bleeding requiring transfusion	53
Upper respiratory obstruction	9
Respiratory distress	110
Generalised sepsis	31
Wound infection	18
Wound dehiscence	11
Anastomotic failure	5
Low cardiac output	185
Hepatic failure	141
Renal failure	113
Endocrine system failure	4
Stroke or other neurological problems other than head injury	24
Persistent coma	7
Other organ failure	39
Problems with analgesia	5
DVT and/or pulmonary embolus	11
Pressure sores	13
Peripheral ischaemia	75
Urinary tract infection	9
Urinary retention	5
Nutritional problems	8
Other problems	54
None	40

* excludes patients who died in theatre or the recovery area.

Multiple organ failure appears to be the major cause of death in these elderly patients with extreme comorbidity.

Table S310
Remediable factors in vascular surgery

Poor surgical judgment and inappropriate procedures	16
Inappropriate grade of operating surgeon	10
Inappropriate specialty of Consultant in charge	8
Lack of ICU bed	8
Failure to refer to specialist surgeon/vascular unit	5
Bed shortage leading to delay in admission	2
Multi-sited district, delay in emergency blood supply	2
Inappropriate pre-operative assessment/management	2
Lack of DVT prophylaxis	2
Theatre shortage leading to delay in operation	1
Inadequate support services eg physiotherapy, during holiday periods	1
Poor communication/liaison with other departments	1

The overall standard of care given to patients was high and Consultant-led. This comment is supported by the many letters which Consultants sent in with the completed forms in order to clarify the clinical situation. Nevertheless there were 56 cases (2% of the total sample and 13% of the vascular cases) in which it was considered that death might have been avoidable. The factors contributing to failure were often multiple and interrelated. They include factors which have been highlighted in previous reports[1,2] such as inappropriate operations and grade of operating surgeon.

In addition to those remediable factors which contributed directly to the causes of death, there were other instances where treatment appeared to be less than ideal. These vary from technical matters relating to the practice of vascular surgery, to over-enthusiastic surgery in terminally ill patients and in those where quality of life could not be improved.

It is difficult to differentiate between thrombosis and embolus and in some cases there was a failure to investigate these cases appropriately. If facilities for appropriate investigation are not available then early referral to an expert is required.

> *A previously fit 73-year-old man presented with an acutely ischaemic leg. A mistaken diagnosis of femoral embolism was made. An operation was done by a Registrar with Consultant supervision. An embolectomy was attempted but abandoned due to inability to pass the embolectomy catheter distally. This was clearly an arterial thrombosis but no further investigations were done and the patient died 29 days later with multisystem failure.*

Delay in transfer and the subsequent dangers associated with revascularisation of an ischaemic limb are detrimental to survival.

> *A 53-year-old woman was operated on by a general surgeon in order to drain a left pyonephrosis containing 5 litres of pus. There was considerable haemorrhage from the left renal artery which was controlled by several ligatures. Unfortunately these had unintentionally encircled the abdominal aorta. The subsequent ischaemia of the legs went unnoticed for over nine hours. When this lady was finally transferred to a vascular unit the vascular surgeon was faced with a delayed referral and a choice between bilateral high thigh amputations (or even disarticulation of the hips) or attempted revascularisation with its attendant hazards. The patient was subsequently managed in a cautious and thoughtful manner with repair of the aorta to re-establish circulation, and fasciotomies in the legs. Despite the care taken, when the legs were revascularised, the patient suffered a cardiac arrest due to hyperkalaemia.*

Proper assessment, earlier recognition of the initial problem and prompt referral might have avoided the outcome.

Organisation of vascular services

The surgery of ruptured aortic aneurysms and other complex vascular problems can prove difficult for general surgeons without specific vascular training. These problems appear to occur at weekends and during periods of annual and study leave when suitably experienced cover may not be available or designated vascular surgeons cannot be contacted to deal with specific problems. Liaison between Districts and the provision of Regional Vascular Units would help to alleviate some of these problems.

> *A 60-year-old man had a technically successful repair of a leaking abdominal aortic aneurysm by a general surgeon in a District General Hospital. The patient died three days postoperatively following an acute myocardial infarction. There were three vascular surgeons on the staff of the hospital but none were available.*

> *A very ill 72-year-old man was admitted to a District General Hospital with a leaking abdominal aortic aneurysm following a successful repair of an aneurysm 15 years previously. The general surgeon on call was reluctant to tackle the problem, the vascular surgeon was on holiday and there was an unfilled vacancy for a Consultant Vascular Surgeon in the neighbouring District. The nearest large vascular unit (with three surgeons) had no beds in their intensive care unit and declined to take the case. The local vascular surgeon therefore abandoned his vacation to deal with the problem. The pathology was complex and the surgeon, being aware of the remote probability of survival, abandoned the procedure. The surgeon wrote to say that although services were stretched he did not think this affected the outcome.*

Suitable arrangements were in place to provide vascular services and it would appear that the designated vascular unit should have taken this case.

Split sites

Multi-sited districts pose problems for vascular surgeons as mentioned above. Comprehensive services must be rationalised and provided on one site. NCEPOD is aware of several cases where delays in transferring blood from one hospital to another adversely affected the outcome.

> *A 73-year-old man presented on a Sunday with a leaking abdominal aortic aneurysm. An experienced locum Consultant Surgeon operated skilfully and the aneurysm was controlled. Pathology services were in another hospital some three to four miles away and the provision of blood for transfusion was delayed. Despite successful insertion of a graft the patient died on the table from hypovolaemia.*

Redefinition of goals

There may be a need to redefine the goals in complicated vascular cases in order that patient survival is given priority over limb survival. Sometimes competent and experienced vascular surgeons strive too hard to preserve a limb and fail to see the deteriorating general condition of the patient. When this situation arises or when patients present moribund with only a slim chance of survival, then an appropriate procedure should be chosen.

> *A 63-year-old man underwent five major vascular operations in 33 days, culminating in an above knee amputation. He died two days later in congestive cardiac failure.*

Had the objectives of surgery been reviewed earlier he might have survived.

> *A 76-year-old lady had an elective aortobifemoral bypass graft done by an experienced surgeon with a vascular interest in a District General Hospital with a teaching commitment. She was known to have ischaemic heart disease but there was no bed in the intensive care unit. Twenty-four hours after surgery the patient suffered an acute myocardial infarction and died. The surgeon felt that the additional monitoring and management by experienced intensivists would have been beneficial. He wrote a personal letter pointing out that the four-bedded intensive care unit was grossly inadequate for the size of the hospital and that staff were bitter about the constant proposals to improve facilities which never came to fruition.*

Knowing the situation, should the surgeon have embarked on the operation?

> *An aortobifemoral bypass was done on a 52-year-old man. The Consultant was experienced but several problems occurred. The patient was known to have severe coronary artery disease. The intensive care unit was full so an opportunity arose to cancel the case but the surgeon went ahead. At anaesthetic induction the patient became persistently hypotensive and it appeared inadvisable to proceed, particularly in view of the lack of an intensive care bed. Considering the state of the patient, the level of monitoring used was also insufficient. Exhibiting particularly poor judgement the anaesthetist and surgeon decided to proceed. The surgery was uneventful but the patient died in the recovery room when he developed a ventricular arrhythmia two hours after surgery.*

Difficult decisions

The decision not to operate is a difficult one and should be made at senior level. There is also no place in modern management for heroics and over-enthusiasm, such as opening the abdomen for a ruptured aortic aneurysm in the Accident and Emergency Department. Such a patient should either be transferred immediately to the operating suite whilst resuscitation proceeds or a decision should be made to abandon further treatment.

Many cases were reported where over-enthusiastic or even inhumane intervention had taken place. In replying to the questionnaire many surgeons replied to Question 43, "What was the anticipated risk of death related to the proposed operation?", by answering that death was expected. One wonders what the anticipated benefits were. Advancing, widespread vascular disease can sometimes be a terminal disease and should be recognised as such when appropriate, in which case symptom control alone is preferable.

Serious thought should be given to the indications and expected benefits when considering surgery in the elderly with vascular catastrophes. Examples included:

> *An 89-year-old with a ruptured intra-abdominal aneurysm and ischaemic colitis who was operated on by a Senior Registrar in a University Hospital.*
>
> *A senile 78-year-old in heart failure who was admitted with critical ischaemia of a leg and poor distal vessels. A femorodistal bypass with prosthetic material failed and the patient died.*
>
> *A deaf and blind 89-year-old lady with severe rheumatoid arthritis had an above knee amputation 24 hours before she died.*
>
> *A 66-year-old man with a recent myocardial infarct, multiple sclerosis and pneumonia was subjected to an above knee amputation 24 hours before he died.*
>
> *A man suffering with advanced motor neurone disease died on the operating table when he ruptured his abdominal aortic aneurysm.*
>
> *A patient aged 73, terminally ill with liver metastases from a carcinoma of stomach, developed an ischaemic foot due to arterial thrombosis. Wrongly diagnosing an embolus a Registrar attempted an embolectomy. The patient died 24 hours later.*

Varicose veins

> *A death occurred in a 53-year-old man undergoing laser surgery for unilateral varicose veins. The patient was under the care of a general surgeon with an interest in oncology in a District General Hospital with a teaching commitment. The patient had a long history of chest pains but no definitive diagnosis of ischaemic heart disease had been made. On three occasions surgery had been refused by the surgeons because of concern about the chest pain. The decision to operate was taken after assessment in an anaesthetic clinic. (The indications for surgery in this man's case are not clear.) The Consultant operated personally. Fifteen to twenty minutes into the operation the patient suffered a myocardial infarct and died despite extensive resuscitation measures. Post mortem confirmed the cause of death.*

This case is discussed further in the anaesthetic section (page 110).

General comments on vascular surgery

The deaths in vascular surgery raised several issues which have not been dealt with above. The nature of NCEPOD means that many issues were raised for which satisfactory answers cannot be provided without a more comprehensive audit of "outcome" as distinguished from "death alone".

The following additional points were raised by the advisers.

a) Major questions surround the appropriateness and degree of pre-operative assessment of vascular pathology and comorbidity. Thorough assessment before operation in relation to other manifestations of vascular disease needs to be made by competent specialists.

b) The management of the acutely ischaemic leg is difficult. The distinction between thrombosis and embolism is crucial. For optimal results it requires a multi-disciplinary approach with access to angiography and, increasingly, thrombolysis.

c) It should be established and recorded that an adequate haemodynamic result has been achieved after vascular reconstruction. This should be done before the patient leaves the operating theatre.

d) Surgeons strive to achieve healed amputations at the below knee level as this is far more beneficial to the patient. It is accepted by vascular surgeons that this policy is not always successful and further procedures may be necessary.

e) Revisional vascular surgery is a complex procedure usually requiring special expertise.

f) There must be an adequate provision of ICU/HDU services to allow for the proper care and monitoring of patients undergoing vascular surgery.

ORTHOPAEDIC SURGERY

There were 420 questionnaires relating to deaths in orthopaedic surgery.

The majority of the orthopaedic patients were elderly (88% over 70 years old) and mortality was often unavoidable due to coexisting multi-system diseases. Death was attributable to inappropriate or inadequate surgery in two cases (0.2%). Similarly, remediable factors such as organisational issues and clinical decision-making had a minimal influence on the death rate. The commonest procedures leading to death were for fractured neck of femur.

Table S311 (q 51)
Orthopaedic surgery procedures
(may be multiple and includes coincidental procedures undertaken simultaneously)

Hip fracture (various procedures)	303
Total hip replacement	29
Open procedures for femoral fractures (other than of femoral neck)	27
Revision of hip prostheses	12
Open fixation of humeral fractures	6
Total knee replacement	5
Reduction of dislocated hip prosthesis	4
Exploration of infected hip prosthesis	4
Manipulation under anaesthesia (tibial fracture)	4
Arthrotomy for septic arthritis of knee	3
Manipulation under anaesthesia (fractures around wrist)	3
Open procedures for tibial fractures	2
Application of POP spica for femoral fractures	2
Manipulation under anaesthesia (pelvic fractures)	2
Drainage of wound haematoma	2
Drainage of wound abscess	2
Reduction of dislocated shoulder	1
Reduction of dislocated hip	1
Removal of infected fixation apparatus	1
Insertion Denham pin	1
Bone biopsy	1
Change POP	1
Palmar fasciectomy	1
Manipulation under anaesthesia (knee)	1
Metatarsal osteotomies	1
Transfer of hallux to replace thumb	1

Table S312 (q 1)
Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=420)
Orthopaedic	406
Accident and Emergency	5
General	4
Not answered	5

There are no surprises here. Three of the general surgeons regularly have a component of orthopaedic trauma surgery in their workload. In only one case was the specialty of the Consultant inappropriate.

> *A 85-year-old man presented with an abscess at the site of a recent hip operation (internal fixation had been inserted for a fractured neck of femur). The patient was admitted under a general surgeon and a Senior House Officer proceeded to drain the superficial pocket of pus. This inadequate surgery did not prevent septicaemia and, once an orthopaedic team was involved, the infected screw and hip joint were adequately treated. However by this stage the patient was gravely ill, developed gastrointestinal bleeding and died.*

There were unsatisfactory factors in the management of this case mainly revolving around the initial inadequate surgery by a junior surgeon from an inappropriate specialty.

Table S313 (q 4)
Age of patient at final operation

	(*n*=420)
11 to 19	1
20 to 29	-
30 to 39	-
40 to 49	3
50 to 59	11
60 to 69	34
70 to 79	102
80 to 89	182
90 to 99	86
100	1

Table S314 (q 5)
Sex of patient

	(*n*=420)
Male	146
Female	274

The preponderance of females is due to the high number of fractured necks of femur.

Table S315 (q 10)
Initial admission intention for the last operation performed

	(*n*=420)
Elective	55
Urgent	114
Emergency	251

Thus 87% of the deaths in orthopaedic surgery occurred in patients admitted with some degree of urgency. Amongst the reported deaths in orthopaedic surgery, only 13% followed elective surgery.

Weekends and holiday periods

Twenty-three per cent of deaths in orthopaedic/trauma surgery occurred at weekends and public holidays. Some might have been avoided if services had not been reduced. The reduction in facilities often imposes delay in treatment and limits the diagnostic facilities available. Pathology and orthopaedic emergencies do not respect weekends and holidays; why should the quality of care be jeopardised by inferior provision of resources at these times?[20]

> *An active and fit 83-year-old lady was admitted on Christmas Eve with a fractured neck of femur. Operation was delayed until Boxing Day due to a lack of operating theatre space and a shortage of junior anaesthetic staff. An Austin Moore hemiarthroplasty was done. The patient subsequently died of a pulmonary embolus.*

The two day delay is acceptable if it was planned for pre-operative preparation but the intermittent starvation and dehydration of an unplanned delay could have been detrimental and a possible factor in this lady's demise.

> *An 84-year-old lady was admitted to a University Hospital with a fractured neck of femur. She was known to suffer with ischaemic heart disease and had experienced a mild cerebrovascular accident eight years previously. She was graded ASA 3 and the decision to operate was taken by the orthopaedic Registrar. Due to the Christmas Holiday period there was a four day delay before surgery took place, by which time the patient was developing pressure sores and a chest infection. The Registrar did the operation as a more senior surgeon was not available. Postoperatively the patient developed respiratory distress and pressure sores. She died 13 days after surgery. The cause of death was given as bronchopneumonia and no post mortem was done.*

Table S316 (q 33)

Was care undertaken on a formal shared basis with another specialty?

	(*n*=420)
Yes	90
No	322
Not answered	8

It is encouraging that 21% of orthopaedic patients were managed in a formal manner with other specialties such as general medicine or geriatric medicine. There is a need for elderly patients, especially those with fractured neck of femur or those undergoing major joint replacement, to be assessed by geriatric specialists. These same physicians should then take an intense interest in the patient's postoperative progress in order to achieve the optimum outcome. The mortality of surgery for fractured neck of femur is unlikely to drop much further until the impact of general medical conditions is reduced. In this respect, close liaison of medical specialists can have a beneficial effect on the mortality and morbidity associated with the surgical procedure[21,22].

Table S317 (q 38)

Surgical staff who examined the patient before operation but after admission

	(*n*=420)	(Locums)
House Officer	87	(1)
Senior House Officer	360	(9)
Registrar	227	(3)
Senior Registrar	61	(4)
Associate Specialist/Staff Grade	46	(-)
Consultant	218	(6)
Other	4*	(1)

NB - this can be a multiple entry

* - Clinical Assistant (3)
 - Medical student locum

Table S318 (q 35)

Which grade of surgeon made the final decision to operate?

	(*n*=420)	(Locums)
Senior House Officer	21	(-)
Registrar	97	(3)
Senior Registrar	40	(5)
Associate Specialist/Staff Grade	20	(-)
Consultant	234	(4)
Clinical Assistant	2	
Not answered	6	

Table S319 (q 36)

Grade of the most senior surgeon consulted before operation

	(*n*=420)	(Locums)
Senior House Officer	5	(-)
Registrar	67	(3)
Senior Registrar	32	(4)
Associate Specialist	20	(-)
Consultant	285	(4)
Clinical Assistant	2	(-)
Not answered	9	

It should be borne in mind that the majority of these cases were admitted urgently or as emergencies but even so the input from Consultants is proportionately less than in other specialties e.g. vascular surgery (76.8%, Table S293).

Table S320 (q 41)

Other identified diagnoses at time of final surgery

	(*n*=420)
Respiratory	140
Cardiac	199
Neurological	96
Endocrine	35
Alimentary	41
Renal	46
Musculoskeletal	90
Haematological	39
Psychiatric	62
Alcohol-related problems	4
Other	81
Not known	13
None	23

Elderly patients presenting to orthopaedic surgeons often suffer from serious general problems which impose considerable risks when anaesthesia and surgery are necessary.

Table S321 (qs 42/43)

ASA Class/Anticipated risk of death

	ASA Class					
Risk	**1**	**2**	**3**	**4**	**5**	**Not answered**
Not expected	21	29	7	2	-	6
Small, significant risk	4	68	33	8	-	17
Definite risk	8	43	78	38	6	21
Expected	-	-	1	9	2	2
Not answered	1	5	3	2	1	5

Table S322 (q 44)

What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=420)
Pulse rate recording	411
Blood pressure recording	405
Respiratory rate recording	329
Temperature	391
Central venous pressure measurement	12
Gastric aspiration	8
Intravenous fluids	231
Correction of hypovolaemia	116
Blood transfusion	69
Antibiotics	212
Oxygen therapy	72
Airway protection i.e in head injuries	6
Tracheal intubation	21
Mechanical ventilation	18
Stabilisation of fractures	154
Stabilisation of cervical spine	3
Nutritional support	22
Vitamin K	2
DVT prophylaxis	64
Others	30
Not answered or none	4

The low utilisation of thromboembolic prophylaxis is noted.

Table S323 (q 46A/54)

Day of operation/Classification of operation

	Classification			
	Emergency	**Urgent**	**Scheduled**	**Elective**
Monday	1	28	18	7
Tuesday	-	40	10	12
Wednesday	2	51	16	8
Thursday	1	46	17	5
Friday	1	35	26	9
Saturday	4	36	7	3
Sunday	1	30	4	-

NB - Classification of operation not answered in two cases.

The definitions of Emergency, Urgent, Scheduled and Elective are in Appendix A. Most deaths are recorded after urgent operations (reflecting the influence of hip fracture) and those took place every day of the week and at weekends.

Table S324 (q 55)
In view of your answer to question 54, was there any delay due to factors other than clinical?

	(*n*=420)
Yes	43
No	363
Not answered	14

Table S325 (q 56)
Time of start of operation (not including anaesthetic time)

	(*n*=420)
08.00 to 18.00	302
18.01 to 23.00	34
23.01 to 07.59	2
Not answered	82

Delays in surgery

Given that timely surgery for fractured neck of femur improves postoperative results, the advisers recommend 24 to 36 hours after admission as an ideal timing for surgery[22] . This allows adequate assessment of the patient's general condition and appropriate prophylactic measures e.g. treatment of chest infection or cardiac failure. Deaths occurred where this approach was not applied.

There were 16 deaths in orthopaedic surgery where delay was thought to be a contributory factor. Fourteen of these cases occurred in patients with fractures of the proximal femur. The main reason quoted was a lack of available theatre space.

> *A 95-year-old woman was admitted to a District General Hospital with a trochanteric fracture of femur. She suffered with ischaemic heart disease and hemiparesis. Seven days later internal fixation was done by a Registrar. The delay was due to a lack of operating theatre space. The patient died 20 days after surgery and post mortem revealed a deep venous thrombosis and pulmonary embolus.*

> *Ten days after admission with a fractured neck of femur a 75-year-old lady had "urgent" surgery on a Sunday. A Jewett nail and plate technique was used. On the eleventh postoperative day the patient suffered a pulmonary embolus and died. It is unclear why the patient waited 10 days for surgery.*

There is a need for dedicated operating lists to deal with trauma. It would appear that the current provision of such theatre time and supporting staffing levels is less than adequate although most cases are done during the period 08.00 to 18.00 hrs. Time should be available for Consultant surgeons and anaesthetists to be involved in these trauma lists, particularly where frail elderly patients are involved. It is only by the provision of specialist theatres that patients will receive experienced care and a guarantee of adequate theatre discipline with less risk of infection and other intra-operative mishaps.

Table S326 (q 47)
Grade of the most senior operating surgeon

	(*n*=420)	(Locums)
Senior House Officer	39	(-)
Registrar	169	(12)
Senior Registrar	58	(-)
Associate Specialist/Staff Grade	26	(-)
Consultant	124	(7)
Clinical Assistant	2	(-)
Not answered	2	

Table S327 (q 47/54)
Grade of operating surgeon/Classification of operation

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Senior House Officer	2	32	5	-
Registrar	6	115	42	5
Senior Registrar	1	41	12	4
Associate Specialist/Staff Grade	1	15	2	1
Consultant	-	57	33	34
Clinical Assistant	-	5	4	-

NB - Classification of operation not answered in two cases
Grade of surgeon not answered in two cases

Table S328 (q 49)
If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=296)
Yes	85
No	202
Not answered	9

Consultant Orthopaedic surgeons were involved in 124 (30%) of operations. The lack of supervision (see table S328) is considerable. Nevertheless this is an improvement on the situation reported in the 1987 CEPOD report[1]. It can be argued that patients treated by juniors, who perform certain procedures regularly, have fewer complications and a lower mortality. This does not, however, excuse Consultants from supervising and training their juniors.

Inappropriate grade

> *During a weekend a 93-year-old woman was admitted to a University Hospital with a supracondylar fracture of the femur. She suffered with respiratory and cardiac problems and was graded as ASA 4. A joint decision was therefore taken by the Consultant Surgeon and Senior Registrar to manage the lady in a plaster cast. One week later the decision was changed and surgery was proposed. Ten days after admission the relatively inexperienced Senior Registrar did a very difficult operation which took two hours. The patient developed pressure sores and died three weeks later with a pulmonary embolus. Although this case was reported to the coroner, no post mortem was done.*
>
> *An inexperienced Registrar had problems with fixation of a fractured neck of femur. No senior surgeon was available to advise. The poverty of fixation of the fracture led to poor mobilization, bronchopneumonia and death.*
>
> *An inexperienced Senior Registrar did an unnecessarily complex operation for a trochanteric fracture of the femur. Lack of mobility, pressure sores and bronchopneumonia were the result.*

Table S329 (q 70)
Was the postoperative period complicated by;

	(*n*=409)*
Haemorrhage/postoperative bleeding required transfusion	30
Upper respiratory obstruction	7
Respiratory distress	141
Generalised sepsis	14
Wound infection	17
Wound dehiscence	8
Anastomotic failure	1
Low cardiac output	85
Hepatic failure	12
Renal failure	42
Endocrine system failure	9
Stroke or other neurological problems other than head injury	38
Persistent coma	8
Other organ failure	26
Problems with analgesia	4
DVT and/or pulmonary embolus	43
Orthopaedic prosthetic complications	9
Pressure sores	32
Peripheral ischaemia	3
Urinary tract infection	25
Urinary retention	23
Nutritional problems	24
Other problems	82
None	66

* excludes patients who died in theatre or the recovery area.

Thromboembolism

The incidence of death from pulmonary embolism in this study is a cause for concern. Orthopaedic surgeons are well aware of the impact of the problem on their specialty. Not only do pulmonary emboli cause deaths but incidence of the post-phlebitic leg syndrome may be as high as 50% after hip surgery. In addition subclinical pulmonary emboli occur frequently and may lead to later respiratory problems[23,24,25].

In particular the incidence of deep vein thrombosis and pulmonary embolism in the elderly with fractures of the proximal femur has always been a worrying problem. Morbidity and mortality from this condition are high and pulmonary embolism is the single most preventable cause of death in the group. Despite this, the use of prophylactic measures is uncommon.

Many prophylactic regimens have been described but none have proved ideal and there is no consensus on the most suitable prophylaxis. Conventional full anticoagulation is effective in preventing thromboembolism but it is accompanied by many complications and has never been widely accepted because of the risks [25]. This is not an indication to do nothing. Urgent further research and trials are required and in particular a look at the efficacy of the new low molecular weight anticoagulants and the cost implications of their widespread use.

An additional challenge is the need to identify thrombosis. It is likely that many patients with sub-capital and trochanteric fractures have a silent ilio-femoral thrombosis which may even be present by the time the patient is admitted to hospital. The problem also occurs after joint replacement. There is a need to identify developing postoperative thrombosis. There is no consensus about suitable diagnostic technique with an adequate sensitivity and specificity where there is a combination of an established thrombus and a surgical procedure.

Early operative intervention and mobilisation of the patient remain the most practical way to combat the problem of thromboembolism. "Early" means within 24 to 36 hours of admission/diagnosis and services should be provided to enable such early intervention to take place, provided the general condition of the patient is satisfactory. Delay beyond this period is unacceptable unless medically unavoidable.

Table S330 (q 88)
Has this death been considered at a local audit/quality control meeting?

	(*n*=420)
Yes	207
No	124
Not answered	89

The percentage of deaths discussed in audit meetings continues to improve. Fifty per cent of orthopaedic deaths were discussed. Because of the nature of the elderly patients with multiple comorbidity it is recommended that orthopaedic audit meetings should include multispecialty sessions with general specialties, anaesthetics and accident and emergency staff.

Remediable factors in orthopaedic surgery

Orthopaedic surgeons are dealing with an increasingly elderly population and a heavy workload associated with this ageing population. From the data presented there appears to be a low level both of input from Consultants and supervision of trainees. This probably reflects the inadequacy of Consultant numbers and the considerable emergency work load.

The table below details areas in which remediable factors were identified. Many of these have been discussed in the preceding text.

Table S331
Remediable factors implicated in deaths in orthopaedic surgery

	(*n*=420)
Delay in operation	16
Inappropriate grade of operating surgeon	4
Lack of ICU/HDU	3
Inadequate service during holiday periods	2
Delay in diagnosis	1
Poor surgical judgement	1
Inappropriate specialty of consultant in charge	1
Surgical mishap	1
Nursing staff shortages	1

In addition 366 (89%) patients did not receive prophylaxis against thromboembolism (Table S329). The exact incidence of pulmonary embolism is unknown due to the low post mortem rate (see section on post mortem examinations).

The published figures suggest a 7.5% mortality from pulmonary embolus after surgery for a fractured hip. After total hip replacement, without prophylaxis, fatal pulmonary embolism occurs in one to five per cent of patients. It is likely therefore that the low prophylaxis rate in the survey had an impact on the death rate following orthopaedic surgery.

Surgical mishap

> *During a total hip replacement on a 77-year-old woman the external iliac artery was damaged and she died of hypovolaemia.*

Trauma to the iliac vessels is a well recognised complication of hip surgery and occurs when screws etc are inserted through the anterosuperior quadrant of the acetabulum [26,27]. Awareness of the problem might have saved her life. The surgeon comments that there was "no bleeding into the wound at all".

(For discussion of the anaesthesia in this case, see page 83).

General orthopaedic observations

It is possible to make the following general observations based on the information contained in the questionnaires.

a) Complications arose in orthopaedic patients which related to another specialty e.g. acute abdominal problems and gastrointestinal haemorrhage. Whilst delay and difficulties in diagnosis occurred, it was felt that orthopaedic wards were no more dangerous a place to develop an acute general surgical problem than for instance a geriatric or general medical ward.

b) Operation notes and postoperative instructions were often of poor quality (see section on operation notes). This may reflect the lack of secretarial facilities for those who wish to have operation notes typed up.

c) Lack of facilities in specialist hospitals on isolated sites caused problems and there is a need to rationalize orthopaedic and trauma surgery to one site. Elective orthopaedic surgery may be done in specialist centres which are separate from the major hospitals and often do not have adequate back-up and support facilities such as an intensive care unit. Orthopaedic surgeons should consider whether poor risk cases should have their surgery in more appropriately equipped units.

> *A 79-year-old man was admitted electively to a specialist hospital for a total knee replacement. All went well until the fifth postoperative day when he had a pulmonary embolus and died.*

The surgeon commented that the hospital did not have a cardiac arrest team available at any time and there was no intensive care unit on site.

> *A 63-year-old man underwent an elective knee replacement in a specialist hospital. Four hours after surgery he developed acute pulmonary oedema and subsequently died.*

There was no intensive care unit or high dependency unit available at this hospital.

It is not ideal to perform surgery of this magnitude in a hospital without essential services to cope with the range of common acute problems which might be expected.

d) Whilst not implicated directly as an avoidable factor contributing to death, the length of time taken for some operations caused concern. These long times mainly occurred when junior surgeons were operating on complex cases, often without expert help and advice.

> *A Senior House Officer took over two hours to fix an intertrochanteric fracture of the femoral neck. The patient was 78 and demented. She died from a pulmonary embolus three days later.*
>
> *A Senior House Officer operating in the evening on a 97-year-old woman, took two hours to fix a fractured neck of femur with a nail plate. The Consultant who completed the form commented that this was too long but he was not present to supervise his junior trainee. The patient died later the same day with pulmonary oedema and left ventricular failure.*

e) In the sample analysed there were 303 deaths associated with surgery for fractured neck of femur. Fractures of the proximal femur are common and, with an increasingly elderly population, the incidence of femoral neck fractures is rising[22] . A large part of orthopaedic trauma practice is dedicated to treating patients with these fractures.

Although a fracture of the hip is not in and of itself fatal, the mortality associated with the occurrence of this injury in the elderly is significant.

The majority of patients with fractures of the proximal femur are treated surgically despite their frailty. Is there really a viable option to surgical treatment in those patients who are known to be poor risks? Is surgical treatment cost-effective? The answer is "yes", because surgery reduces the short term mortality in these patients and diminishes the length of hospitalization. The approach of offering surgery to most patients accounts for the large number of deaths reported after surgery for a common condition. What is not known to the Enquiry is the background activity against which these deaths are occurring. Hence a 30-day mortality rate cannot be calculated from the data held at NCEPOD.

There is a general trend of a fall in the published 30-day mortality to around six per cent. This reduction has been the result of alterations in surgical practice, (with early surgery and mobilisation) and anaesthetic techniques[21].

The rising incidence of hip fractures places a considerable strain on the resources available to orthopaedic surgery which must be recognised when planning staffing levels and provision of essential medical services.

UROLOGY

The range of procedures performed is shown in Table S332.

Table S332
Procedures in urological surgery
(may be multiple and includes coincidental procedures undertaken simultaneously)

Cystoscopy and diathermy or biopsy	32
Transurethral resection of benign prostate	26
Transurethral resection of bladder tumour	24
Nephrectomy	12
Total cystectomy and ileal conduit	7
Transurethral resection of prostatic carcinoma	7
Open prostatectomy	6
Laparotomy and repair of bladder perforation	5
Lithotripsy for bladder calculi	4
Exploration of kidney	3
Bilateral orchidectomy	3
Extensive debridement for Fournier's gangrene	3
Prostatic biopsy	3
Dorsal slit of prepuce	3
Defunctioning colostomy	3
Exploratory laparotomy	3
Refashioning of ileal conduit	2
Formation of ileal conduit	2
Renal transplant	2
Optical urethrotomy	2
Ureterolithotomy	2
Cystoscopic insertion of ureteric stent	2
Inguinal hernia repair	2
Miscellaneous	20

There were 161 deaths in the sample under consideration. In 17 cases there were factors (often combined) which may have contributed to the patient's death. These are listed in Table S333.

Table S333
Remediable factors involved in deaths in urological surgery

Inappropriate operation	7
Inappropriate specialty	5
Intraoperative mishap	2
Errors in postoperative management	2
Lack of radiological support	2
Inappropriate grade of surgeon	1
Poor judgement	1
Lack of intensive care unit on site	1
	--
	21

Table S334 (q1)

Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=161)
Urology	91
General	14
General with special interest in	
- Urology	46
- Vascular surgery	3
- Gastroenterology	3
- Transplantation	1
Gynaecology	1
Not answered	2

Inappropriate specialty

General surgeons performing occasional urological procedures caused some problems. There were instances of open procedures in situations where an experienced urologist would have performed endoscopic or percutaneous techniques. The management of ureteric obstruction was of particular concern as there were more instances of open surgery when general surgeons were involved. It may be necessary for general surgeons to provide a urological service because of the lack of urological expertise locally.

Referral to a specialist urologist should be considered where percutaneous techniques may be more appropriate. General surgeons are unlikely to gain adequate experience of minimally invasive urological techniques.

The cases described overleaf illustrate the problems.

> *An 86-year-old woman was treated by a general surgeon. Her right kidney was explored because of haematuria (the indications for this procedure are unclear from the questionnaire). The kidney appeared normal externally so a nephrectomy was done in order to examine the kidney further. Nothing pathological was found. Postoperatively there was a wound dehiscence and the patient died with respiratory complications. No post mortem was done and the case was not considered at an audit meeting.*

The surgeon removed a normal kidney, with very little pre-operative investigation, and the patient died. He then displayed an alarming lack of curiosity and desire to establish the diagnosis and the cause of errors in decision-making.

> *A general surgeon in a District General Hospital did an open nephrostomy on a 71-year-old man with renal failure thought to be secondary to a carcinoma of the prostate (although there was no histological proof). He then proceeded to perform a total cystectomy and ileal conduit. The patient died 15 days later with pneumonia.*

A percutaneous nephrostomy should have been done originally. In addition, it seems a curious decision to perform this type of major surgery for an unproven carcinoma of the prostate.

Table S335 (q 4)
Age of patient

	(*n*=161)
30-39	1
40-49	3
50-59	8
60-69	34
70-79	59
80-89	50
90-99	6

Table S336 (q 5)
Sex of patient

	(*n*=161)
Male	132
Female	29

This reflects the usual M:F ratio of 4:1 found in urological practice.

Table S337 (q 10)
Initial admission intention for the last operation performed

	(*n*=161)
Elective	83
Urgent	20
Emergency	57
Not answered	1

As might be expected, urology patients are elderly and predominantly male. There is an even split between elective and urgent/emergency admissions.

Table S338 (q 34)

Who made the working diagnosis?

	(*n*=161)	(Locums)
Surgeons		
House Officer	24	(-)
Senior House Officer	19	(-)
Registrar	35	(2)
Senior Registrar	9	(1)
Associate Specialist	3	(-)
Consultant	129	(3)
General Practitioner	25	(-)
Radiologist	3	(-)
Not answered	2	

NB - this can be a multiple entry

Table S359 (q 35)

Which grade of surgeon made the final decision to operate?

	(*n*=161)	(Locums)
Registrar	9	(1)
Senior Registrar	8	(1)
Associate Specialist	1	(-)
Consultant	142	(5)
Not answered	1	

Table S340 (q 36)

Grade of the most senior surgeon consulted before operation

	(*n*=161)
Senior Registrar	5
Associate Specialist	1
Consultant	152
Not answered	3

Consultants were involved in a large proportion of urological cases during the pre-operative phase (80% made the working diagnosis, 88% made the final decision to operate and 94% were consulted before operation).

Table S341 (q 41)
Other identified diagnoses at time of final surgery

	(*n*=161)
Respiratory	55
Cardiac	73
Neurological	19
Endocrine	6
Alimentary	16
Renal	48
Musculoskeletal	12
Haematological	22
Psychiatric	10
Alcohol-related problems	1
Other	20
Not known	2
None	11

Table S342 (qs 42/43)
ASA Class/Anticipated risk of death

	ASA Class					
	1	**2**	**3**	**4**	**5**	**Not answered**
Risk						
Not expected	9	17	10	5	1	3
Small, significant risk	3	25	21	10	-	2
Definite risk	2	5	18	17	2	1
Expected	-	-	1	3	1	-
Not answered	-	1	1	-	-	3

Table S343 (qs 42/54)
ASA Class/Classification of operation

	ASA Class					
Classification of operation	**1**	**2**	**3**	**4**	**5**	**Not answered**
Emergency	-	-	1	2	1	-
Urgent	-	6	9	12	1	5
Scheduled	8	24	34	18	2	2
Elective	6	18	7	3	-	2

Despite the high age group of urological patients and the extent of comorbidity, their general condition was quite good with few patients in ASA classes 4 or 5 and few moribund at the time of surgery (only four patients were in ASA class 5).

Table S344 (q 44)
What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=161)
Pulse rate recording	156
Blood pressure recording	158
Respiratory rate recording	122
Temperature	152
Central venous pressure measurement	12
Gastric aspiration	12
Intravenous fluids	66
Correction of hypovolaemia	23
Blood transfusion	2
Antibiotics	77
Oxygen therapy	23
Tracheal intubation	10
Mechanical ventilation	7
Nutritional support	5
Vitamin K	2
DVT prophylaxis	34
Others	13
Not answered or none	2

Twenty-one per cent of patients were given prophylaxis against thromboembolism. In transurethral surgery, such prophylaxis using anticoagulants is not usually indicated because of the risk of haemorrhage.

Table S345 (q 46)
Day of operation

	(*n*=161)
Monday	28
Tuesday	30
Wednesday	24
Thursday	44
Friday	30
Saturday	1
Sunday	4

Only five urological cases required surgery during weekends despite the number of emergency admissions.

Table S346 (q 47)
Grade of the most senior operating surgeon

	(*n*=161)	(Locums)
Senior House Officer	2	(-)
Registrar	13	(-)
Senior Registrar	14	(1)
Associate Specialist	3	(-)
Consultant	128	(4)
Not answered	1	

Table S347 (qs 47/54)
Grade of operating surgeon/Classification of operation

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Senior House Officer	-	-	1	1
Registrar	-	2	7	4
Senior Registrar	2	2	3	7
Associate Specialist	-	-	2	1
Consultant	2	28	75	23

NB - Grade of surgeon not answered in one case.

Consultants performed 79% of all operations and 83% of the emergency and urgent procedures.

Table S348 (q 49)
If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=33)
Yes	20
No	12
Not answered	1

Supervision of trainees appears reasonable in urology.

Table S349 (q 70)
Was the postoperative period complicated by:

	(*n*=159)*
Haemorrhage/postoperative bleeding requiring transfusion	39
Upper respiratory obstruction	4
Respiratory distress	34
Generalised sepsis	14
Wound infection	9
Wound dehiscence	4
Anastomotic failure	2
Low cardiac output	26
Hepatic failure	5
Renal failure	48
Stroke or other neurological problems other than head injury	12
Persistent coma	4
Other organ failure	6
Problems with analgesia	2
DVT and/or pulmonary embolus	8
Pressure sores	1
Peripheral ischaemia	1
Urinary tract infection	9
Urinary retention	7
Nutritional problems	3
Other problems	24
None of the above	39

* excludes patients who died in theatre or the recovery area.

The range of complications experienced by urological patients is appropriate for the specialty and the type of pathology involved.

Table S350 (q 88)
Has this death been considered at a local audit/quality control meeting?

	(*n*=161)
Yes	92
No	24
Not answered	45

The inadequacy of answers to this question causes a certain ambiguity. Only 57% of patients were definitely considered, which would suggest considerable scope for improvement.

General comments on urological surgery

The following comments illustrate other problems which came to light.

Combined operations

One patient had multiple operations at the time of transurethral prostatectomy. This is a misguided approach and not recommended by the urological advisers.

> *A general surgeon performed a haemorrhoidectomy at the same time as a transurethral prostatectomy. The patient died following septicaemia.*

Poor communication

A Consultant Urologist wrote a comprehensive account of the management of a 73-year-old man who died whilst under his care.

> *The patient suffered with an ureteric calculus which was lodged in the pelvic ureter. There were technical difficulties with an initial cystoscopy due to previous prostatic surgery and a bladder neck stenosis; a preliminary bladder neck incision was done. Eleven days later there was a secondary haemorrhage. It had been noted that the patient's platelet count had fallen to 91 x 10/L but the significance of this was not appreciated. A successful ureterolithotomy was done but the operation was bloody. A weekend followed and the patient deteriorated, becoming shocked with a marked thrombocytopaenia. There was a different surgical team on call who did not think of haemorrhage as a cause of the problem and did not discuss the case with the consultant responsible for the patient. The patient died on the Monday. Post mortem revealed a massive retroperitoneal haemorrhage. There was also a previously undiagnosed, diffuse, carcinoma of the lung.*

There were several avoidable factors in this case. The pre-operative assessment failed to detect the bronchial carcinoma and there appeared to be a degree of complacency regarding the falling platelet count. Finally there was a breakdown in communication between the on-call general surgical team and the Consultant Urologist. This led to inadequate resuscitative measures.

Inappropriate operations

> *A 40-year-old man presented to a general surgeon with an interest in transplantation. There was a mass in the right loin and a CT scan had suggested a tumour mass. A laparotomy was then performed in order to obtain a biopsy for tissue diagnosis. It was noted that the mass involved the inferior vena cava. The diagnosis was that of a seminoma. Radiotherapy treatment had hardly commenced when the patient suffered a pulmonary embolism and died.*

Why was it necessary to do an open biopsy? A suitably guided needle biopsy could have provided an accurate diagnosis without the need for invasive surgery.

Postoperative problems

Occasionally complications arose after successful surgery when general principles were overlooked, with tragic consequences.

> *A 52-year-old man presented with haematuria. Adenocarcinoma of the ureter was diagnosed and a nephroureterectomy done by a urologist. Six days postoperatively there was evidence of a dehiscence of the deeper layers of the abdominal wound. Urine began to drain from the wound. The abdomen became distended and a diagnosis of paralytic ileus was made. On the next day the patient was found dead in a large pool of vomit. Post mortem examination showed aspiration of gastric contents, dehiscence of the abdominal wall and confirmed the adenocarcinoma of the ureter.*

This death could have been avoided by the use of a nasogastric tube to aspirate the stomach, once it was clear that the patient had an ileus: this simple measure might have been life-saving.

Carcinomatosis

The following is an example of an unnecessary major operation being performed in a patient with carcinomatosis.

> *A 70-year-old woman who had advanced bladder cancer and renal failure began vomiting and death was clearly inevitable. A general surgeon did a laparotomy and gastroenterostomy when she was discovered to have intraperitoneal secondaries causing duodenal obstruction.*

It is likely that various mechanical and pharmacological measures could have been used to ease this patient's suffering during her terminal illness.

> *In another case, a gastroenterological surgeon did a total cystectomy in a patient with known liver metastases.*

Even if the surgery was justified (e.g. for haemorrhage or pain) it is likely that a more successful palliative result could have been achieved by a specialist urologist.

GYNAECOLOGY

The majority of cases reviewed in the sample were elderly, and suffering from advanced malignancy. The majority of operations were correctly and caringly performed with clear objectives.

Table S351

Procedures in gynaecology (may be multiple and includes coincidental procedures undertaken simultaneously)

Total abdominal hysterectomy and bilateral salpingo-oophorectomy	11
Laparotomy with/without biopsy for malignancy	6
Dilatation and curettage	6
Colostomy	5
Pelvic examination under anaesthetic	4
Vaginal hysterectomy	3
Pelvic floor repair	3
Excision ovarian cysts	2
Other	9

Table S352 (q 1)

Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=44)
Gynaecology	34
General	2
General with special interest in	
- Gastroenterology/colorectal surgery	5
- Vascular surgery	1
- Urology	1
- Oncology	1

Most cases were dealt with by an appropriate specialist or advice was sought from a gynaecologist.

Table S353 (q 4)

Age at final operation

	(*n*=44)
40-49	2
50-59	2
60-69	9
70-79	22
80-89	8
90-99	1

Table S354 (q 10)
Initial admission intention for the last operation performed

	(*n*=44)
Elective	25
Urgent	7
Emergency	12

Table S355 (q 43)
What was the anticipated risk of death related to the proposed operation?

	(*n*=44)
Not expected	10
Small but significant risk	18
Definite risk	14
Expected	-
Not answered	2

Table S356 (q 42)
ASA Class

	(*n*=44)
1	4
2	19
3	12
4	7
5	-
Not answered	2

Table S357 (q 41)
Other identified diagnoses at time of final surgery

	(*n*=44)
Respiratory	5
Cardiac	13
Neurological	2
Endocrine	6
Alimentary	6
Renal	5
Musculoskeletal	9
Haematological	8
Psychiatric	2
Other	7
Not known	1

There was an expected degree of morbidity for the age group involved.

There were five cases which merit comment. In two instances radical gynaecological procedures were done by general surgeons in situations where collaboration with a gynaecologist might have given a better outcome.

> *A general surgeon with an interest in gastroenterology performed a scheduled operation on a 73-year-old woman with carcinomatosis peritonei from an ovarian tumour. It was necessary to do a right hemicolectomy to relieve impending intestinal obstruction. The surgeon then proceeded to do a total hysterectomy and bilateral salpingo-oophorectomy. The patient died 20 days later with carcinomatosis.*

Whilst a manoeuvre to relieve obstruction was worthwhile, discussion with an experienced gynaecologist/oncologist might have questioned the wisdom, in this case of advanced disease, of attempting an additional major procedure.

The management of ovarian cancer is extremely complex. It is a common disease with a high mortality; interested clinicians (both specialist gynaecologists and general surgeons) are recommended to read the SMAC report on the management of ovarian cancer[28].

> *In another case, an 85-year-old woman developed intestinal obstruction whilst recovering from a leg injury. At an emergency laparotomy she was found to have both a colonic carcinoma, at the splenic flexure, and a carcinoma of the ovary. The Consultant general surgeon did a colectomy followed by a total hysterectomy and salpingo-oophorectomy (without any gynaecological input). The patient died 11 days later following aspiration of gastric contents.*

The clinical judgement was questionable in a further three cases.

> *A grossly obese 62-year-old, with Parkinson's disease, was offered a vaginal hysterectomy for minimal vaginal prolapse. She died on the day of surgery following a myocardial infarction. Gross coronary artery stenosis was disclosed at post mortem.*
>
> *A negative laparoscopy was performed on a 58-year-old during the investigation of a possible pelvic mass. She died 48 hours later following a cerebrovascular accident. The Consultant Physician in overall charge of the case deemed a post mortem unnecessary. Thus the final diagnosis remains unknown.*
>
> *An 81-year-old woman was diagnosed as suffering from advanced carcinoma of the ovary, including a subcutaneous umbilical metastasis. Radical surgery in the form of a total abdominal hysterectomy and bilateral salpingo-oophorectomy was done. The sigmoid colon was involved and a sigmoid colectomy and end colostomy was necessary. Unfortunately there was an inadvertent injury to the left ureter which required repair. The surgery took two hours and 15 minutes. The patient died nine days later in hepatic coma.*

The decision to include a bowel resection (which produced a ureteric injury) in a patient of this age with advanced disease seems inappropriate.

Table S358 (q 35)

Which grade of surgeon made the final decision to operate?

	(*n*=44)	(Locums)
Registrar	1	(-)
Senior Registrar	1	(1)
Associate Specialist	2	(-)
Consultant	39	(-)
Not answered	1	

Table S359 (q 36)

Grade of the most senior surgeon consulted before operation

	(*n*=44)	(Locums)
Senior Registrar	1	(1)
Associate Specialist	2	(-)
Consultant	40	(-)
Not answered	1	

Table S360 (q 47)

Grade of the most senior operating surgeon

	(*n*=44)	(Locums)
Registrar	6	(2)
Senior Registrar	6	(1)
Associate Specialist	2	(-)
Consultant	30	(-)

Table S361 (q 49)

If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=14)
Yes	4
No	9
Not answered	1

When allowances are made for the involvement of Senior Registrars, there is an adequate provision of experienced cover. There appears to be an appropriate level of Consultant involvement in the specialty of gynaecology.

Table S362 (q 54)

Classification of the operation

	(*n*=44)
Emergency	1
Urgent	9
Scheduled	29
Elective	5

Table S363 (q 56)

Time of start of operation (not including anaesthetic time)

	(*n*=44)
08.00 to 18.00	35
18.01 to 23.00	1
23.01 to 07.59	1
Not answered	7

The majority of the gynaecological cases reported to the Enquiry were not emergencies and surgery was performed on routine scheduled lists. This contrasts markedly to the heavy emergency load in other specialties, such as general, orthopaedic and vascular surgery.

Table S364 (q 70)

Was the postoperative period complicated by:

	(*n*=43)*
Haemorrhage/postoperative bleeding requiring transfusion	3
Upper respiratory obstruction	1
Respiratory distress	7
Generalised sepsis	3
Wound infection	5
Wound dehiscence	2
Low cardiac output	6
Hepatic failure	3
Renal failure	6
Endocrine system failure	1
Stroke or other neurological problems other than head injury	5
Persistent coma	1
Other organ failure	3
Problems with analgesia	2
DVT and/or pulmonary embolus	2
Pressure sores	2
Urinary tract infection	1
Urinary retention	1
Nutritional problems	2
Other problems	8
None recorded	10

* excludes patient who died in the recovery area.

Table S365 (q 88)
Has this death been considered at a local audit/quality control meeting?

	(*n*=44)
Yes	11
No	17
Not answered	16

From the range of complications listed in table S364 there would be ample material on which to base gynaecological audit. Information is not available on 16 cases which leads the authors to suspect that these 16 patients were not included in discussions on audit. The inclusion of only 25% of deaths in gynaecology in any form of audit demonstrates considerable scope for improvement in quality control in this specialty, in contrast to obstetrics.

NEUROSURGERY

Eighty-seven questionnaires relating to neurosurgery were analysed. The final surgical procedures which preceded the patient's death are shown in Table S366. The commonest causes of death were the consequences of severe head trauma.

The overall impression is one of thoughtful diligent patient care with most decisions made by Consultant Neurosurgeons.

Table S366
Neurosurgical Procedures
(may be multiple and includes coincidental procedures undertaken simultaneously)

Evacuation of acute subdural haematoma	15
External ventricular drainage	13
Burr hole and biopsy of malignant glioma	9
Evacuation of traumatic extradural haematoma	8
Clipping of intracranial aneurysm	8
Evacuation of intracerebral haematoma	6
Insertion of intracranial pressure monitor	4
Excision of malignant intracranial tumour	4
Debulking of malignant intracranial tumour	3
CT guided stereotactic biopsy of tumour	3
Tracheostomy	3
Evacuation of chronic subdural haematoma	2
Excision of pituitary adenoma	2
Miscellaneous procedures for tumours	3
Haematomas	2
Other conditions	5

Table S367 (q1)
Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=87)
Neurosurgery	85
General	1
Orthopaedic	1

Bearing in mind that general surgeons and orthopaedic surgeons are frequently in charge of trauma cases, the specialties listed above are quite appropriate.

Table S368 (q10)
Initial admission intention for the last operation performed

	(*n*=87)
Elective	16
Urgent	20
Emergency	51

This reflects the heavy workload of head trauma dealt with by neurosurgeons.

Table S369 (q25)
Was the patient transferred as an in-patient from another hospital?

	(*n*=87)
Yes	49
No	37
Not answered	2
From	
same District (or Health Board)	13
same Region	28
outside Region	3
Not answered	5

Delay in referral

There were five deaths where there was a delay in referral to a neurosurgical unit. It was considered that the outcome in these cases would probably not have been different. There should be earlier referral to neurosurgical units if deaths are to be avoided. The diagnoses in these cases were extradural haematoma (four), and cerebral abscess (one). In all cases the delay was *medical* rather than organizational.

Published guidelines concerning the indications for referral are very helpful in this situation and may prevent delays in the future.

Table S370 (q35)

Which grade of surgeon made the final decision to operate?

	(*n*=87)	(Locums)
Registrar	2	(-)
Senior Registrar	9	(-)
Associate Specialist	3	(2)
Consultant	73	(-)

Table S371 (q36)

Grade of the most senior surgeon consulted before operation

	(*n*=87)	(Locums)
Senior House Officer	5	(-)
Associate Specialist	1	(-)
Consultant	81	(1)

Although Senior House Officers were the most senior surgeons consulted *pre-operatively* in five cases, the following table indicates that they did not operate.

Table S372 (qs47/54)

Grade of operating surgeon/Classification of operation

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Registrar	18	11	3	-
Senior Registrar	14	3	5	-
Associate Specialist	2	1	1	-
Consultant	8	4	15	2

Table S373 (q49)

If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=58)
Yes	22
No	35
Not answered	1

Fifty-nine per cent of patients were operated on by a Consultant or Senior Registrar. The majority of emergencies and urgent cases were dealt with by trainees. There was clear evidence however that the decision-making was Consultant-led (Tables S370 and S371).

Table S374 (qs42/54)
ASA Class/Classification of operation

Classification of operation	**ASA Class** 1	2	3	4	5	**Not answered**
Emergency	1	1	1	13	21	5
Urgent	1	4	3	7	3	1
Scheduled	5	11	3	3	-	2
Elective	2	-	-	-	-	-

Table S375 (qs42/43)
ASA Class/Anticipated risk of death

Risk	**ASA Class** 1	2	3	4	5	**Not answered**
Not expected	3	1	2	2	2	3
Small but significant risk	4	8	4	2	-	-
Definite risk	1	5	1	19	4	3
Expected	1	2	-	-	18	2

Over-aggressive and excessively ambitious surgery

Deaths occurred in seven patients who were perhaps beyond help. Two examples are given below.

> *A craniotomy was performed on a 60-year-old woman with a malignant glioma. She was moribund before operation.*

> *A 66-year-old woman with cerebral and cerebellar metastases underwent posterior fossa exploratory surgery in order to obtain biopsies for histology. She died a week later. No post mortem was done.*

It is questionable whether such extensive surgery was needed when the diagnosis was reasonably clear.

Table S376 (q70)

Was the postoperative period complicated by:

	(*n*=86)*
Haemorrhage/postoperative bleeding requiring transfusion	8
Upper respiratory obstruction	1
Respiratory distress	18
Generalised sepsis	5
Low cardiac output	19
Hepatic failure	3
Renal failure	4
Endocrine system failure	1
Stroke or other neurological problems other than head injury	20
Persistent coma	44
Other organ failure	8
DVT and/or pulmonary embolus	3
Urinary tract infection	1
Urinary retention	1
Other problems	19
None	8

* excludes patient who died in theatre or the recovery area.

Pulmonary embolism

There were at least three deaths due to pulmonary embolism (bearing in mind the likely under-diagnosis of the condition). In 82 cases prophylaxis was not given. Thromboembolic disease is not usually thought to be a major problem in neurosurgery but perhaps this is mistaken.

Table S377 (q88)

Has this death been considered at a local audit/quality control meeting?

	(*n*=87)
Yes	34
No	38
Not answered	15

It appears that only 39% of neurosurgical deaths are discussed and analysed in structured audit meetings. However, we are aware that many more cases are discussed in other national audit schemes within the specialty.

Unknown cause of death

Few post mortems were done in neurosurgical patients unless this was for medicolegal reasons. The results of coroners' post mortems are rarely available to the clinicians in sufficient time to be considered at audit meetings. Difficulty in obtaining the reports of post mortems is a continuing problem which hinders the educational process.

> *A 22-year-old woman suffered head and facial injuries. No treatment was undertaken other than the insertion of an intracranial pressure monitor. Nine days later she died. Why did she die? The post mortem result has not been communicated to the neurosurgeon involved.*

Remediable factors in neurosurgery

There were only two cases in which remediable factors were identified in the surgical care which were thought to be responsible for death. Remediable factors were inadequacy of observation and monitoring following chest and head injuries, and failure to predict and prevent a complication of craniotomy.

> *A 17-year-old man suffered an extradural haematoma and chest injuries following a road traffic accident. He suddenly deteriorated 22 hours after otherwise satisfactory care; this was due to unrecognised hypoxaemia.*

> *Following the removal of a cranial meningioma in a 72-year-old lady an extradural haematoma developed which led to her death 13 days later. The reporting surgeon did not know whether a post mortem had been done. This postoperative complication is well recognised and preventable.*

SPINAL SURGERY

There were 10 deaths following spinal surgery.

Table S378

Procedures in spinal surgery
(may be multiple and includes coincidental procedures undertaken simultaneously)

Reduction/Fusion C6-C7 dislocation	1
C6-C7 Anterior cervical decompression (cervical spondylosis)	1
C5-T1 Decompressive laminectomy (myelopathy)	1
Anterior cervical microdiscectomy (cervical spondylosis)	1
Thoracic spinal cord decompression (secondary tumour)	2
Stabilisation thoracic spine	1
Anterior spinal fusion (secondary tumour)	1
Decompressive lumbar laminectomy (spinal canal stenosis)	2
Evacuation of extradural haematoma (post-laminectomy)	1
Excision of extradural spinal tumour	1

Table S379 (q1)

Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=10)
Neurosurgery	7
Orthopaedic	3

Table S380 (q4)

Age at final operation

	(*n*=10)
50 to 59	2
60 to 69	2
70 to 79	5
80 to 89	1

Table S381 (q5)

Sex of patient

	(*n*=10)
Male	7
Female	3

Table S382 (q10)

Initial admission intention for the last operation performed

	(*n*=10)
Elective	3
Urgent	6
Emergency	1

Five of these patients were appropriately transferred from other centres; there were no problems with deterioration during transfer.

Consultant involvement (questions 34 to 38)

In all cases, there was discussion with the Consultant prior to surgery and a Consultant Surgeon examined the patient in nine out of ten cases.

Table S383 (q41)

Other identified diagnoses at time of final surgery

	(*n*=10)
Respiratory	5
Cardiac	2
Neurological	3
Alimentary	1
Renal	2
Musculoskeletal	3
Haematological	1
Other	3
None	1

Table S384 (q42)

ASA Class

	(*n*=10)
1	1
2	7
3	2
4	-
5	-

Table S385 (q43)

What was the anticipated risk of death related to the proposed operation?

	(*n*=10)
Not expected	5
Small but significant risk	2
Definite risk	3
Expected	-

The patients were mostly in good ASA classes and not expected to die in the perioperative period.

Table S386 (q44)

What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(n=10)
Pulse rate recording	10
Blood pressure recording	10
Respiratory rate recording	8
Temperature	10
Central venous pressure measurement	1
Intravenous fluids	6
Correction of hypovolaemia	2
Blood transfusion	1
Antibiotics	4
Oxygen therapy	2
Tracheal intubation	3
Mechanical ventilation	1
Stabilisation of fractures	1
Stabilisation of cervical spine	1
DVT prophylaxis	2

Thromboembolic prophylaxis was given in 20% of cases.

Table S387 (q47)

Grade of the most senior operating surgeon

	(n=10)	(Locums)
Registrar	4	(-)
Senior Registrar	2	(-)
Consultant	4	(-)

Table S388 (q49)

If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(n=6)
Yes	2
No	4

Consultants were directly involved in 60% of cases, either operating or supervising.

Table S389 (q70)
Was the postoperative period complicated by:

	(*n*=9)*
Respiratory distress	5
Wound infection	1
Low cardiac output	2
Renal failure	1
Problems with analgesia	1
DVT and/or pulmonary embolus	4
Urinary tract infection	1
Urinary retention	2
Nutritional problems	1
Other problems	1

* excludes patients who died in theatre or the recovery area.

> *An appropriate thoracic spinal decompression was done in a 73-year-old man with vertebral metastases. He was recovering well when he died on the seventeenth postoperative day from a pulmonary embolism. No prophylaxis against thromboembolism had been given.*

Table S390 (q88)
Has this death been considered at a local audit/quality control meeting?

	(*n*=10)
Yes	1
No	3
Not answered	6

Only one surgeon stated that a case was considered at an audit meeting. Audit in this field is urgently needed.

CARDIOTHORACIC SURGERY

(General Comments)

A high standard of care is delivered in cardiothoracic surgery. There was a high level of Consultant involvement in patient care and the manner in which Consultants from various specialties collaborated to carry out multiple procedures was impressive.

In general the cases were well documented. Many Consultants wrote passionately about the problems involved in the care of their patients. It was also clear that the majority of cases in the practice of cardiothoracic surgery are thoroughly audited.

Remediable factors

The majority of deaths were inevitable (virtually all occurring in patients with end-stage cardiac disease or bronchial carcinoma) and there was no evidence of inappropriate and over-enthusiastic surgery in this specialty. Some remediable factors relating to postoperative deaths were identified and are listed in Table S387. They will be discussed in more detail in the relevant sections.

Table S391
Remediable factors implicated in deaths in cardiothoracic surgery

Delay in admission due to lack of resources	16
Inappropriate site	3
Inappropriate grade of operating surgeon	4
Inadequate facilities	4
Poor surgical judgement and management	3
Delay in referral to specialist unit	1
Inappropriate specialty of Consultant in charge	1

The practices of cardiac and thoracic surgery have been separated for analysis of the questionnaires.

CARDIAC SURGERY

Table S392
Procedures in cardiac surgery
(may be multiple and includes coincidental procedures undertaken simultaneously)

Coronary artery bypass grafting	48
Mitral valve replacement	20
Aortic valve replacement	18
Repair of ventricular septal defect (post infarct)	8
Aortic root replacement	5
Infarctectomy	4
Redo coronary artery bypass grafting	3
Correction of postoperative bleeding	3
Orthotopic cardiac transplantation	2
Tricuspid valve annuloplasty	2
Tricuspid valve replacement	2
Correction of complex congenital cardiac anomalies	2
Miscellaneous	12

Table S393 (q1)
Specialty of Consultant Surgeon in charge at time of operation

	(*n*=103)
Cardiothoracic	
- Adult	82
- Paediatric	3
- Mixed practice	17
Not answered	1

Table 394 (q4)
Age of patient

	(*n*=103)
11 to 19	3
20 to 29	2
30 to 39	3
40 to 49	14
50 to 59	19
60 to 69	40
70 to 79	18
80 to 89	4

Table S395 (q5)
Sex of patient

	(*n*=103)
Male	64
Female	39

The patients are younger than in many other specialties with a preponderance of men. This reflects the incidence of ischaemic heart disease.

Table S396 (q10)
Initial admission intention for the last operation performed

	(*n*=103)
Elective	64
Urgent	18
Emergency	21

Table S397 (q20)
Was there any *delay in admitting* the patient?

	(*n*=103)
Yes	18
No	81
Not answered	4
Delay	
lack of resources	13
surgical staff committed elsewhere	1
non-medical staff shortage	2
other	7*

* - long waiting list (2)
- shortage of operating sessions
- medical treatment for endocarditis
- ICU beds occupied
- patient overweight
- not specified

Table S398 (q20)
If there was a delay in admitting the patient, did this delay affect the outcome?

	(*n*=18)
Yes	9
No	9

The length of time spent on a waiting list was a striking finding. In addition the general lack of facilities caused delays in admission or surgery. In nine cases the delay in admission was detrimental to the outcome, contributing considerably to the patient's demise. Waits of 12 months were not uncommon.

> *A 49-year-old man was treated at a hospital where there is a three-year waiting list for coronary artery bypass grafting. Due to the severity of his disease and deteriorating cardiac function he was admitted after seven months on the waiting list. He underwent four vessel coronary artery bypass grafting but died two days later due to cardiac failure. No post mortem was done.*

In another case:

> *A 43-year-old woman with ischaemic heart disease including a left main coronary artery occlusion waited four months for surgery. It was considered that the delay in this dangerous situation contributed to the unfavourable outcome.*

Inadequate facilities

> *A 26-year-old woman suffered with a complex congenital cardiac problem including mitral atresia, a double outlet right ventricle, aortic coarctation and pulmonary hypertension. She died 24 hours after an atrial septostomy. The respondent, an appropriate specialist at a University Hospital, noted the lack of facilities for treating such complex problems at his hospital.*
>
> *In another case a patient's operation was cancelled three times due to the lack of an intensive care bed.*

Unfortunately it is a common occurrence that operations are cancelled as a result of inadequate facilities.

Table S399 (q25)
Was the patient transferred as an inpatient from another hospital?

	(*n*=103)
Yes	35
No	68
From	
non-NHS hospital	1
same District (or Health Board)	8
same Region	21
outside Region	2
overseas	1
Not answered	2

Cardiothoracic surgery is practised in regional or sub-regional centres so the numbers of patients transferred is not surprising. Transfer was not a problem in terms of deterioration of the patient during the move.

Table S400 (q35)
Which grade of surgeon made the final decision to operate?

	(*n*=103)	(Locums)
Senior Registrar	1	(-)
Associate Specialist	2	(-)
Consultant	100	(2)

Table S401 (q36)
Grade of the most senior surgeon consulted before operation

	(*n*=103)	(Locums)
Senior Registrar	1	(-)
Associate Specialist	2	(-)
Consultant	100	(2)

Consultants were involved in the pre-operative decision-making in 97% of cases.

Table S402 (q41)
Other identified diagnoses at time of final surgery

	(*n*=103)
Respiratory	19
Cardiac	61
Neurological	9
Endocrine	7
Alimentary	5
Renal	21
Musculoskeletal	5
Haematological	2
Psychiatric	1
Drug addiction	1
Other	9
Not known	1
None	17

The spread of coexistent diseases is as would be expected in this group.

Table S403 (qs42/54)
ASA Class/Classification of operation

	ASA Class					
Classification of operation	**1**	**2**	**3**	**4**	**5**	**Not answered**
Emergency	-	-	1	8	10	1
Urgent	1	1	-	12	-	3
Scheduled	4	6	14	21	-	-
Elective	3	9	3	5	-	-
Not answered	-	-	-	-	-	1

Table S404 (qs42/43)
ASA Class/Anticipated risk of death

	ASA Class					
Risk	**1**	**2**	**3**	**4**	**5**	**Not answered**
Not expected	4	1	-	-	-	1
Small, significant risk	3	10	6	3	1	1
Definite risk	-	5	11	41	3	3
Expected	1	-	-	2	6	-
Not answered	-	-	1	-	-	-

Many patients were, not surprisingly, in poor risk categories.

Table S405 (q47)
Grade of the most senior operating surgeon

	(*n*=103)	(Locums)
Registrar	1	(-)
Senior Registrar	10	(1)
Associate Specialist	2	(-)
Consultant	90	(3)

Table S406 (qs47/54)
Grade of operating surgeon/Classification of operation

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Senior Registrar	1	5	1	3
Associate Specialist	-	-	1	1
Consultant	19	12	43	16

NB - Classification of operation not given in one case

Table S407 (q49)
If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=13)
Yes	10
No	3

Eighty-seven per cent of procedures were carried out by Consultants. The Senior Registrars all had considerable experience which means that 97% of patients were operated on by appropriately graded surgeons. The case done by a Registrar (Table S405) was a more minor procedure and his grade was irrelevant to the patient's death.

Two cases were operated on by Associate Specialists.

> *A 62-year-old woman had undergone previous surgery for mitral and tricuspid valve disease. At a revisional operation a mitral valve replacement and tricuspid annuloplasty were done by an Associate Specialist. Death occurred 24 hours later due to low cardiac output.*

> *An Associate Specialist operated electively on a 68-year-old man with ischaemic heart disease. A coronary artery bypass graft was done. There was no Consultant cover. The patient died on the day of operation from heart failure.*

No operation note or post mortem report was sent with the questionnaire.

A Senior Registrar performed the following operation with no Consultant cover.

> *A severely ill 51-year-old lady had surgery for coronary artery disease. This woman was suffering from extensive coronary artery disease with poor left ventricular function. She also had polycystic kidneys and had received a renal transplant in the past. The patient died.*

Table S408 (q70)
Was the postoperative period complicated by:

	(*n*=80)*
Haemorrhage/postoperative bleeding requiring transfusion	22
Upper respiratory obstruction	3
Respiratory distress	13
Generalised sepsis	15
Wound infection	1
Wound dehiscence	1
Low cardiac output	60
Hepatic failure	6
Renal failure	36
Stroke or other neurological problems other than head injury	12
Persistent coma	9
Other organ failure	2
Pressure sores	1
Peripheral ischaemia	1
Nutritional problems	3
Other problems	7
None	6

* excludes patients who died in theatre or the recovery area.

An expected variety of complications for this specialty.

Table S409 (q88)
Has this death been considered at a local audit/quality control meeting?

	(*n*=103)
Yes	70
No	15
Not answered	18

At least 85% of cases were considered in audit meetings.

Poor surgical judgement and management

> *It was the practice of the surgeon to have two cases running simultaneously in parallel theatres. A 44-year-old woman with severe coronary artery disease was kept waiting on the operating table as the case in the adjacent theatre proved unexpectedly difficult. In total the patient's operation (including the delay) took six hours. She died the same day due to ventricular fibrillation.*
>
> *A mitral valve replacement was done on a 61-year-old woman through posterior thoracotomy. Active tuberculous pericarditis was present. The initial valve prosthesis was too large and proved obstructive in a small ventricle. The valve was therefore replaced with a xenograft but the patient could not be weaned from cardiopulmonary bypass and she died.*
>
> *A 68-year-old man needed an urgent aortic valve replacement. There was a 12-day wait for a space on an elective list. By the end of the period he suffered a cardiac arrest and, despite emergency surgery, the situation was irretrievable.*

There was an error of judgement here in that the patient should have been operated on as an emergency.

Post mortems in cardiac surgery

It is noted that several post mortems were not observed by a member of the cardiac surgical team because the examination was conducted at a separate and distant hospital. It is probable that this is a more common occurrence than documented in the questionnaires returned to the Enquiry (see section on post mortems).

THORACIC SURGERY

Table S410
Procedures in thoracic surgery
(may be multiple and includes coincidental procedures undertaken simultaneously)

Bronchoscopy	10
Pneumonectomy	8
Pulmonary lobectomy	6
Closure of bronchopleural fistula	4
Lung biopsy	3
Exploratory thoracotomy	3
Thoracoplasty	2
Oesophageal bypass	1
Pleurectomy	2
Intubation of carcinoma of oesophagus	2
Tracheostomy	2
Resection thoracic aortic aneurysm	1
Mediastinoscopy	1
Nephrectomy	1
Repair tracheooesophageal fistula	1
Repair aorto-oesophageal fistula	1

Table S411 (q1)
Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=41)
Cardiothoracic	
- Adult	23
- Adult and paediatric	9
Thoracic	5
General with special interest in vascular surgery	3
Otorhinolaryngology	1

Patients were mainly looked after by appropriate specialists given that the general surgeons with a vascular interest were operating on aneurysmal disease, trauma or the complications of vascular surgery.

However in one case, the specialist was inappropriate.

> *A general surgeon, with a professed interest in vascular surgery, carried out a complicated four-and-a-half-hour gastric bypass procedure. The patient was 89 years of age and the carcinoma of the cardia was inoperable.*

Table S412 (q4)

Age of patient

	(*n*=41)
11 to 20	1
21 to 30	1
31 to 40	-
41 to 50	3
51 to 60	3
61 to 70	24
71 to 80	8
81 to 90	1

Table S413 (q5)

Sex of patient

	(*n*=41)
Male	29
Female	12

Table S414 (q10)

Initial admission intention for the last operation performed

	(*n*=41)
Elective	26
Urgent	11
Emergency	4

The majority of patients were admitted electively unlike many of the deceased patients in most other specialties.

Table S415 (q34)

Who made the working diagnosis?

	(*n*=41)	(Locums)
Surgeons		
House Officer	1	(-)
Senior House Officer	6	(-)
Registrar	6	(-)
Senior Registrar	4	(-)
Consultant	35	(-)
General Practitioner	7	(-)
Consultant Radiologist	2	

NB - this can be a multiple entry

All patients were operated on with the full knowledge of the Consultant (questions 35 and 36).

Table S416 (q41)
Other identified diagnoses at time of final surgery

	(*n*=41)
Respiratory	24
Cardiac	9
Neurological	3
Endocrine	2
Alimentary	6
Renal	2
Musculoskeletal	4
Haematological	1
Other	6
Not known	1
None	8

Table S417 (q42)
ASA Class

	(*n*=41)
1	4
2	15
3	6
4	11
5	4
Not answered	1

Table S418 (q43)
What was the anticipated risk of death related to the proposed operation?

	(*n*=41)
Not expected	5
Small but significant risk	19
Definite risk	13
Expected	3
Not answered	1

Fifty one per cent of patients were ASA Classes 3 to 5 and in 39% (16 out of 41) surgery carried a definite risk.

Table S419 (qs42/43)
ASA Class/Anticipated risk of death

	ASA Class					
Risk	1	2	3	4	5	Not answered
Not expected	-	3	1	-	1	-
Small, significant risk	3	8	3	4	-	1
Definite risk	1	3	2	6	1	-
Expected	-	-	-	1	2	-
Not answered	-	1	-	-	-	-

Table S420 (qs42/54)
ASA Class/Classification of operation

	ASA Class					
Classification of operation	1	2	3	4	5	Not answered
Emergency	-	1	-	2	3	-
Urgent	-	1	1	2	-	-
Scheduled	3	9	3	7	1	1
Elective	1	4	2	-	-	-

Table S421 (q44)
What precautions or therapeutic manoeuvres were undertaken pre-operatively to ensure adequate physiological function?

	(*n*=41)
Pulse rate recording	41
Blood pressure recording	41
Respiratory rate recording	37
Temperature	39
Central venous pressure measurement	12
Gastric aspiration	5
Intravenous fluids	21
Correction of hypovolaemia	10
Blood transfusion	8
Antibiotics	19
Oxygen therapy	17
Airway protection i.e. in head injuries	1
Tracheal intubation	16
Mechanical ventilation	13
Nutritional support	6
DVT prophylaxis	15
Others	4

Table S422 (q47)
Grade of the most senior operating surgeon

	(*n*=41)	(Locums)
Registrar	6	(1)
Senior Registrar	4	(2)
Consultant	31	(-)

Table S423 (q49)
If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=10)
Yes	7
No	3

Virtually all patients were operated on by Consultants or Senior Registrars.

Table S424 (qs47/54)
Grade of operating surgeon/Classification of operation

	Classification			
Grade	**Emergency**	**Urgent**	**Scheduled**	**Elective**
Registrar	-	-	5	1
Senior Registrar	-	1	3	-
Consultant	6	3	16	6

Table S425 (q46)
Day of operation

	(*n*=41)
Monday	7
Tuesday	9
Wednesday	8
Thursday	8
Friday	8
Saturday	-
Sunday	1

Table S426 (q56)
Time of start of operation (not including anaesthetic time)

	(*n*=41)
08.00 to 18.00	33
18.01 to 23.00	2
23.01 to 07.59	-
Not answered	6

Most cases were dealt with during the working day. This reflects the ability of thoracic surgeons to schedule most of these cases.

Table S427 (q70)
Was the postoperative period complicated by:

	(*n*=35)*
Haemorrhage/postoperative bleeding requiring transfusion	6
Upper respiratory obstruction	1
Respiratory distress	24
Generalised sepsis	6
Wound infection	3
Wound dehiscence	1
Low cardiac output	8
Hepatic failure	2
Renal failure	5
Stroke/other neurological problems other than head injury	3
Other organ failure	1
Problems with analgesia	1
DVT and/or pulmonary embolus	2
Peripheral ischaemia	1
Urinary tract infection	1
Urinary retention	2
Nutritional problems	4
Other problems	4
None of the above	6

* excludes patients who died in theatre or the recovery area.

Table S428 (q88)
Has this death been considered at a local audit/quality control meeting?

	(*n*=41)
Yes	25
No	7
Not answered	9

One Consultant commented that he *never* attended a post mortem of his patients. Can this individual participate in well informed, systematic audit?

Inappropriate site

> *A 65-year-old man underwent a thoracotomy for a thoracic aortic aneurysm in a District General Hospital where cardiopulmonary bypass was not available. The Consultant specialist found that the aneurysm was inoperable due to the friability of the aorta.*

If this case had been operable, were the facilities at the chosen site adequate to manage the anticipated spectrum of postoperative problems?

Problem with intensive care facilities

> *An intensive care unit had a problem with pseudomonas infections which necessitated closure of the unit. Immediately prior to this closure a 64-year-old man had a pneumonectomy for bronchial carcinoma. Due to a postoperative haemorrhage he was admitted to the ICU. He subsequently developed pseudomonas pneumonia and wound infection which proved fatal.*

This was unfortunate and no adverse comment is implied. However the case does emphasise the need to develop and adhere to procedures intended to prevent cross-infection.

OPHTHALMOLOGY

All operations in this specialty were considered to be potentially beneficial to the patient in that they were all for elective cataract surgery in order to improve vision. There were no surgical factors contributing to death which could have been avoided.

Examples of good practice include the Consultant-led care (all procedures were performed by Consultant Ophthalmologists), involvement of anaesthetists even when local/regional anaesthesia was used, and appropriate monitoring of patients where local/regional anaesthesia was used.

One area of concern was the lack of post mortems in the specialty and the absence of a clear scientific cause of death in two cases.

Table S429 (q4)
Age of patient

	(*n*=6)
60 to 69	1
70 to 79	1
80 to 89	3
90 to 99	1

Table S430 (q5)
Sex of patient

	(*n*=6)
Male	2
Female	4

This elderly group were all under the care of the appropriate specialist surgeon.

Table S431 (q41)

Other identified diagnoses at time of final surgery

	(*n*=6)
Respiratory	1
Endocrine	1
Renal	1
Not known	1
None	2

Table S432 (q42)

ASA Class

	(*n*=6)
1	1
2	1
3	-
4	-
5	-
Not answered	4

Bearing in mind the physiological changes of age, the group were relatively fit.

Table S433 (q54)

Classification of the operation

	(*n*=6)
Emergency	-
Urgent	-
Scheduled	-
Elective	6

ORAL/MAXILLOFACIAL SURGERY

There were only two deaths in this specialty. The procedures involved were radical resection of a carcinoma of floor of mouth and a technically straightforward dental extraction.

Both cases were under the care of an appropriate specialty.

In one case there were errors of judgement which could have been avoided.

> *A 16-year-old patient with known cardiorespiratory, renal and alimentary problems was admitted to a Community Hospital as a day case for dental extractions. The surgeon stated that the site of admission was appropriate. No pre-operative assessment was done and this site lacked any support facilities such as an intensive care or high dependency unit. The surgery was done by a Senior House Officer with a Senior Clinical Medical Officer as anaesthetist. During the recovery phase the patient suffered a cardiac arrest. The surgery was done in an inappropriate unit for a young patient with pre-existing disease and without pre-operative assessment.*

It was felt that there were avoidable factors. No post mortem report was available. This case is also discussed in the anaesthesia section (page 78).

OTORHINOLARYNGOLOGY

There were 36 cases considered by the Enquiry. The majority of deaths were either in patients with terminal malignancy or those having an incidental tracheostomy.

Table S434 (q51)
Procedures in otorhinolaryngological surgery
(may be multiple and includes coincidental procedures undertaken simultaneously)

Tracheostomy	17
Head and neck surgery	9
Endoscopies	8
Nasal surgery	6

Surgery was directly implicated in two deaths.

> *A 70-year-old lady underwent surgery for chronic mastoiditis. Her first operation had to be aborted when the mastoid drill failed and no replacement could be found. She had a second operation within a week but again there were difficulties with the drill. She subsequently developed a myocardial infarct and died. The failure of the equipment and lack of suitable back-up machine meant that the patient required two general anaesthetics.*

The stress of these two operations and the associated anaesthesia probably contributed to the lady's death (this case is also discussed in the anaesthesia section page 73).

> *A 55-year-old man presented with an uncontrolled epistaxis for which a submucous resection was done. It is uncertain whether complete control of the bleeding was achieved, and the patient died 48 hours later due to a cardiac arrest.*

The Consultant was never involved in this case and the information provided was patchy and incomplete. There is disquiet about this case and it is possible that remediable factors were present. Unfortunately the lack of information precludes any further comment.

Table S435 (q1)
Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=36)
Otorhinolaryngology	28
Accident and Emergency	1
General with special interest in	
- vascular surgery	3
- transplantation	1
Orthopaedic	1
Not answered	2

The procedures listed were performed by appropriate specialists. All procedures performed by non-ENT specialists were tracheostomies for ventilatory support eg after multiple trauma.

Table S436 (q4)
Age of patient

	(*n*=36)
20 to 29	1
30 to 39	1
40 to 49	3
50 to 59	7
60 to 69	8
70 to 79	10
80 to 89	5
90 to 99	1

Table S437 (q5)
Sex of patient

	(*n*=36)
Male	21
Female	15

The age and sex distribution are as expected.

Table S438 (q10)

Initial admission intention for the last operation performed

	(*n*=36)
Elective	11
Urgent	16
Emergency	9

Sixty-nine per cent of cases were either emergencies or urgent. Twelve patients were transferred from elsewhere but there was no deterioration during transfer.

Table S439 (q35)

Which grade of surgeon made the final decision to operate?

	(*n*=36)	(Locums)
Senior House Officer	1	(-)
Registrar	3	(-)
Senior Registrar	4	(-)
Associate Specialist	1	(-)
Consultant	26	(3)
Clinical Assistant	1	(-)

Table S440 (q36)

Grade of the most senior surgeon consulted before operation

	(*n*=36)	(Locums)
Senior Registrar	5	(-)
Associate Specialist	1	(-)
Consultant	29	(3)
Clinical Assistant	1	(-)

Pre-operative decision making was almost entirely by Consultants and Senior Registrars.

Table S441 (q41)

Other identified diagnoses at time of final surgery

	(*n*=36)
Respiratory	18
Cardiac	12
Neurological	7
Endocrine	4
Alimentary	8
Renal	3
Musculoskeletal	4
Haematological	5
Psychiatric	1
Alcohol-related problems	1
Other	6
None	4

Table S442 (q42

ASA Class

	(*n*=36)
1	5
2	6
3	9
4	13
5	1
Not answered	2

Table S443 (q43)

What was the anticipated risk of death related to the proposed operation?

	(*n*=36)
Not expected	16
Small but significant risk	10
Definite risk	6
Expected	1
Not answered	3

A considerable proportion of these patients were in a high risk group. In many cases tracheostomy was done on patients with critical illnesses from other specialties. The "not expected" group includes seven cases of malignancy.

Table S444 (qs42/54)
ASA Class/Classification of operation

Classification of operation	**ASA Class** 1	2	3	4	5	Not answered
Emergency	-	-	1	2	-	-
Urgent	-	1	3	5	1	2
Scheduled	3	5	5	6	-	-
Elective	2	-	-	-	-	-

Table S445 (q47)
Grade of the most senior operating surgeon

	(*n*=36)	(Locums)
Senior House Officer	1	(-)
Registrar	7	(1)
Senior Registrar	8	(1)
Consultant	19	(3)
Clinical Assistant	1	(-)

Seventy-five per cent of cases were operated on by either a Consultant or a Senior Registrar.

Table S446 (q88)
Has this death been considered at a local audit/quality control meeting?

	(*n*=36)
Yes	13
No	13
Not answered	10

Tracheostomy in terminal illness

There were two cases where it was evident that tracheostomy had been appropriately performed to improve the comfort of terminally ill patients.

> *An 85-year-old patient with a brain stem infarct and bilateral vocal cord palsy had a tracheostomy. He died three days later.*
>
> *A 58-year-old patient with long standing dystrophia myotonica was deteriorating and developed cardiac and respiratory failure. A tracheostomy was done but she died soon after.*

Lack of imaging facilities

It was noted that major head and neck malignancies had often been poorly assessed due to the lack of adequate scanning facilities such as CT and MRI. These deficiencies did not contribute directly to any deaths but proper assessment might have avoided some fruitless surgery.

PLASTIC SURGERY

There were no deaths in the specialty of plastic surgery where remediable surgical factors were directly linked to death. There was consistent Consultant involvement.

Table S447
Procedures in plastic surgery
(may be multiple and includes coincidental procedures undertaken simultaneously)

Debridement of burns and grafting	5
Wide excision of recurrent tumours and reconstruction	2
Tracheostomy	1
Skin grafting for traumatic skin loss	1
Excision sacral pressure sore, following failed hip surgery	1
Free latissimus dorsi flap, compound fracture tibia	1

Table S448 (q1)
Specialty of Consultant Surgeon in charge at time of final operation before death

	(*n*=11)
Plastic	10
Orthopaedic	1

Table S449 (q4)
Age of patient

	(*n*=11)
11 to 19	1
30 to 39	1
40 to 49	1
60 to 69	1
70 to 79	3
80 to 89	4

Sixty-four per cent of patients were over 70 years of age.

Table S450 (q10)
Initial admission intention for the last operation performed

	(*n*=11)
Elective	4
Urgent	2
Emergency	5

The emergency and urgent admissions were mainly for burns and followed resuscitation, stabilisation and transfer from other units. No patients deteriorated as a result of transfer.

Table S451 (q41)
Other identified diagnoses at time of final surgery

	(*n*=11)
Respiratory	7
Cardiac	2
Neurological	1
Endocrine	1
Alimentary	1
Musculoskeletal	1
Haematological	1
Psychiatric	3
Drug addiction	1
Other	3
None	1

Table S452 (q42)
ASA Class

	(*n*=11)
1	2
2	1
3	5
4	2
5	-
Not answered	1

Table S453 (q43)
What was the anticipated risk of death related to the proposed operation?

	(*n*=11)
Not expected	2
Small but significant risk	3
Definite risk	3
Expected	2
Not answered	1

Table S454 (q47)
Grade of the most senior operating surgeon

	(*n*=11)	(Locums)
Registrar	4	(-)
Senior Registrar	1	(-)
Consultant	6	(-)

Table S455 (q49)

If the most senior operating surgeon was *not* a Consultant, was a more senior surgeon *immediately* available, i.e. in the operating room/suite?

	(*n*=5)
Yes	1
No	4

Consultants or Senior Registrars were involved in the surgical procedures in 73% of cases.

Table S456 (q70)

Was the postoperative period complicated by:

	(*n*=11)
Haemorrhage/postoperative bleeding requiring transfusion	1
Respiratory distress	1
Generalised sepsis	2
Anastomotic failure	1
Low cardiac output	2
Renal failure	1
Stroke or other neurological problems other than head injury	1
Other organ failure	1

Table S457 (q88)

Has this death been considered at a local audit/quality control meeting?

	(*n*=11)
Yes	5
No	3
Not answered	3

It is disappointing that three of the deaths were not discussed at a local audit meeting.

POST MORTEM EXAMINATIONS

The majority of post mortems were performed by the authority of the coroner. Degenerative diseases, malignancy and trauma furnish most causes of death, with the elderly constituting the majority. In many, multi-organ failure was present where a single cause of death may be inappropriate.

It is important to note that any conclusions drawn reflect the post mortem reports available to the advisers. These reports are the only record of the post mortem, and good practice cannot be assumed unless the report issued to the clinicians or coroner gives a clear picture of the examination undertaken by the pathologist.

Table S458 (q 77)
Was the death reported to the coroner?

	(*n*=2558)
Yes	1450
No	1027
Not answered	81

Table S459 (q 77a)
If the death was reported to a coroner was a post mortem ordered by him/her?

	(*n*=1450)
Yes	827
No	579
Not answered	44

Table S460 (q 78)
If the death was not reported to a coroner, or the coroner did not order a post mortem, was a hospital post mortem requested?

	(*n*=1731)
Yes	417
No	1314

* also includes 125 questionnaires where question 77 was not answered.

The surgeon thought that a post mortem was unnecessary in 773 of the deaths. Forty-nine other surgeons commented that the operation had revealed the cause of death. A physician or pathologist advised against the post mortem in three cases, and in four deaths, the relatives were not available to give consent. Junior doctors were not aware of the policy on post mortem requests in two cases and four post mortems could not be performed because of lack of facilities or of pathology staff.

Table S461 (q 78a)
If a hospital post mortem was requested, who requested the post mortem permission from the relatives?

	(*n*=417)
House Officer	149
Senior House Officer	72
Registrar	52
Senior Registrar	24
Associate Specialist	23
Consultant	20
Other	9
Not answered	68

Table S462 (q 79)
Was a hospital post mortem refused?

	(*n*=417)
Yes	187
No	230

Permission was refused by relatives in 183 deaths (the other four questionnaires did not give an explanation).

Table S463 (q80)
Was the surgical team informed of the date and time of the post mortem?

	Hospital post mortems (*n*=231*)	Coroners' post mortems (*n*=827*)
Yes	102 (44%)	253 (31%)
No	103	469
Not answered	26	105

* Number of coroners' and hospital post mortems requested, and not refused.

It is regrettable that the clinical team was not informed of the date and time of 44% of hospital post mortems. It is even more regrettable that, despite our early discussions with the Coroners' Society and The Home Office, the clinical team was informed of the post mortem timing in only 31% of cases referred to the Coroner. How can clinicians learn from such an inadequate system?

Table S464 (q 81a)
The *most senior* member of the surgical team who attended the post mortem

	Hospital Post mortems (*n*=102)	Coroners' Post mortems (*n*=253)
House Officer	27	37
Senior House Officer	15	37
Registrar	15	50
Senior Registrar	8	12
Associate Specialist	-	1
Consultant	10	37
Other	2	4

When they were informed of the date and time, a member of the surgical team attended 75.5% of the hospital post mortems and 70% of those performed on behalf of the coroner.

Reasons for non-attendance concentrated on other, more urgent clinical commitments, but 43 surgeons felt that the experience was not likely to be of value. Three surgeons commented that they held regular discussions with the pathologist and in one case the post mortem was recorded on videotape.

Table S465 (q 82)
Did the Consultant Surgeon and his/her team receive a copy of the post mortem report?

	Hospital post mortems (*n*=231)	Coroners' post mortems (*n*=827)
Yes	199	624
No	27	179
Not answered	5	24

Table S466 (q 83)
What was the date of the first written information received about any post mortem?

Interval between death and receipt of information

	Hospital post mortems (*n*=231)	Coroners' post mortems (*n*=827)
within 7 days	101	298
8 to 14 days	20	31
15 to 21 days	4	17
22 to 28 days	3	7
29 to 60 days	9	36
more than 60 days	13	69
not answered	81	369

Table S467 (q 85)
Was the pathological information given useful i.e. did it contribute additional information to the understanding of the case?

	Hospital post mortems (*n*=231)	Coroners' post mortems (*n*=827)
Yes	158	461
No	67	291
Not answered	6	75

Surgeons considered that the cause of death was already known in 59% of the cases where they did not attend the post mortem. This may, in some instances, have been due to a narrow interpretation of the question.

> *The unexpected finding of a carcinoma of the larynx was not clinically useful in a case of emphysema, chronic pulmonary failure and pneumothorax.*
>
> *In a further example, the confirmation of the presence of an oesophageal carcinoma in a patient with anaemia of gastrointestinal origin was not thought to be of help.*

Nine of the respondents commented that the post mortem was not adequate or that they did not agree with the results.

Table S468 (q 86)
Who performed the post mortem?

	Hospital post mortems (*n*=231)	Coroners' post mortems (*n*=827)
Consultant pathologist	170	716
Junior pathologist	58	47
Not answered	3	64

COMMENTARY ON POST MORTEM REPORTS

All post mortem reports received were reviewed by the pathology advisers.

Histories

Table S469
Was a clinical history given on the post mortem report?

	Hospital post mortems (*n*=118)	Coroners' post mortems (*n*=486)
Yes	97	367
No	21	119

Ninety-eight per cent of the available histories were typewritten and in 97% they were consistent with the clinical data available to NCEPOD. It is regrettable that 2% of the histories were handwritten.

Thirty-five histories on post mortem forms contained major errors or deficiencies. In one notable case, a left-sided lesion was consistently referred to as being on the right.

Table S470
Was the gross description of the external examination of the cadaver adequate?

	(*n*=604)
Yes	529
No	71
Not answered	4

Table S471
Were measurements of scars, incisions etc. on the cadaver recorded in the post mortem report?

	(*n*=604)
Yes	311
No	263
Not answered	30

Pathologists did not examine the sites of fractures of the neck of femur in two cases.

Table S472
Were the organ systems described in a systematic manner at post mortem?

	(*n*=604)
Yes	552
No	49
Not answered	3

Volumes of effusion and organ weights were given in 74% of the post mortem reports. However, in some cases only one organ, the heart, was weighed.

The examination reflected the perceived surgical problems in 89% of the reports. In 8% reports, the problems were not addressed, including one extreme example of failure to comment on total gangrene of the right leg described by the surgeon. Another report omitted mention of a kyphosis which impeded an operation.

Table S473

Was there evidence that appropriate materials were saved for further examination?

	Hospital post mortems (*n*=118)	Coroners' post mortems (*n*=486)
Yes	31	62
No	61	315
Not known	26	109

Examination of tissues and fluids after post mortem is an important and sometimes major element. The advisers suspected that more tissue was saved for examination than the reports showed. In the absence of a positive statement in the report, or of a histology report, there can be no certainty that such material exists. The requirements of the Human Tissue Act (1961) may have inhibited the retention of tissues from coroner's post mortems unless their further examination had a direct bearing on the cause of death. The advisers were impressed by the pre-printed forms from some departments which had space to indicate the nature of the material saved.

In 15% of cases there was evidence that appropriate material had been saved for histology, microbiology, and, more rarely, for toxicology.

Table S474

Was there a summary of the lesions?

	(*n*=604)
Yes	222
No	379
Not answered	3

A summary was present in 37% of cases. The advisers felt that 55 of the 222 summaries were not satisfactory, mainly due to omission of significant lesions.

The clinical/pathological correlation

The advisers considered that the post mortem provided a clinical/pathological correlation and explanation of the cause of death in 39% of cases.

The histological report

Pathologists only provided a histological report in 15% of hospital post mortems and 9% of coroners' post mortems.

Table S475
The advisers classed the overall performance of the post mortems as:

	Hospital post mortems (*n*=118)	Coroners' post mortems (*n*=486)
Excellent	37	82
Adequate/satisfactory	54	282
Poor	20	95
Unacceptable	6	27
Not answered	1	-

The advisers were entirely dependent on the written information available. A well written clinical/pathological correlation can do much to indicate that the examination has been well thought out and directed to the needs of the surgeon or coroner.

Table S476
What was the value of the information provided by the post mortem?

	Hospital post mortems *n*=118	Coroners' post mortems *n*=486
New information of major importance to understanding the surgical/patient's problems	11	36
New information significantly affecting patient's prognosis	37	119
Confirmation of surgical observations	67	320
No value	2	9
Not answered	1	2

Overall, there were two problems with post mortem reports. First, the quality was poor in 24%. Second, the information only reached the clinical team in 78%.

These findings must be seen in the light of the report of the joint working party of the Royal College of Pathologists, the Royal College of Physicians and the Royal College of Surgeons[29].

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APPENDICES

APPENDIX A

GLOSSARY

ADMISSION

Elective - at a time agreed between the patient and the surgical service.

Urgent - within 48 hours of referral/consultation.

Emergency - immediately following referral.

AMERICAN SOCIETY OF ANESTHESIOLOGY CLASSIFICATION OF PHYSICAL STATUS

Class 1

The patient has no organic, physiological, biochemical or psychiatric disturbance. The pathological process for which operation is to be performed is localised and does not entail a systemic disturbance.

Class 2

Mild to moderate systemic disturbance or distress caused by either the condition to be treated surgically or by other pathophysiological processes.

Class 3

Severe systemic disturbance or disease from whatever cause, even though it may not be possible to define the degree of disability with finality.

Class 4

Severe systemic disorders that are already life threatening, not always correctable by operation.

Class 5

The moribund patient who has little chance of survival but is submitted to operation in desperation.

CLASSIFICATION OF OPERATION

Emergency

Immediate operation, resuscitation simultaneous with surgical treatment (eg trauma). Operation usually within one hour.

Urgent

Operation as soon as possible after resuscitation (eg irreducible hernia, intussusception, intestinal obstruction, perforation, embolism, some forms of haemorrhage, major fractures). Operation usually within 24 hours.

Scheduled

An early operation but not immediately life-saving (eg malignancy, cardiovascular surgery). Operation usually within 3 weeks.

Elective

Operation at a time to suit both patient and surgeon (eg cholecystectomy, hysterectomy, cataract surgery).

DAY CASE

A patient who is admitted for investigation or operation on a planned non-resident basis (i.e. no overnight stay).

HIGH DEPENDENCY UNIT

A high dependency unit (HDU) is an area for patients who require more intensive observation and/or nursing than would be expected on a general ward. Patients who require mechanical ventilation or invasive monitoring would not be admitted to this area.

INTENSIVE CARE UNIT

An intensive care unit (ICU) is an area to which patients are admitted for treatment of actual or impending organ failure who may require technological support (including mechanical ventilation of the lungs and/or invasive monitoring).

RECOVERY AREA

A recovery area is an area to which patients are admitted from an operating room, where they remain until consciousness is regained and ventilation and circulation are stable.

National Confidential Enquiry Into Perioperative Deaths

35-43 LINCOLN'S INN FIELDS, LONDON WC2A 3PN : Tel: 01-831 6430

ASSOCIATION OF ANAESTHETISTS OF GREAT BRITAIN AND IRELAND
COLLEGE OF ANAESTHETISTS AT THE ROYAL COLLEGE OF SURGEONS OF ENGLAND
ASSOCIATION OF SURGEONS OF GREAT BRITAIN AND IRELAND
FACULTY OF COMMUNITY MEDICINE OF THE ROYAL COLLEGES OF PHYSICIANS OF THE UK
ROYAL COLLEGE OF SURGEONS OF ENGLAND
ROYAL COLLEGE OF PATHOLOGISTS
ROYAL COLLEGE OF OBSTETRICIANS AND GYNÆCOLOGISTS

December 1988

PROTOCOL

This protocol is derived from the CEPOD report* published in December 1987.

1 AIMS

The National Confidential Enquiry into Perioperative Deaths (NCEPOD) is to enquire into clinical practice and to identify remediable factors in the practice of anaesthesia and surgery.

The NCEPOD will investigate deaths which occur in hospital within 30 days of any surgical or gynaecological operation. This will include all procedures carried out by surgeons, whether in the presence or absence of an anaesthetist. Procedures involving local anaesthetics, as well as day cases, are included.

All NHS hospitals within the Regional or Special Health Authorities of England, Wales, Northern Ireland, Guernsey, Jersey and the Isle of Man are to be included in the Enquiry, as well as hospitals managed by the Ministry of Defence, and by the British United Provident Association.

All Consultants (surgeons, gynaecologists and anaesthetists) will be involved in the assessment programme.

2 STEERING GROUP

The Enquiry is overseen by a steering group consisting of the following members:

Chairman	Professor D Campbell	CBE FFARCS FRCS
Vice Chairman	Mr J A P Marston	FRCS
Secretary	Mr H B Devlin	FRCS
Treasurer	Dr M M Burrows	FFARCS
	Professor J P Blandy	FRCS
	Dr N P Halliday	MB BS
	Dr A C Hunt	FRCPath
	Professor A G Johnson	FRCS
	Dr J N Lunn	FFARCS
	Professor R Owen	FRCS
	Professor M Rosen	FFARCS
	Mr S C Simmons	FRCOG
	Professor E D Alberman	FFCM

3 ANNUAL SAMPLE

A sample of all deaths reported will be investigated each year. The **dead cases** sampled will each be compared with similar patients, matched for sex, age, and mode of admission, who underwent similar operations and survived (**survivor cases**). Details of these patients will be obtained from consultants in another NHS Region.

Additionally, details of a large sample of patients undergoing surgery will be sought from all consultants (surgeons, gynaecologists and anaesthetists) each year. These **index cases** will provide a background against which the sample of dead cases and survivor cases will be compared.

Normally, consultants will be asked for details of **one** index case per year. This will depend, however, on the sample of dead cases being studied each year and the discipline of the consultant concerned.

Data will be collected by means of structured **questionnaires**, designed by the specialist groups and approved by the Steering Group.

It is anticipated that all consultants will provide information regarding all **dead** cases in the year's sample, any **survivor** case requested and one **index** case relevant to the sample.

The dead cases will be compared with the survivor cases and both samples with the index case sample. The specialist groups will advise on the sampling and conclusions to be drawn.

4 ANNUAL PROGRAMME

Groups of specialist doctors, formed as a result of nominations from specialist societies and associations and approved by the Steering Group will advise the clinical coordinators during each year's programme. Each year a sample of deaths and survivors will be considered by NCEPOD in a rolling programme to provide an ongoing audit of clinical practice.

5 EXCLUDED CASES

The NCEPOD will **not** consider deaths after:

i) Diagnostic procedures carried out by physicians or other non-surgeons;

ii) Therapeutic procedures carried out by physicians or other non-surgeons;

iii) Radiological procedures performed solely by a radiologist without a surgeon present;

iv) Obstetric operations or delivery;

v) Dental surgery other than that taking place in the hospitals listed in Section 1 above.

6 LITIGATION

The Department of Health has confirmed that it will support the total confidentiality of the NCEPOD.

The Data Protection Act does **not** apply to the information collected on the dead patients since there is no provision for third party access to the data. We intend to request information already in the patient's notes for the **index** and **survivor** cases and no assessment of these cases will be carried out. The information will be collated in an anonymous form and will not be stored as identifiable data.

Extract from Data Protection Act 1984 Section 33(6)

> "Personal data held only for –
> (a) preparing statistics; or
> (b) carrying out research,
> are exempt from the subject access provisions; but it shall be a condition of that exemption that the data are not used or disclosed for any other purpose and that the resulting statistics or the results of the research are not made available in a form which identifies the data subjects or any of them."

The Secretary of State has confirmed that the same support will be provided for the NCEPOD as is already given for the Confidential Enquiry into Maternal Deaths. The Secretary of State is satisfied that disclosure of documents about individual cases prepared for these enquiries would be against the public interest. The courts have always had regard to the overriding public interest as grounds for refusal of requests for disclosure of documents, and Section 35 of the Supreme Court Act 1981, which provides that the Court shall not make an order, under Sections 33 or 34 of that Act, for disclosure "if it considers that compliance with the Order, if made, would be likely to be injurious to the public interests" has provided additional support for such opposition. The Department has been assured that if it should be necessary, the claim for public interest immunity would be pressed vigorously by the Crown.

The Department in addition states that in its opinion a fruitful outcome to this Enquiry will be a major achievement by the medical profession in the field of medical audit/quality assurance. Therefore, the information on the dead patients sent to the National CEPOD is protected from subpoena. However, if any participant takes a photocopy of the form, that photocopy becomes his or her property (the original form remains the property of the NCEPOD) and is open to subpoena by the courts and the NCEPOD cannot protect that copy. It is therefore essential that NO PHOTOCOPIES ARE MADE OF PART OR ALL OF COMPLETED NCEPOD QUESTIONNAIRES. Participants may take copies of the BLANK form but please **DO NOT** keep records other than the patient's notes.

7 LOCAL REPORTING

Arrangements will be made in each district for cases to be reported to the NCEPOD office. An appropriate local reporter will be appointed after discussion with the consultants in each district. The local reporter **must** be a consultant. A pathologist or community physician is recommended. Appropriate delegation of day-to-day duties is, of course, permissible. It is necessary for the local reporter to have a nominated deputy.

The Royal College of Pathologists and the Faculty of Community Medicine are participating in the programme and their members are encouraged to assist data collection.

The reporter's role will be to ensure that **all** deaths in hospital within 30 days of an operation are reported to the NCEPOD office.

The reporter will be asked to provide demographic data **only** on the dead patient, and the names of the consultants in charge. No further information will be sought from the local reporter.

Each hospital has arrangements for the storage of death certificates and other information. We expect each local reporter to organise his/her own method to inform us of all perioperative deaths in hospital. To enable an adequate system to be established we suggest the support of the DMO and the DGM is sought. Printed advice about this task can be obtained from the NCEPOD office.

8 QUESTIONNAIRES

The questionnaires have been developed by the specialist groups to obtain details of particular surgical and anaesthetic procedures. All personal identification of patients and medical staff will be removed before entry of a particular case into the computer.

It is our recommendation that consultants ask their junior staff to complete the questionnaire from the patient's notes. Once the form is completed the consultant and his junior should review it together and it should be returned to the NCEPOD office. It is hoped that this joint completion will act as a training process by reviewing the case on a one-to-one basis. This method could be used to develop a framework of local review of clinical practice. Trainees and consultants may write in total confidentiality to the NCEPOD office under separate cover if they wish.

Consultants *(surgeons and anaesthetists)* will also be asked to complete a small number of questionnaires on patients who have survived surgery. These cases will provide the benchmarks for assessment.

The information you give to us is important. It must be complete and accurate if valid conclusions are to be drawn.

If further information is required we may request the patient's notes be provided.

9 FEEDBACK

The Enquiry recognises the importance of adequate feedback to individual consultants and to the profession as a whole. However, feedback must avoid any likelihood of legal or professional jeopardy to the individual consultant. Therefore the Enquiry will publish an annual report which will present aggregated data but will not allow identification of individual consultants. There will be no assessments provided on individual cases.

10 ACCREDITATION

All the Colleges and Faculties stress the importance of clinical audit for both monitoring clinical standards and as a discipline in the training of junior doctors. NCEPOD is a national audit system. The Colleges and Faculties require audit as a precondition for accreditation for training.

11 PARTICIPANTS

The annual report will include the names of all consultants who have contributed all the index, survivor and dead cases requested for the data base.

12 CLINICAL COORDINATORS

The coordinators appointed by the Steering Group may be contacted by telephone.

Dr J N Lunn	0222 763601 (direct)
Mr H B Devlin	0642 603571 (direct)

Assistant to the Coordinators;

Mr R W Hoile	0634 400677 (direct)

or via the National CEPOD office.

13 FURTHER INFORMATION

Please contact Ms Anne Campling, Administrator, on 01-831 6430 if you require any further information, or write to;

NCEPOD
35-43 Lincoln's Inn Fields
London
WC2A 3PN

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*Buck N., Devlin H. B., Lunn J. N. Report of the Confidential Enquiry into Perioperative Deaths. Nuffield Provincial Hospitals Trust and The King Edward's Hospital Fund for London. London 1987.

National Confidential Enquiry Into Perioperative Deaths
35-43 LINCOLN'S INN FIELDS, LONDON WC2A 3PN

SURGICAL QUESTIONNAIRE (DEATHS) 1990

QUESTIONNAIRE No. S ☐☐☐☐☐☐

DO NOT PHOTOCOPY ANY PART OF THIS QUESTIONNAIRE

QUESTIONNAIRE COMPLETION

The questionnaire should be completed with reference to the **last** operation before the death of the patient specified by the NCEPOD office.

The whole questionnaire will be shredded when data collection is complete. The information will be filed anonymously.

Neither the questions nor the choices for answers are intended to suggest standards of practice.

Please enclose a copy of the surgical operation notes, the postmortem reports and the postmortem request form if available. Any identification will be removed in the NCEPOD office.

Many of the questions can be answered by "yes" or "no". **Please insert a tick(s) in the appropriate box.**

Where multiple choices are given, please insert the tick(s) in the appropriate box(es).

If you wish to alter an answer, please "white" out the incorrect answer. Please do not write in amendments, which can not be accepted by the computer.

Consultants or junior staff may write to the NCEPOD office under separate cover, quoting the questionnaire number, offering any additional details which may be relevant to the evaluation of the case. All original copies of correspondence will be confidential (but **do not** retain copies of your correspondence).

In case of difficulty, please contact the NCEPOD office on:

01-831 6430

(071 831 6430 from 6 May 1990)

1 Speciality of Consultant Surgeon in charge at time of final operation before death:

1

a General ☐ a
b General with special interest in Paediatric Surgery ☐ b
c General with special interest in Urology ☐ c
d General with special interest in Vascular Surgery ☐ d
e General with special interest in Gastroenterology ☐ e
f General with special interest in Endocrinology ☐ f
g General with special interest in ____________ ☐ g
h Accident and Emergency ☐ h
j Cardiothoracic - Paediatric ☐ j
k Cardiothoracic - Adult ☐ k
m Cardiothoracic - Mixed practice ☐ m
n Oral/Maxillofacial ☐ n
o Gynaecology ☐ o
p Neurosurgery ☐ p
q Ophthalmology ☐ q
r Orthopaedic ☐ r
s Otorhinolaryngology ☐ s
t Paediatric ☐ t
v Plastic ☐ v
w Transplantation ☐ w
x Urology ☐ x
y Other (please specify) ☐ y

2 In which type of hospital did the last operation take place?

2

a University Hospital ☐ a
b District General Hospital (with undergraduate teaching) ☐ b
c District General Hospital ☐ c
d Community Hospital ☐ d
e Specialty Hospital ☐ e
f MOD Hospital ☐ f
g Independent Hospital ☐ g
h Other (please specify) ☐ h

PATIENT DETAILS

3 Date of birth D D M M Y Y ☐☐☐☐☐☐

4 Age at final operation ______________

5 Sex
- a Male ☐ a
- b Female ☐ b

6 Recorded weight at operation:

__________ kg or __________ st __________ lb

6A Please indicate the patient's physique.
- a Thin ☐ a
- b Average ☐ b
- c Obese/overweight ☐ c
- d Not recorded ☐ d

7 Height at operation:

__________ cm or __________ ft __________ ins

7A Please indicate the patient's height if a measurement is not available.
- a Short ☐ a
- b Average ☐ b
- c Tall ☐ c
- d Not recorded ☐ d

8 To which ethnic group did the patient belong?
- a White ☐ a
- b West Indian/Guyanese ☐ b
- c Indian/Pakistani/Bangladeshi ☐ c
- d Chinese ☐ d
- e African ☐ e
- f Arab ☐ f
- g Mixed Origin ☐ g
- h Other (please specify) ☐ h

9 Did any outpatient investigations impose an undesirable delay in setting a date for surgery?

Yes ☐
No ☐ 9

If yes, please explain

ADMISSION or TRANSFER DETAILS

10 Initial admission intention for the last operation performed:
- a Elective – at a time agreed between patient and surgical service ☐ a
- b Urgent – within 48 hours of referral/consultation ☐ b
- c Emergency – immediately following referral ☐ c

11 Source of referral:
- a GP ☐ a
- b A/E department ☐ b
- c Self-referral by patient ☐ c
- d Other specialty ☐ d
- e Own specialty ☐ e
- f Transfer from other hospital ☐ f
- g Other (please specify) ☐ g

12 Please specify the following dates:

Date of initial referral: eg date on letter of referral

☐☐☐☐☐☐ 12

D D M M Y Y

13 Date of first consultation following referral

☐☐☐☐☐☐ 13

D D M M Y Y

14 Decision to operate

☐☐☐☐☐☐ 14 Time ☐☐☐☐ 14A

D D M M Y Y (use 24 hour clock)

15 Date placed on waiting list (if relevant)

Date ☐☐☐☐☐☐ 15

D D M M Y Y

16 Date of admission to hospital in which final operation took place

☐☐☐☐☐☐ 16

D D M M Y Y

17 Admission

17

a Weekday (ie Monday to Friday) ☐ a
b Weekend (ie Saturday or Sunday) ☐ b
c Public Holiday ☐ c
d Extra-statutory Holiday (NHS) ☐ d

18 Was the patient transferred from another department within the hospital where the operation took place?

18

Yes ☐
No ☐

If yes, give time and date of transfer to surgical team

Date ☐☐☐☐☐☐ 18A Time ☐☐☐☐ 18B

D D M M Y Y (use 24 hour clock)

19 If this was an urgent or emergency case, was there any **delay** in REFERRAL on this occasion?

19

Yes ☐
No ☐

19A If yes, was the delay:

19A

a Doctor related ☐ a
b Patient related ☐ b
c Other (please specify) ☐ c

20 Was there any **delay** in ADMITTING the patient?

20

Yes ☐
No ☐

20A If yes, was the delay due to:

20A

a Lack of resources (please specify) ☐ a

b Surgical staff committed elsewhere ☐ b
c Non-medical staff shortages ☐ c
d Other (please specify) ☐ d

20B In your opinion did this delay affect the outcome?

20B

Yes ☐
No ☐

21 Had this patient's admission ever been cancelled on a previous occasion as a result of a lack of resources (ie not a patient imposed delay)?

21

Yes ☐
No ☐

If yes, please explain

22 Was the outcome in this case altered by the time spent on the waiting list?

22

Yes ☐
No ☐

If yes, please explain

23 If the admission was from a waiting list, was the patient's category or degree of urgency appropriate (bearing in mind subsequent events)?

23

Yes ☐
No ☐
Not applicable ☐

24 Was this patient initially intended as an elective day case (see definition below)?

24

Yes ☐
No ☐

DEFINITION

A surgical day case is a patient who is admitted for investigation or operation on a planned non-resident basis (ie no overnight stay).

25 Was the patient transferred as an inpatient from another hospital?

25

Yes ☐
No ☐

If no, go to question 29

If yes,

25A

25A a from non-NHS hospital ☐ a
b from same District (or Health Board) ☐ b
c from same Region ☐ c
d from outside Region ☐ d
e from overseas ☐ e
f Other (please specify) ☐ f

26 Type of referring hospital

26

a University Hospital ☐ a
b District General Hospital (with undergraduate teaching) ☐ b
c District General Hospital ☐ c
d Community Hospital ☐ d
e Specialty Hospital ☐ e
f MOD Hospital ☐ f
g Independent Hospital ☐ g
h Other (please specify) ☐ h

27 Why was the patient transferred?

28 Did the patient's condition deteriorate during transfer?

28

Yes ☐
No ☐

29 Was the patient's transfer TO another hospital ever considered?

29

Yes ☐
No ☐

30 If transfer was considered desirable, why was it not undertaken?

31 To what type of area was the patient first admitted? (see definitions)

31

- a Medical ward ☐ a
- b Surgical ward ☐ b
- c Mixed medical/surgical ward ☐ c
- d Gynaecological/obstetric ward ☐ d
- e Admission ward ☐ e
- f Day unit ☐ f
- g HDU ☐ g
- h ICU ☐ h
- j A/E holding area ☐ j
- k Direct to theatre ☐ k
- m Other (please specify) ☐ m

DEFINITIONS

A high dependency unit (HDU) is an area for patients who require more intensive observation and/or nursing than would be expected on a general ward. Patients who require mechanical ventilation or invasive monitoring would not be admitted to this area.

An intensive care unit (ICU) is an area to which patients are admitted for treatment of actual or impending organ failure who may require technological support (including mechanical ventilation of the lungs and/or invasive monitoring).

32 Was the site of admission appropriate for the patient's condition

32

Yes ☐
No ☐

If no, please explain

33 Was care undertaken on a formal shared basis with another specialty?

33

Yes ☐
No ☐

If yes, please specify

34 Who made the working diagnosis? (This can be a multiple entry - please put a tick in **each** appropriate box.)

Please tick the box(es) in the second column if a locum.

				Locum
a	GP	a	☐	☐
b	HO	b	☐	☐
c	SHO	c	☐	☐
d	Registrar	d	☐	☐
e	Senior Registrar	e	☐	☐
f	Associate Specialist	f	☐	☐
g	Consultant	g	☐	☐
h	Other (please specify)	h	☐	☐

35 Which grade of surgeon made the final decision to operate?

				Locum
a	HO	a	☐	☐
b	SHO	b	☐	☐
c	Registrar	c	☐	☐
d	Senior Registrar	d	☐	☐
e	Associate Specialist	e	☐	☐
f	Consultant	f	☐	☐
g	Other (please specify)	g	☐	☐

36 Grade of the most senior surgeon consulted before operation

				Locum
a	HO	a	☐	☐
b	SHO	b	☐	☐
c	Registrar	c	☐	☐
d	Senior Registrar	d	☐	☐
e	Associate Specialist	e	☐	☐
f	Consultant	f	☐	☐
g	Other (please specify)	g	☐	☐

37 Please record all surgical staff who **took history** before operation but after admission (this can be multiple entry).

				Locum
a	HO	a	☐	☐
b	SHO	b	☐	☐
c	Registrar	c	☐	☐
d	Senior Registrar	d	☐	☐
e	Associate Specialist	e	☐	☐
f	Consultant	f	☐	☐
g	Other (please specify)	g	☐	☐

38 Please record all surgical staff who **examined** the patient before operation but after admission (this can be multiple entry).

a HO
b SHO
c Registrar
d Senior Registrar
e Associate Specialist
f Consultant
g Other (please specify)

		Locum
a	☐	☐
b	☐	☐
c	☐	☐
d	☐	☐
e	☐	☐
f	☐	☐
g	☐	☐

39 Working diagnosis by most senior member of surgical team.

☐☐☐☐☐☐

(coding - for NCEPOD use only)

40. What operation was proposed by the most senior member of the surgical team?

GENERAL PREOPERATIVE DETAILS

41 Other identified diagnoses at time of final surgery (specify disorder in space below category). Please put a tick in each appropriate box.

		41	
a	Respiratory	☐	a
b	Cardiac	☐	b
c	Neurological	☐	c
d	Endocrine	☐	d
e	Alimentary	☐	e
f	Renal	☐	f
g	Musculoskeletal	☐	g
h	Haematological	☐	h
j	Psychiatric	☐	j
k	Alcohol-related problems	☐	k
m	Drug addiction	☐	m
n	Other (please specify)	☐	n
o	Not known	☐	o

42 ASA Class (see definition below).

42
☐ 1
☐ 2
☐ 3
☐ 4
☐ 5

AMERICAN SOCIETY OF ANESTHESIOLOGY CLASSIFICATIONS OF PHYSICAL STATUS

Class 1

This patient has no organic, psychological or psychotic disturbance. The pathological process for which operation is to be performed is localised and does not entail a systemic disturbance.

Class 2

Mild to moderate systemic disturbance or distress caused by either the condition to be treated surgically or by other pathophysiological processes.

Class 3

Severe systemic disturbance or disease from whatever cause, even though it may not be possible to define the degree of disability with finality.

Class 4

Severe systemic disorders that are already life threatening, not always correctable by operation.

Class 5

The moribund patient who has little chance of survival but is submitted to operation in desperation.

43 What was the anticipated risk of death related to the proposed operation?

43
a Not expected ☐ a
b Small but significant risk ☐ b
c Definite risk ☐ c
d Expected ☐ d

PREOPERATIVE PREPARATION

44 What precautions or therapeutic manoeuvres were undertaken preoperatively to ensure adequate physiological function? Enter a tick in each appropriate box.

44
a Pulse rate recording ☐ a
b Blood pressure recording ☐ b
c Respiratory rate recording ☐ c
d Temperature ☐ d
e Central venous pressure measurement ☐ e
f Gastric aspiration ☐ f
g Intravenous fluids ☐ g
h Correction of hypovolaemia ☐ h
i Blood transfusion ☐ i
j Antibiotics ☐ j
k Oxygen therapy ☐ k
l Airway protection ie in head injuries ☐ l
m Tracheal intubation ☐ m
n Mechanical ventilation ☐ n
o Stabilisation of fractures ☐ o
p Stabilisation of cervical spine ☐ p
q Nutritional support ☐ q
r Vitamin K ☐ r
s DVT prophylaxis ☐ s
t Others (please specify) ☐ t

45 Do you think the patient's medication (excluding premedication) was relevant to the outcome?

45
Yes ☐
No ☐

If yes, please explain

OPERATION

Please include a copy of all operation notes. Identification will be removed at the NCEPOD office.

46 Date of final operation before death ☐☐☐☐☐☐ 46

D D M M Y Y

46A Please circle day M T W Th F Sa Sun

46B Was this a Public Holiday ☐ a
b Extra-statutory Holiday (NHS) ☐ b

47 Grade of most senior operating surgeon.

Please tick the second column if a locum.

				Locum? 47
a	HO	a	☐	☐
b	SHO	b	☐	☐
c	Registrar	c	☐	☐
d	Senior Registrar	d	☐	☐
e	Associate Specialist	e	☐	☐
f	Consultant	f	☐	☐
g	Other (please specify)	g	☐	☐

48 How long had this surgeon spent in this grade?

__________yrs __________mths

49 Was a more senior surgeon **immediately** available, ie in the operating room/suite?

49
Yes ☐
No ☐

If yes, please specify grade and location.

50 Diagnosis at operation:

51 Final operation undertaken:

52 If the operation was different to that proposed, please explain.

53 Multiple operations

If this operation was the most recent in a sequence or was preceded by a minor procedure, please list the other procedures.

	Operation	Date	Specialty of Operating Surgeon
a	______________	________	________
	______________		
b	______________	________	________
	______________		
c	______________	________	________
	______________		
d	______________	________	________
	______________		

54 Classify the operation (See definitions below and choose the category most appropriate to the case).

54

a Emergency ☐ a
b Urgent ☐ b
c Scheduled ☐ c
d Elective ☐ d

DEFINITIONS

a EMERGENCY

Immediate operation, resuscitation simultaneous with surgical treatment (eg trauma). Operation usually within one hour.

b URGENT

Operation as soon as possible after resuscitation (eg irreducible hernia, intussusception, intestinal obstruction, perforation, embolism, some forms of haemorrhage, major fractures). Operation usually within 24 hours.

c SCHEDULED

An early operation but not immediately life saving (eg malignancy, cardiovascular surgery). Operation usually within 3 weeks.

d ELECTIVE

Operation at a time to suite both patient and surgeon (eg cholecystectomy, hysterectomy, cataract surgery).

55 In view of your answer to Q54, was there any delay due to factors other than clinical?

55

Yes ☐
No ☐

If yes, please specify

56 Time of start of operation (not including anaesthetic time) ☐☐☐☐

(use 24 hour clock)

57 Duration of operation (not including anaesthetic time)

________hrs ________mins

58 Was the time taken acceptable?

58

Yes ☐
No ☐

If no, please specify

59 Were there any unanticipated intra-operative problems?

59

Yes ☐
No ☐

If yes, please specify

LOCAL ANAESTHESIA/SEDATION

60 Was local/regional anaesthesia or sedation administered by a surgeon at any time during this operation?

60
Yes ☐
No ☐

If no, go to question 64

If yes, what was the main drug/agent used?

What dosage was administered?

61 Was any other drug administered with the local anaesthetic?

61
Yes ☐
No ☐

If yes, please describe

62 If the procedure was performed **solely** under local anaesthetic or sedation, which of the following were recorded during or immediately after the procedure?

62
a Blood pressure ☐ a
b Pulse ☐ b
c ECG ☐ c
d Pulse oximetry ☐ d
e Other (please specify) ☐ e

f None ☐ f

63 Were facilities for resuscitation, including airway management, immediately available during this procedure?

63
Yes ☐
No ☐

POSTOPERATIVE PROGRESS

64 Which of the following are available in the hospital in which the operation took place:

64
a Theatre recovery room ☐ a
b Adult ICU ☐ b
c Adult HDU ☐ c

65 Was the patient admitted immediately to an ICU or HDU postoperatively?

		Yes	No	
a	ICU	☐	☐	a
b	HDU	☐	☐	b

65A Were these facilities adequate?

65A
Yes ☐
No ☐

If no, what in your opinion was inadequate?

66 Were you at any time unable to transfer the patient into an ICU/HDU etc within the hospital in which the surgery took place?

66
Yes ☐
No ☐

If yes, why?

67 What were the indications for the admission to ICU/HDU? (This can be multiple entry.)

67

a Specialist nursing ☐ a
b Presence of experienced intensivists ☐ b
c General monitoring ☐ c
d Metabolic monitoring ☐ d
e Ventilation ☐ e
f Surgical complications ☐ f
g Anaesthetic complications ☐ g
h Co-incident medical diseases ☐ h
j Inadequate nursing on general wards ☐ j
k Transfer from hospital without facilities ☐ k
m Other (please specify) ☐ m

68 Discharge from ICU/HDU due to:

68

a Elective transfer to ward ☐ a
b Pressure on beds ☐ b
c Death ☐ c
d Other (please specify) ☐ d

69 Was the patient subsequently readmitted to an ICU/HDU etc?

69

Yes ☐
No ☐

If yes, please give details.

70 Was the postoperative period complicated by:

70

a Haemorrhage/postoperative bleeding requiring transfusion ☐ a
b Upper respiratory obstruction ☐ b
c Respiratory distress ☐ c
d Generalised sepsis ☐ d
e Wound infection ☐ e
f Wound dehiscence ☐ f
g Anastomotic failure ☐ g
h Low cardiac output ☐ h
i Hepatic failure ☐ i
j Renal failure ☐ j
k Endocrine system failure ☐ k
l Stroke or other neurological problems other than head injury ☐ l
m Persistent coma ☐ m
n Other organ failure (please specify) ☐ n

o Problems with analgesia ☐ o
p DVT and/or pulmonary embolus ☐ p
q Fat embolus ☐ q
r Orthopaedic prosthetic complications ☐ r
s Pressure sores ☐ s
t Peripheral ischaemia ☐ t
v Urinary tract infection ☐ v
w Urinary retention ☐ w
x Nutritional problems ☐ x
y Other problems (please specify) ☐ y

71 Was mechanical ventilation employed?

71

Yes ☐
No ☐

71A If yes, were there complications with mechanical ventilation?

71A

Yes ☐
No ☐

If yes, please explain

DEATH

72 Date of death ☐☐☐☐☐☐ 72
D D M M Y Y

72A
72A a Weekday ☐ a
b Weekend ☐ b
c Public holiday ☐ c
d Extra-statutory holiday (NHS) ☐ d

72B Time of death ☐☐☐☐ 72B
(use 24 hour clock)

73
73 Place of death
a Theatre ☐ a
b Recovery area ☐ b
c Ward ☐ c
d ICU/HDU ☐ d
e Home ☐ e
f Another hospital ☐ f
g Other (please specify) ☐ g

74 Was cardiopulmonary resuscitation attempted?

74
Yes ☐
No ☐

If not, why not?

75 What was the immediate **clinical** cause of death? (This need not be a duplication of the death certificate.)

☐☐☐☐☐☐
(coding for NCEPOD use only)

76 **CAUSE OF DEATH** (this is a facsimile of the death certificate: please complete it accordingly).

I(a) Disease or condition directly leading to death

(b) Other disease or condition, if any, leading to I(a)

(c) Other disease or condition, if any, leading to I(b)

II Other significant conditions CONTRIBUTING TO THE DEATH but not related to the disease or condition causing it

77 Was the death reported to the coroner?

77
Yes ☐
No ☐

77A If yes, was a postmortem ordered by him/her?

77A
Yes ☐
No ☐

78 Was a hospital postmortem requested?

78
Yes ☐
No ☐

If no, why not?

78A If yes, who requested the postmortem permission from the relatives?

78A

a HO ☐ a
b SHO ☐ b
c Registrar ☐ c
d Senior Registrar ☐ d
e Associate Specialist ☐ e
f Consultant ☐ f
g Other (please specify)

79 Was a postmortem refused?

79
Yes ☐
No ☐

79A If yes, by whom?

79A

a Relatives ☐ a
b Pathologist ☐ b
c Other (please specify) ☐ c

If postmortem was not performed, please move to Q

80 Was the surgical team informed of the date and time of postmortem?

80
Yes ☐
No ☐

81 Which member of the surgical team attended the postmortem?

81

a HO ☐ a
b SHO ☐ b
c Registrar ☐ c
d Senior Registrar ☐ d
e Associate Specialist ☐ e
f Consultant ☐ f
g Other (please specify) ☐ g
☐ h

h None of the above

If a surgeon did not attend the postmortem, why not?

82 Did the consultant surgeon and his/her team receive a copy of the postmortem report?

82
Yes ☐
No ☐

83 What was the date of the first written information received about any postmortem?

☐☐☐☐☐☐ 83
D D M M Y Y

84 If a postmortem was performed, please list the relevant findings.

PLEASE SEND A COPY OF ALL POSTMORTEM REPORTS AND POSTMORTEM REQUEST FORM IF AVAILABLE

85 Was the pathological information given useful i.e. did it contribute additional information to the understanding of the case?

85
Yes ☐
No ☐

If not, why not?

86 Who performed the postmortem?

86
a Specialist pathologist ☐ a
b Consultant pathologist ☐ b
c Junior pathologist ☐ c

87 Are you aware of any subspecialty of the pathologist involved?

87
Yes ☐
No ☐

If yes, please specify

88 Has this death been considered at a local audit/quality control meeting?

88
Yes ☐
No ☐

OTHER INFORMATION

89 Was there a shortage of personnel in this case?

		Yes	No	
a	Consultant surgeons	☐	☐	a
b	Trainee surgeons	☐	☐	b
c	Consultant anaesthetists	☐	☐	c
d	Trainee anaesthetists	☐	☐	d
e	Skilled assistants	☐	☐	e
f	Nurses	☐	☐	f
g	ODAs	☐	☐	g
h	Porters	☐	☐	h
i	Other (please specify)	☐	☐	i

90 Out of hours operations only:

Would this operation have been done during the routine list time if operating theatre space had been available?

90
Yes ☐
No ☐

91 Did any organisational aspects, lack of resources or any other non-clinical factors contribute to the fatal outcome?

91
Yes ☐
No ☐

If yes, please specify

Please write on a separate sheet if space is inadequate.
Alternatively write a confidential letter to NCEPOD quoting the questionnaire number. Do not retain copies of your letter.

92 Who completed this questionnaire?

92

- a HO ☐ a
- b SHO ☐ b
- c Registrar ☐ c
- d Senior Registrar ☐ d
- e Associate Specialist ☐ e
- f Consultant ☐ f
- g Other (please specify) ☐ g

93 Did you have any problems in obtaining the patient's notes?

93

Yes ☐
No ☐

If yes, how long did they take to reach you?

94 Were all the notes available?

94

Yes ☐
No ☐

94A If no, which part was inadequate/unavailable?

94A

- a Preoperative notes ☐ a
- b Operative notes ☐ b
- c Postoperative notes ☐ c
- d Death certificate book ☐ d
- e Other notes (please specify) ☐ e

95 Were the nursing notes available?

95

Yes ☐
No ☐

96 Has the consultant surgeon seen and agreed this form?

96

Yes ☐
No ☐

97 Have you enclosed a copy of the surgical operation notes?

97

Yes ☐
No ☐

If no, why not?

98 Have you enclosed a copy of the postmorten report?

98

Yes ☐
No ☐

If no, why not?

99 Date questionnaire completed

D	D	M	M	Y	Y

100 How long did it take you to complete this questionnaire?

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE

YOU MUST NOT KEEP A COPY OF THIS QUESTIONNAIRE

Please return it in the reply-paid envelope provided to:

NCEPOD
35-43 Lincoln's Inn Fields
LONDON
WC2A 3PN

THIS QUESTIONNAIRE IS THE PROPERTY OF NCEPOD

If you wish to inform the NCEPOD office of any other details of this case, please do so here or on a separate sheet.

National Confidential Enquiry Into Perioperative Deaths

35-43 LINCOLN'S INN FIELDS, LONDON WC2A 3PN

ANAESTHETIC QUESTIONNAIRE (DEATHS) 1990

QUESTIONNAIRE No. A ☐☐☐☐☐☐

DO NOT PHOTOCOPY ANY PART OF THIS QUESTIONNAIRE

QUESTIONNAIRE COMPLETION

The whole questionnaire will be shredded when data collection is complete.

The information you supply is important. It must be accurate if valid conclusions are to be drawn.

Neither the questions nor the choices for answers are intended to suggest standards of practice.

Please **enclose** a copy of the anaesthetic record and of the fluid balance chart(s). Any identification will be removed in the NCEPOD office.

Many of the questions can be answered by "Yes" or "No." Please insert the relevant **number** in the appropriate box eg

1 for Yes

2 for No

Where multiple choices are given, please insert the relevant letter(s) of your answer in the box(es), and leave the remaining boxes blank.

eg question 10

c

d

☐

indicates that advice was sought from both a Senior Registrar and a Consultant.

Consultants or junior staff may write to the NCEPOD office under separate cover, quoting the questionnaire number. All original copies of correspondence will be confidential **(but do not retain copies of your correspondence).**

In case of difficulty, please contact the NCEPOD office on:

01 831 6430

(071 831 6430 from 6th May 1990)

HOSPITAL

1 In what type of hospital did the anaesthetic take place?

a District General Hospital
b University/Teaching Hospital
c Single surgical specialty Hospital
d Community Hospital
e MOD Hospital
f Independent Hospital
g Other (please specify)

☐☐ 1

____

ANAESTHETISTS

2 If you were not involved in any way with this anaesthetic and have filled out this questionnaire on behalf of someone else, please indicate your position.

a Chairman of Division
b College Tutor
c Duty Consultant
d Other Consultant
e Other (please specify)

☐ 2

____

3 Grade(s) of anaesthetist(s) present at this anaesthetic. Enter the appropriate letter for each grade present.

If locum, please indicate, by entering a figure 1 in the right hand box.

a SHO
b Registrar
c Senior Registrar
d Consultant
e Staff Grade
f Associate Specialist
g Clinical Assistant
h General Practitioner
i Hospital Practitioner
k Other (please specify)

Grades	Locum?
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

3

____

We want to know about the experience of the **most senior anaesthetist** in the operating room at the start of this procedure.

Questions 4 to 6 inclusive refer to this anaesthetist

4 Year of primary medical qualification 1 9 ☐ ☐ 4

and the university (or institution) awarding this qualification:

______________________________ 4a

If not in UK, please state country: ______________________________ 4b

5 Year of first full-time anaesthetic training post 1 9 ☐ ☐ 5

Which higher diploma in anaesthesia is held?

a None
b FFARCS/FCAnaes/FFARCSI/FFARACS
c DA (ie Part 1 FCAnaes)
d Other (please specify)

☐ ☐ ☐ 5a

____

Year of award of higher qualification: 1 9 ☐ ☐ 5b

6 Has the anaesthetist been in continuous anaesthetic practice since the first training job?

Yes = 1 No = 2 ☐ 6

If no, for how many years was he/she out of anaesthetic practice?

____

If the most senior anaesthetist was **not** a consultant, please answer questions 7 to 9.

7 Was a consultant anaesthetist informed about this case **BEFORE** the anaesthetic?

Yes = 1 No = 2 ☐ 7

8 Was a consultant anaesthetist informed **DURING** the anaesthetic?

Yes = 1 No = 2 ☐ 8

9 Was a consultant anaesthetist informed **AFTER** the anaesthetic?

Yes = 1 No = 2 ☐ 9

10 Did the anaesthetist (of whatever grade) seek advice from another anaesthetist at any time?

Grade(s)

Yes = 1 No = 2 ☐ 10

If **yes,** grade(s) of anaesthetists from whom advice sought:

a SHO
b Registrar
c Senior Registrar
d Consultant
e Staff Grade
f Associate Specialist
g Clinical Assistant
h General Practitioner
i Hospital Practitioner
k Other (please specify)

☐ ☐ ☐ ☐ ☐ ☐ 10a

____

11 Did any colleague(s) come to help at any time?

Yes = 1 No = 2 ☐ 11

If **yes,** grade(s) of anaesthetists who came to help:

a SHO
b Registrar
c Senior Registrar
d Consultant
e Staff Grade
f Associate Specialist
g Clinical Assistant
h General Practitioner
i Hospital Practitioner
k Other (please specify)

☐ ☐ ☐ ☐ ☐ 11a

____

THE PATIENT

12 Date of patient's birth

☐☐☐☐☐☐ 12
D D M M Y Y

13 Date of admission to hospital eg 03 02 90 (3 February 1990)

☐☐☐☐☐☐ 13
D D M M Y Y

14 Date of operation

☐☐☐☐☐☐ 14
D D M M Y Y

THE OPERATION

15 What operation was planned?

____
____
____
____

16 What operation was performed, if different?

____
____
____

17 If this operation was the most recent in a sequence, please list the previous procedures.

Procedure	Date

Please enclose a copy of all anaesthetic record(s)

18 Classification of operation (last before death). See definitions below.

a Emergency
b Urgent
c Scheduled
d Elective

☐ 18

DEFINITIONS

a **Emergency**
Immediate life-saving operation, resuscitation simultaneous with surgical treatment (eg trauma, ruptured aortic aneurysm). Operation usually within one hour.

b **Urgent**
Operation as soon as possible after resuscitation (eg irreducible hernia, intussusception, oesophageal atresia, intestinal obstruction, major fractures). Operation within 24 hours.

c **Scheduled**
An early operation, but not immediately life-saving (eg malignancy). Operation usually within 3 weeks.

d **Elective**
Operation at a time to suit both patient and surgeon (eg cholecystectomy, joint replacement).

CONDITION BEFORE OPERATION

19 Was a record of the patient's weight available?

Yes = 1 No = 2 ☐ 19

If yes, what was this weight? ____________ kg
If no, the estimated weight was ____________ kg

20 Was a record of the patient's height available?

Yes = 1 No = 2 ☐ 20

If yes, what was this height? ____________ cm
If no, the estimated height was ____________ cm

21 Was an anaesthetist consulted by the surgeon (as distinct from informed), before the operation?

Yes = 1 No = 2 ☐ 21

22 Did an anaesthetist visit the patient before operation?

Yes = 1 No = 2 ☐ 22

If yes, was **this** anaesthetist present at the start of the operation?

Yes = 1 No = 2 ☐ 22a

23 Were any investigations done before the operation?

Yes = 1 No = 2 ☐ 23

If yes, which of the following?

PLEASE WRITE RESULTS IN THE SPACE BELOW THE TEST NAME.

INDICATE WHICH TEST(S) BY INSERTION OF THE APPROPRIATE LETTER(S) IN A BOX

a Haemoglobin
b Packed cell volume (haematocrit)
c White cell count
d Sickle cell test (eg Sickledex)
e Plasma electrolytes Na
f K
g Cl
h $HC0_3$
i Blood urea
k Creatinine
m Serum albumin
n Bilirubin
p Glucose
q Urinalysis (ward or lab)
r Blood gas analysis
s Chest x-ray
t Electrocardiography

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ 23a

continued on next page

23a continued

v Respiratory function tests

w Echocardiography

x Special cardiac investigation
(eg cardiac catheterization)

y Special neurological investigation (ie imaging)

z Others relevant to anaesthesia (please specify)

____

____

☐☐☐☐ 23a

24 Coexisting medical diagnoses (please enter the appropriate letter in a box, **and** specify the disorder in the space below the category).

a none

b respiratory

c cardiac

d neurological

e endocrine

f alimentary

g renal

h musculoskeletal

k haematological

m genetic abnormality

n other (please specify)

Diagnosis(es)

☐☐☐☐☐☐☐☐☐☐☐ 24

(coding for NCEPOD office use only)

25 What drug or other therapy was the patient receiving at the time of operation (but excluding premedication or drugs for anaesthesia)?

Please enter each appropriate letter, and specify drugs and doses in the space below each category.

- a none
- b analgesic - aspirin
- c analgesic - other non-narcotic (specify)
- d analgesic - narcotic (specify)
- e anti-angina
- f antiarrhythmic
- g anticoagulant
- h anticonvulsant
- i antidepressant
- j antidiabetic
- k antihypertensive
- m anti-infective (antibiotic, antifungal, antiviral etc)
- n anti-Parkinson's
- o anxiolytic
- p benzodiazepines

☐☐☐☐☐☐☐☐☐☐☐☐ 25

continued on next page

25 continued

- q bronchodilator
- r cardioactive drug (not otherwise specified)
- s contraceptive
- t corticosteroid
- v cytotoxic
- w diuretic
- x H_2 blockers
- y psychotropic
- z other (please specify)

☐☐☐☐☐☐☐ 25

26 Was there any history of a drug (including anaesthetic) reaction?

Yes = 1 No = 2 ☐ 26

If **yes,** specify drug and reaction:

____

____

____

____

27 ASA Status (enter class number)

Class 1 ☐ 27
Class 2
Class 3
Class 4
Class 5 (Note we are not using the E subclassification)

ASA GRADES

AMERICAN SOCIETY OF ANESTHESIOLOGY CLASSIFICATION OF PHYSICAL STATUS

CLASS 1

The patient has no organic, physiological, biochemical, or psychiatric disturbance. The pathological process for which operation is to be performed is localized and does not entail a systemic disturbance.

Examples: a fit patient with inguinal hernia;
fibroid uterus in an otherwise healthy woman.

CLASS 2

Mild to moderate systemic disturbance caused either by the condition to be treated surgically or by other pathophysiological processes.

Examples: non, or only slightly limiting organic heart disease,
mild diabetes
essential hypertension
anaemia.

Some might choose to list the extremes of age here, either the neonate or the octogenarian, even though no discernible systemic disease is present. Extreme obesity and chronic bronchitis may be included in this category.

CLASS 3

Severe systemic disturbance or disease from whatever cause, even though it may not be possible to define the degree of disability with finality.

Examples: severely limiting organic heart disease
severe diabetes with vascular complications
moderate to severe degrees of pulmonary insufficiency
angina pectoris or healed myocardial infarction.

CLASS 4

Severe systemic disorders that are already life threatening, not always correctable by operation.

Examples: patients with organic heart disease showing marked signs of cardiac insufficiency
persistent angina or active myocarditis
advanced degrees of pulmonary, hepatic, renal or endocrine insufficiency.

continued on next page

CLASS 5

The moribund patient who has little chance of survival but is submitted to operation in desperation.

Examples: the burst abdominal aneurysm with profound shock
major cerebral trauma with rapidly increasing intracranial pressure
massive pulmonary embolus

Most of these patients require operation as a resuscitative measure with little if any anaesthesia.

PREPARATION OF PATIENT BEFORE OPERATION

28 When was the last fluid/food given by mouth? ☐ 28

a more than 6 hours before operation
b between 4-6 hours before operation
c less than 4 hours before operation
d not known/not recorded

Please specify nature and volume if known.

____

____

29 Indicate measures taken to reduce gastric acidity and volume. ☐☐☐ 29

a none
b antacids
c H_2 antagonists
d metoclopramide
e nasogastric/stomach tube
f other (please specify)

____

30 Did the patient receive intravenous fluid therapy in the 12 hours before induction?

Yes = 1 No = 2 ☐ 30

If **yes**, please specify nature and volume in 12 hour pre-induction period.

a Crystalloid or dextrose
b Colloid
c Whole blood
d Red cell component
e Other components eg platelets
f Inotropes
g Vasopressors

Fluid (enter letter for each)	Total (mls) given in 12 hours before induction
☐	☐☐☐☐
☐	☐☐☐☐
☐	☐☐☐☐

31 Was anything added to the above solution(s)?

Yes = 1 No = 2 ☐ 31

If yes, please specify:

____

____

32 Were measures taken to improve the respiratory system **before** induction of anaesthesia?

Yes = 1 No = 2 ☐ 32

If **yes,** please indicate which measure(s) by entering a letter for each

a bronchodilators (nature and dose)

b chest physiotherapy

c airway management eg oral airway, tracheostomy

d other (please specify)

☐☐☐☐ 32A

____

33 Were premedicant drugs prescribed?

Yes = 1 No = 2 ☐ 33

If yes, please enter each appropriate letter in a box, and specify drugs and doses in the space below each category.

a Atropine

b Chloral hydrate

c Diazepam (eg Valium)

d Droperidol

e Fentanyl

f Glycopyrronium (Robinul)

g Hyoscine (Scopolamine)

h Lorazepam (eg Ativan)

j Ketamine

k Methohexitone

m Midazolam (Hypnovel)

n Morphine

p Papaveretum (Omnopon)

r Pethidine

s Temazepam

t Promethazine (eg Phenergan)

x Trimeprazine (Vallergan)

y Other (please specify)

☐☐☐☐☐☐☐☐☐ 33a

____

34 Did you have non-medical help?

Yes = 1 No = 2 ☐ 34

If **yes,** please specify

☐☐☐☐ 34a

- a trained anaesthetic nurse
- b trainee anaesthetic nurse
- c trained operating department assistant (ODA)
- d trainee ODA
- e operating department orderly (ODO)
- f ward nurse
- g physiological measurement technician
- h other (please specify)

____

35 Was **non-invasive** monitoring established just **before** the induction of anaesthesia?

Yes = 1 No = 2 ☐ 35

If **yes,** please indicate whether

☐☐☐ 35a

- a ECG
- b BP
- c Pulse oximetry
- d Other (please specify)

____

If **yes** to question 35, what was the blood pressure immediately prior to induction?

________/________mmhg

36 Was **invasive** monitoring established **before** induction of anaesthesia eg CVP, arterial line?

Yes = 1 No = 2 ☐ 36

If yes, please specify

____

____

37 Were any measures taken (before, during or after operation) to prevent venous thrombosis?

Yes = 1 No = 2 ☐ 37

If yes, please enter letter for each measure taken

		Before or during	**After**
a	aspirin	☐	☐
b	heparin	☐	☐
c	dextran infusion	☐	☐
d	leg stockings	☐	☐
e	calf compression/stimulation	☐	☐
f	other (please specify)	☐	☐

37a

____

38 Was it necessary to take **additional** measures to improve the patient's **cardiovascular function just before and at the induction of** anaesthesia?

Yes = 1 No = 2 ☐ 38

If yes, please specify (enter a figure 1 or 2 in **each** box):

a Crystalloid IV fluids (Ringer lactate, 0.9% saline, etc)

Yes = 1 No = 2 ☐ 38a

Please specify type and amount:

b Colloid IV fluids(Dextran, gelatin, etc)

Yes = 1 No = 2 ☐ 38b

Please specify type and amount:

c Whole blood transfusion

Yes = 1 No = 2 ☐ 38c

If yes, how many units?

____

d Blood components (Packed cells, FFP, Platelets etc)

Yes = 1 No = 2 ☐ 38d

Please specify type and volume:

e Antiarrhythmic drugs (verapamil etc)

Yes = 1 No = 2 ☐ 38e

Please specify drug and dose

f Cardiac glycoside

Yes = 1 No = 2 ☐ 38f

If yes, please specify

g Diuretics

Yes = 1 No = 2 ☐ 38g

If yes, please specify

h Vasopressors

Yes = 1 No = 2 ☐ 38h

If yes, please specify

i Inotropic drugs by infusion (Dobutamine, adrenaline etc)

Yes = 1 No = 2 ☐ 38i

If yes, please specify drug and strength, solution and dose:

j Others (please specify)

Yes = 1 No = 2 ☐ 38j

PLEASE ENCLOSE A COPY OF THE FLUID BALANCE CHART(S) WITH THIS QUESTIONNAIRE

THE ANAESTHETIC

39 Time of start of anaesthetic

☐☐☐☐ 39
(use 24 hour clock)

(enter 'x' in boxes if times not recorded)

40 Time of start of surgery

☐☐☐☐ 40
(use 24 hour clock)

41 Time of transfer out of operating room (ie to recovery, ITU etc)

☐☐☐☐ 41
(use 24 hour clock)

42 Is there an anaesthetic record for this operation in the notes?

Yes = 1 No = 2 ☐ 42

If **YES,** please send a complete copy of it with this questionnaire to the NCEPOD office. (We will delete/remove identification marks).

If **NO** please give as full an account as possible of the anaesthetic below. Please include details of anaesthetic agents, drugs, routes of administration, breathing system, and tube size.

FLUIDS DURING OPERATION

43 Did the patient receive intravenous fluids **DURING** the operation?

Yes = 1 No = 2 ☐ 43

If yes, please indicate which

Crystalloid

Fluid (indicate type by inserting appropriate letter) ☐ ☐ ☐

Total volume during operation (mls) ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ 43a

a Dextrose 5%

b Dextrose 4% saline 0.18%

c Dextrose 10%

d Saline 0.9%

e Hartmann's (Compound Sodium Lactate)

f Other (please specify)

____

43b **Colloid**

☐ ☐ ☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ 43b

a Modified gelatin (Gelofusin, Haemaccel)

b Human Albumin solution

c Starch (HES)

d Dextran

e Other (please specify)

____

43c **Blood**

☐ ☐ ☐☐☐☐ ☐☐☐☐ 43c

a Whole blood

b Red cell component

c Other component (please specify)

____

BLOOD LOSS

44 What was the assessed blood loss during operation?

☐☐☐☐☐☐ mls 44

45 Were monitoring devices used during the management of this patient?

Yes = 1 No = 2 ☐ 45

If yes, please indicate which monitors were used.

Enter a number in **each** box as follows:

Yes = 1 No = 2 Room not used = 3

		Anaesthetic Room	Operating Room
a	Pulse: manual	☐ a	☐ a
b	Pulse: meter	☐ b	☐ b
c	Indirect BP (non-invasive)	☐ c	☐ c
d	Direct arterial BP	☐ d	☐ d
e	CVP	☐ e	☐ e 45a
f	Pulmonary arterial pressure	☐ f	☐ f
g	ECG	☐ g	☐ g
h	Pulse oximetry	☐ h	☐ h
i	Oesophageal or precordial (chest wall) stethoscope	☐ i	☐ i
j	Temperature (state site)	☐ j	☐ j
k	Ventilation volume	☐ k	☐ k
l	Airway pressure	☐ l	☐ l
m	Expired CO_2 partial pressure (concentration)	☐ m	☐ m
n	O_2 analyser - fresh gas	☐ n	☐ n
p	O_2 analyser - inspired gas	☐ p	☐ p
q	Inspired anaesthetic vapour	☐ q	☐ q
r	Peripheral nerve stimulator	☐ r	☐ r
s	Ventilator alarm-disconnect	☐ s	☐ s
t	Urine output	☐ t	☐ t
v	Other (please specify)	☐ v	☐ v

____

____

46 Was there any malfunction of monitoring equipment?

Yes = 1 No = 2 ☐ 46

If yes, please specify:

____

____

47 Did anything hinder full monitoring?

Yes = 1 No = 2 ☐ 47

If yes, please specify: (eg bilateral arm surgery, radiotherapy, skin pigmentation, inaccessibility)

____

____

TYPE OF ANAESTHESIA

48 What type of anaesthetic was used?

a general alone (49 - 56)
b local infiltration alone
c regional alone (57 - 58)
d general and regional (49 - 58)
e general and local infiltration (49 - 56)
f sedation alone (59 - 60)
g sedation and local infiltration (59 - 60)
h sedation and regional (57 - 60)

☐ 48

Please now answer the questions indicated in brackets, and then continue from question 61.

GENERAL ANAESTHESIA

49 Did you take precautions **at induction** to minimise pulmonary aspiration?

Yes = 1 No = 2 ☐ 49

If yes, please indicate which

a cricoid pressure
b postural changes - head up
c postural changes - head down
d postural changes - lateral
e preoxygenation without inflation of the lungs
f aspiration of nasogastric tube
g other (please specify)

☐☐☐☐ 49a

____

50 How was the airway established during anaesthesia?

a face mask (with or without oral airway)
b laryngeal mask
c orotracheal intubation
d nasotracheal intubation
e tracheostomy
f other (please specify)

☐☐☐ 50

____

51 What was the mode of ventilation during the operation?
a spontaneous
b controlled

☐ 52

52 If the trachea was intubated, how was the position of the tube confirmed?

a tube seen passing through cords
b chest movement with inflation
c auscultation
d expired CO_2 monitoring
e oesophageal detector device
f other (please specify)

☐☐☐☐ 52

____

53 Were muscle relaxants used during the anaesthetic?

Yes = 1 No = 2 ☐ 53

If yes,

a depolarising
b non-depolarising

☐☐ 53a

54 How was general anaesthesia maintained?

a nitrous oxide
b volatile agent
c narcotic agent
d intravenous

☐☐☐☐ 54

55 Were there any problems with airway maintenance or ventilation?

Yes = 1 No = 2 ☐ 55

If yes, please specify:

____

____

56 Was the method of airway management changed during the operation?

Yes = 1 No = 2 ☐ 56

If yes, please explain:

____

____

REGIONAL ANAESTHESIA

57 If the anaesthetic included a regional technique, which method was used?

a Epidural - caudal
b lumbar
c thoracic
d Intrapleural
e Intravenous regional
f Peripheral, nerve block eg paravertebral, sciatic, intercostal
g Plexus block (eg brachial, 3-in-1 block)
h Subarachnoid (spinal)
i Surface (eg for bronchoscopy)

☐☐☐☐ 57

58 Which agent was used? Please specify drug(s) and dosage(s).

a Local
b Narcotic
c Other

☐☐ 58

____

SEDATION (as opposed to General Anaesthesia)

59 Which sedative drugs were given for this procedure (excluding premedication)?

a Inhalant
b Narcotic analgesic
c Others (please specify)

☐☐☐ 59

___

___

60 Was oxygen given?

Yes = 1 No = 2 ☐ 60

If yes, for what reason?

a Routine
b Otherwise indicated (please specify indications)

☐☐ 60a

___

___

RECOVERY FROM ANAESTHESIA

Definitions (as used by the Association of Anaesthetists of Great Britain and Ireland)

1 A recovery area is an area to which patients are admitted from an operating room, where they remain until consciousness is regained and ventilation and circulation are stable.

2 A high dependency unit (HDU or area A) is an area for patients who require more intensive observation and/or nursing care than would normally be expected on a general ward. Patients who require mechanical ventilation or invasive monitoring would not be admitted to this area.

3 An intensive care unit is an area to which patients are admitted for treatment of actual or impending organ failure who may require technological support (including mechanical ventilation of the lungs and/or invasive monitoring).

61 Which special care areas (see definitions above) are available in the hospital in which the operation took place?

a Recovery area or room
b High dependency unit
c Intensive care unit
d Other (please specify)

☐☐☐☐ 61

___

62 After leaving the operating room, did the patient go to a specific recovery area or room (i.e. option "a" in question 61)?

Yes = 1 No = 2 Not applicable (i.e. died in theatre) = 3 ☐ 62

If yes, please answer questions 63 - 67

If no, where did the patient go on leaving the operating room?

a Ward
b High dependency unit
c Intensive care unit
d Specialised ICU
e Home
f Another hospital
g Other (please specify)

☐ 62a

___

Please continue from question 68

RECOVERY AREA/ROOM

63 Were monitoring devices used during the management of this patient in the recovery room?

Yes = 1 No = 2 ☐ 63

If yes, please indicate which monitors were used

Enter a **number** in **each** box as follows:

Yes = 1 No = 2

a Pulse: manual ☐ a
b Pulse: meter ☐ b
c Indirect BP (non-invasive) ☐ c
d Direct arterial BP ☐ d
e CVP ☐ e
f Pulmonary arterial pressure ☐ f
g ECG ☐ g 63a
h Pulse oximetry ☐ h
i Temperature (state site) ☐ i
j Ventilation volume ☐ j
k Airway pressure ☐ k
l Expired CO_2 partial pressure (concentration) ☐ l
m 0_2 analyser-inspired gas ☐ m
n Peripheral nerve stimulator ☐ n
o Ventilator alarm/disconnect ☐ o
p Urine output ☐ p
q Other (please specify) ☐ q

____

64 Who decided that the patient should be discharged from the recovery room?

☐ 64

a The most senior anaesthetist
b Another anaesthetist
c Surgeon
d Nurse
e Other (please specify)

65 Time of leaving recovery area

☐☐☐☐ 65
use 24 hour clock

(enter "x" in boxes if not recorded)

66 Had this patient recovered protective reflexes before discharge from the recovery area?

Yes = 1 No = 2 Not Known = 3 ☐ 66

67 Where did this patient go next i.e. after the recovery room?

☐ 67

a Ward
b High dependency unit
c Intensive care unit
d Specialised ICU
e Home
f Another hospital
g Other (please specify)

____

CRITICAL INCIDENTS DURING ANAESTHESIA AND RECOVERY

68 Did any untoward incidents, which required specific treatment, occur?

Yes = 1 No = 2 ☐ 68

If yes, please specify nature by insertion of the appropriate letter(s) in a box.

a air embolus
b airway obstruction
c anaphylaxis
d arrhythmia
e bronchospasm
f cardiac arrest (unintended)
g convulsions
h cyanosis
j disconnection of breathing system
k hyperpyrexia (greater than 40°C or very rapid increase in temperature)
q hypoxia
r misplaced tracheal tube
s pneumothorax
t pulmonary aspiration
v pulmonary oedema
w respiratory arrest (unintended)
x total spinal
y wrong dose **or** overdose of drug
z other (please specify)

☐☐☐☐☐☐☐☐☐☐☐ 68a

Please specify location of patient, treatment and outcome.

69 Was there any mechanical failure of equipment (excluding that for monitoring)?

Yes = 1 No = 2 ☐ 69

If yes, please specify

a failure of equipment for IPPV
b failure of suction
c other (please specify)

☐☐ 69a

POSTOPERATIVE PERIOD

70 Were there early (ie up to 7 days) complications or events after this operation?

Yes = 1 No = 2 ☐ 70

Please enter a letter for each, and specify in the space below each category:

a Respiratory problems (eg pneumonia, the need for mechanical ventilation)

b Cardiac problems (eg acute LVF, intractable arrhythmias, cardiac arrest)

c Hepatic failure

d Septicaemia

e Renal failure

f Central nervous system failure (failure to recover consciousness)

h Other (please specify)

☐☐☐☐☐☐☐ 70a

71 Were narcotic analgesic drugs given in the first 48 hours after operation?

Yes = 1 No = 2 ☐ 71

If yes, please specify drug(s), dose(s), frequency and route(s):

72 Did complications occur as a result of these analgesic methods?

Yes = 1 No = 2 ☐ 72

If yes, please specify:

73 Were other sedative/hypnotic drugs given?

Yes = 1 No = 2 ☐ 73

If yes, please specify drug(s), dose(s) times and route(s):

____

____

DEATH

Day Month Year

74 Date of death ☐☐☐☐☐☐ 74

75 Time of death ☐☐☐☐ 75

use 24 hour clock

76 Place of death: ☐ 76

a Theatre
b Recovery area
c Intensive care unit
d High dependency unit
e Ward
f Home
g Another hospital
h Other (please specify)

____

77 Did organisational factors contribute to the death?

Yes = 1 No = 2 ☐ 77

If yes, please explain:

____

____

78 Do you have morbidity/mortality review meetings in your department?

Yes = 1 No = 2 ☐ 78

If yes, will this case be, or has it been, discussed at your departmental meeting?

Yes = 1 No = 2 ☐ 78a

79 Have you enclosed a copy of the anaesthetic record and fluid balance chart?

Yes = 1 No = 2 ☐ 79

TRAINEES

80 Has a consultant seen and agreed this form?

Yes = 1 No = 2 ☐ 80

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE

YOU MUST NOT KEEP A COPY OF THIS QUESTIONNAIRE

Please send it to:

NCEPOD
35-43 LINCOLN'S INN FIELDS
LONDON
WC2A 3PN

in the reply paid envelope provided

THIS FORM IS THE PROPERTY OF THE NCEPOD

If you wish to inform the NCEPOD of any other details of this case, please do so here or on a separate sheet.