THE REPORT OF THE NATIONAL CONFIDENTIAL ENQUIRY INTO PERIOPERATIVE DEATHS 1989

E. A. CAMPLING
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FOREWORD

It is my privilege as Chairman of the Steering Group to write a brief introduction to this report of the achievements to date of the National Confidential Enquiry into Perioperative Deaths.

I wish at the outset to express my admiration and gratitude to all those consultant colleagues who so willingly made the effort to ensure that this vital venture got off to a good start, thereby demonstrating to the public and government the profession's unequivocal determination to review its surgical and anaesthetic practice critically, encouraging improvements where these are clearly indicated. The fact that only 0.2% of consultants declined to participate is ample proof of the importance attached to the success of this form of professionally-led clinical audit. At the same time it must be acknowledged that such an ambitious enterprise could not have been contemplated without adequate funding and for this we are grateful.

There is much in this detailed report to reflect on, both concerning the future conduct of the Enquiry and in the management of this group of patients. There are clear conclusions as to matters which must be remedied urgently. Three such deserve to be highlighted; the present inadequacy of the NHS data systems as a basis for effective clinical audit; the unmet needs of children referred to single surgical specialty units; the care with which locum appointments are made to some posts where the special needs of children have to be met. Above all, however, it is indisputable that the care of children by surgeons and anaesthetists is of a satisfyingly high standard throughout.

What of the future? The task is indeed daunting logistically, involving a 1 in 5 sample of all reported deaths in 1990 (approximately 6000) along with a further 6000 survivor cases and up to 5000 index cases (34000 questionnaires). Nevertheless, no one can any longer be in doubt of the value of all this labour.

Such a volume of records clearly presents a problem so far as adequate, secure storage is concerned. Further staff will also be required to augment the Administrator's existing resources. The present accommodation is quite inadequate to meet those needs but with the generous assistance of the President and Council of the Royal College of Surgeons a solution is confidently expected at an early date. The excellent work of Ms Anne Campling, the Administrator, and her supporting staff has been carried out despite these and other difficulties and the Steering Group wish to record its great appreciation.

.....continued overleaf

No one should be in doubt that the success of NCEPOD to date is due, not only to the willing collaboration of all the surgeons and anaesthetists who have been involved, but to the extraordinary energy and dedication with which the Clinical Coordinators, Mr Brendan Devlin and Dr John Lunn, have carried out their task. They have travelled the length and breadth of England, Wales, and Northern Ireland making many visits over the past two years. Their mission has been to explain and reassure colleagues about the purpose and methodology of the Enquiry and this they have done with exemplary thoroughness. The mutual confidence that has been established augurs well for the future and should ensure the continued willing collaboration on which everything else depends. I share the belief that the public and profession stand to reap great benefit from all this effort and with their support improvements in the care of our patients will be instituted wherever indicated. After all, as in medical practice, accurate diagnosis without the timely application of appropriate therapy is pointless.

D Campbell
Chairman
Steering Group

June 1990

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The National Confidential Enquiry into Perioperative Deaths, which was commissioned to review standards of surgery and anaesthesia, has now completed its first year of operation and has reviewed the surgical and anaesthetic care of children in hospital.

GENERAL CONCLUSIONS

1. The overall surgical and anaesthetic care of children as revealed to this Enquiry is excellent.

2. Few children die following surgery. Those who die have multiple congenital anomalies often not compatible with life, or malignant tumours, or suffer severe multiple trauma.

3. Much surgery and anaesthesia for children is given by clinicians with a regular paediatric practice. However, this is not always so.

4. While most children's surgery and anaesthesia is undertaken by, or under the direct supervision of, consultants, on some occasions this supervision was lacking.

5. The clinical competence of some locum appointees to care for the special needs of children must be questioned.

6. The needs of children in single surgical specialty units are not always fully met. Whilst the natural dominance of surgical requirements (for neurosurgery and burns in particular) are paramount, an absence of facilities in intensive care for children and a lack of skilled paediatric anaesthetists, paediatricians and paediatric nurses were found in some units.

7. Local audit meetings to review the management of children occur in 83% of cases. This is a considerable improvement on the situation reported in the report of a Confidential Enquiry into Perioperative Deaths (1987).

8. The system established by NCEPOD for the collection of data worked well. Its success was ensured by the enthusiasm of the consultants who participated. NCEPOD has again demonstrated that consultant anaesthetists and surgeons are willing to review their performance (only 0.2% of consultants refused to participate).

9. The data systems in the NHS are inadequate. Rates of events (admissions, operations and deaths) cannot be calculated because contemporary data are not available. Thus valid comparisons between hospitals, districts or regions cannot be made promptly enough to influence clinical practice.

RECOMMENDATIONS

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

2. The information systems, particularly clinical information systems, in the NHS should be considerably improved to provide accurate and timely information for audit and clinical quality assurance. All consultants should assist in achieving this improvement.

3. Local audit meetings are essential to good clinical practice and all consultants should participate.

4. Surgeons and anaesthetists should not undertake occasional paediatric practice. The outcome of surgery and anaesthesia in children is related to the experience of the clinicians involved.

5. Consultants who take the responsibility for the care of children (particularly in District General Hospitals and in single surgical specialty hospitals) must keep up to date and competent in the management of children.

6. Consultant supervision of trainees needs to be kept under scrutiny. No trainee should undertake any anaesthetic or surgical operation on a child of any age without consultation with their consultant.

GENERAL INFORMATION

INTRODUCTION

Publication in December, 1987, of the Report of a Confidential Enquiry into Perioperative Deaths[1] (CEPOD) marked an important milestone in the quest for quality assurance in surgery and anaesthesia. CEPOD showed that, while standards of surgery and anaesthesia in the three NHS regions studied were generally good, there were worrying deficiencies in care.

CEPOD was initiated in 1982 and was a joint venture between the Association of Anaesthetists and the Association of Surgeons, supported financially by the Nuffield Provincial Hospitals Trust and the King Edward's Hospital Fund for London. The Enquiry reviewed surgical and anaesthetic practice over one year in three NHS Regions: Northern, South Western (1 November 1985 to 31 October 1986) and North East Thames (1 December 1985 to 30 November 1986).

In the three Regions, 95% of surgeons, gynaecologists and anaesthetists were found to be willing to participate in confidential review of their work.

In CEPOD, assessments of the clinical care of patients were made by a large panel of assessors chosen broadly from the different specialties. This method of peer review was cumbersome and difficult to validate, and has subsequently been criticised. Critics have alleged that the peer reviewers chosen used unrealistic standards to measure the process of clinical care and often expected unobtainable standards for the average district hospital consultant to achieve.

The first recommendation of the CEPOD Report stated

"There is a need for an assessment of clinical practice on a national basis. Our experience suggests that our colleagues would welcome this."

The publication of the CEPOD report was followed the next day by a government statement that the Department of Health and Social Security would provide funds to set up an independent Enquiry to review anaesthetic and surgical care in England;

"Although we have not yet had an opportunity to study this report, it is at once clear that it is a very valuable exercise in self-examination by doctors of their own practice and performance. In the same way as the confidential enquiries on maternal deaths have helped both the Government and the professions to reduce maternal mortality, so I hope this work will help to reduce peri-operative mortality.....I have decided at once to make available a sum of the order of £200,000 in 1988/89 to enable the work to be built on with a wider study covering all 14 health regions in England" (Tony Newton, Minister for Health, 8 December 1987)

In March 1988, the Welsh Office agreed funding for Wales, and soon afterwards, the Northern Ireland Department of Health and Social Services and the Ministry of Defence (Medical Services) were included in the Enquiry. The independent sector was encouraged to participate, and BUPA and AMI hospitals joined the Enquiry on exactly the same basis as the NHS hospitals. By the commencement of the Enquiry in January 1989, the participants also included hospitals in the Isle of Man, Guernsey and Jersey.

CORPORATE STRUCTURE

Exploratory discussions between the Associations who had initiated CEPOD and the relevant Colleges and Faculties were rapidly completed. The institutions responsible agreed that NCEPOD must be completely independent and manage its own affairs. These Associations, Colleges and Faculties gave their support and committed themselves to the Enquiry.

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
Royal College of Obstetricians and Gynaecologists
Royal College of Pathologists
Royal College of Surgeons of England
Faculty of Dental Surgery of the Royal College of Surgeons of England
Faculty of Public Health Medicine of the Royal Colleges of Physicians of the UK

The whole NCEPOD enterprise is overseen by a Steering Group nominated by the sponsoring Associations, Colleges and Faculties. The members of the Steering Group are;

Professor D Campbell CBE FFARCS FRCS — Chairman
Dean, Faculty of Medicine, University of Glasgow
(College of Anaesthetists)

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

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

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

Professor E D Alberman FFCM
Emeritus Professor of Clinical Epidemiology
(Faculty of Public Health)

Professor J P Blandy FRCS
Professor of Urology
(Royal College of Surgeons of England)

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

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

Professor A G Johnson FRCS
Professor of Surgery
(Association of Surgeons)

Dr J N Lunn FFARCS
Reader in Anaesthetics
(Association of Anaesthetists)

Professor R Owen FRCS
Emeritus Professor of Orthopaedic Surgery
(Royal College of Surgeons of England)

Professor M Rosen PCAnaes
Professor of Anaesthesia
(College of Anaesthetists)

Mr S C Simmons FRCS FRCOG
Consultant Gynaecologist
(Royal College of Obstetricians and Gynaecologists)

The Steering Group first met in December 1987. The Clinical Coordinators (Dr J N Lunn and Mr H B Devlin) for the Enquiry were appointed by the Steering Group, and arrangements were made with their employing authorities to release them for the required number of sessions. A whole-time Administrator (Ms E A Campling) was appointed after open competition for the post. Mr R W Hoile, Consultant Surgeon (Medway HA) was appointed as Assistant Clinical Coordinator (surgical). Office space for the new Enquiry was found at the Royal College of Surgeons in Lincoln's Inn Fields. The day-to-day organisation of the Enquiry is entrusted to the Clinical Coordinators and Administrator. Financial administration is carried out by the Accounts department of the Royal College of Surgeons, the budget being managed by the Administrator of the Enquiry.

The Enquiry functions as a separate entity within the College and all of its activities are independent. Most importantly, its data are confidential. Only personnel employed by the NCEPOD have access to its records and the computer data held can only be accessed by NCEPOD staff.

Clinical audit - the NCEPOD task

The National Confidential Enquiry into Perioperative Deaths is established to enquire into clinical practice and to identify remediable factors in the practice of anaesthesia and surgery. Because of criticisms of the CEPOD (1987) approach, an early decision was made to adopt a more conventional, and potentially rigid, approach for the National Enquiry, which investigates deaths occurring in hospital within 30 days of any surgical or gynaecological operation. Good practice would be identified by comparing deaths with a random sample of patients who survived a similar operation. It was intended that this process would overcome any peer assessor bias. The protocol was approved by the Steering Group, published in September 1988, and updated in December 1988 (see Appendix A).

An annual sample of all reported deaths is investigated in greater detail. The protocol states that the sampled deaths will be compared with similar patients, matched for sex, age and mode of admission who have undergone similar operations and survived (*survivor cases*). Details of these patients are sought from consultants in a Region or Authority other than that in which the death occurred. A larger sample of all surgical practice is also sought and analysed (*index cases*).

INITIATING THE ENQUIRY

Participation

The first task was to compile a database of all consultant surgeons, gynaecologists and anaesthetists. Tutors of the Colleges, and the appropriate personnel departments assisted with this task. The construction of this database and its maintenance against the continuous changes due to retirement, death and recruitment are difficult. The absence of a centralised list of consultants is only the first indication that NHS data are inadequate.

An invitation to participate in the Enquiry was sent to all consultant surgeons, gynaecologists and anaesthetists working in England, Wales, Northern Ireland, Guernsey, Jersey, the Isle of Man and for the Ministry of Defence (total number 6995). Only ten surgeons (0.2%) and four anaesthetists (0.2%) declined to participate.

From the independent sector, BUPA and AMI, with the full support of their Medical Advisory Committees, agreed that all consultant surgeons, gynaecologists and anaesthetists working in hospitals managed by them would participate in the Enquiry.

Communication

The Clinical Coordinators and Administrator attended meetings of Consultants and other staff in all NHS Regions, at the Royal Colleges and Specialist Associations, and in Guernsey, as well as with BUPA and the Ministry of Defence. Information was also provided to Regional and District General Managers and Chairmen, Regional Medical Officers and the National Association of Health Authorities. At these meetings the purpose of the Enquiry, its independence of government, of management and of other institutions was explained. The safeguards for individuals, patients and practitioners, and the absolute anonymity and confidentiality of its data were constant topics.

Local Reporting

The next task was to arrange for a local reporter to be appointed in each hospital or Authority. The role of the local reporter is to send to the Enquiry's office details of *all* patients dying in hospital within 30 days of surgery. He or she is asked to supply routine, non-confidential demographic data only. The reporter has no role in the review of the deaths reported. Tutors of the Colleges were asked to assist in finding a suitable person. The protocol stated that the local reporter *must* be a consultant, although appropriate delegation of day-to-day duties is permissible. A deputy reporter is also identified. The Royal College of Pathologists particularly encouraged its members to assist in this role, and 197 consultant pathologists were appointed as reporters (74% of the total). Other reporters were drawn from the following specialties;

Public Health Medicine	23
Surgery	21
Anaesthesia	18
Haematology	3
Microbiology	2
Accident and Emergency	1
Radiology	1

Guidance notes, reporting forms and reply-paid envelopes were supplied to each local reporter, and the reporters were asked to provide the following data from 1 January 1989, on *all* patients dying in hospital within 30 days of an operation.

District, Special or other Health Authority
Regional or other Health Authority
Patient's details -First name
Surname
Sex
Hospital number
Name of hospital
Date of operation (last before death)
Date of birth
Date of death
Name of Consultant Surgeon
Name of Anaesthetist

If a reporter is aware of a death at home, he or she reports this, marking the form clearly.

An operation is defined by the Enquiry as;

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

Day cases are included, as well as procedures performed in an outpatient department or as an investigation. Insertions of peripheral cannulae are excluded. Reporters were asked to note particularly that the procedure must have been carried out by a *surgeon or gynaecologist.* This includes all members of the surgical team, regardless of grade or experience. Reporters in doubt as to whether to report a death contact the Administrator. Deaths after obstetric operations or delivery, or after oral surgery not performed in a hospital are *not* included.

The Clinical Coordinators and Administrator suggested methods of data collection although the reporter was responsible for setting up and maintaining a system for each hospital. It was suggested that reporters seek the assistance of medical records or information officers at hospital, unit or Authority level.

The many problems of data collection faced by reporters had been identified by the initial CEPOD experience, and National CEPOD shows that these problems remain. The difficulties are further discussed in "Difficulties of data collection".

1989 Sample

The long term ambition of the National Confidential Enquiry into Perioperative Deaths is to review 6000 perioperative deaths each year (1 in 5 of an estimated 30,000 deaths occurring within 30 days of a surgical operation). 1989 was the first year to test the system on a national basis and because of the logistic and computing difficulties foreseen, it was decided that to go immediately to maximum number would be over-ambitious and probably unachievable. In the first year a smaller and more easily defined sample, namely children aged ten years and under, was chosen for full investigation. A review of the management of children in hospital under the care of surgeons is also timely in view of the increasing specialization of children's and neonatal surgery. It was estimated from the previous CEPOD experience and from OPCS data, that approximately 400 children aged 10 years and under die each year after surgical intervention. This was thought to be a reasonable sample size for year one of the Enquiry.

Specialist Groups

More detailed information on the sample was collected by means of questionnaires, and specialist clinicians were sought to devise these and to assist with the interpretation of the final data. Two specialist groups, anaesthetic and surgical, were approved by the Steering Group after advice from the appropriate Specialist Associations and Specialist Advisory Committees. The groups first met in April 1988.

Anaesthetic Group

Dr T R Abbott
Southampton General Hospital

Dr G H Bush
Royal Liverpool Children's Hospital

Dr M Harmer
University Hospital of Wales

Dr J O Morgan-Hughes
Norfolk and Norwich Hospital

Dr P Morris
Royal Manchester Children's Hospital

Dr P Tatham
City Hospital, Nottingham

Surgical Group

Mr J A Fixsen
Consultant Orthopaedic Surgeon
The Hospital for Sick Children

Mr A P Freeland
Consultant Surgeon
Department of Otolaryngology
The Radcliffe Infirmary, Oxford

Professor D I Hamilton
Professor of Cardiac Surgery, Edinburgh

Mr R W Hoile
Consultant Surgeon
Medway Hospital, Gillingham

Dr J W Keeling
Consultant Paediatric Pathologist, Edinburgh

Mr D F M Thomas
Consultant Paediatric Surgeon, Leeds

Despite the care taken to choose an appropriate and broadly representative surgical group, some specialised surgical problems have required evaluation, and additional experts have been recommended by the Society of Cardiothoracic Surgeons of Great Britain and Ireland, the British Association of Plastic Surgeons, the Society of British Neurological Surgeons and the British Paediatric Association. We are very grateful to all the Specialist Associations and Specialist Advisory Committees for their advice and nominations. In particular we must thank Professor June Lloyd, Dr R MacFaul, Mr J Monro, Mr J Colville, Mr G Neil-Dwyer, and Mr R D Illingworth. From the Royal College of Pathologists, additional assistance has been given by Dr M K Bennett, Dr P J Berry, Dr J V Clark, Dr N Kirkham, Dr M Lendon, Professor R A Risdon, Dr A Sherwood, Professor G Slavin, Dr M V Squier, Dr M S Variend and Professor J Wigglesworth.

The questionnaires

The original questionnaires designed and used in the Confidential Enquiry into Perioperative Deaths formed the template for the NCEPOD questionnaires but there are important differences. CEPOD imposed self-assessment on the clinician, and this was compared to peer assessment. CEPOD showed that some clinicians over-valued their clinical care and showed no insight into their shortcomings. The methodological difficulties of comparing self-assessment with peer assessment persuaded us to abandon this technique of data analysis for the 1989 sample.

Separate questionnaires were used for anaesthesia and surgery. The questionnaires designed for the index and survivor cases were broadly similar to those for the deaths in each discipline. Clearly, the assessment of the process and outcome of clinical care is different between anaesthesia and surgery but an important component of overall patient care is the interaction of these two disciplines and this is exlpored in each questionnaire.

Definitions proved to be a problem in the questionnaires. There are few standard clinical and administrative definitions. A simple example will illustrate the confusion. How are the different types of hospital to be identified - teaching, non-teaching, University, single surgical specialty, etc? It was decided to incorporate many of the definitions relevant to the Enquiry in to the questionnaire, so that some uniformity could be obtained. The results indicate that much further work is needed to develop robust definitions for the future.

The questionnaires for 1989 were finalised after many meetings and are reproduced as Appendices E and F.

Confidentiality

The unique numeric identification on each questionnaire was allocated in the NCEPOD office. When questionnaires were returned, the NCEPOD office staff removed all identification from enclosed operation, anaesthetic and post mortem reports and identified the questionnaires and reports only by the unique number before these were seen by the clinical coordinators. The consultant or hospital origin of computer data and questionnaires was not available to the surgical or anaesthetic groups when they reviewed the data. The whole process of data assessment and analysis was, therefore, anonymous and confidential. The NCEPOD places its highest priority on the confidentiality of its activity. This confidentiality is maintained in the interests of both the patients and of the clinical staff involved in the patients' care.

Paediatric experience

The letter of invitation to participate also requested information on the consultant's paediatric practice. Consultant surgeons and gynaecologists were asked "Do you, or your junior staff, ever operate on children aged 10 years or under?". If an affirmative answer was given to this question, figures were requested on the numbers of children operated on each year, in the age groups 3 to 10 years, 6 months to less than 3 years, and birth to less than six months. Similar information was sought from consultant anaesthetists. Although there was a 92% response rate to this request, many consultants were unable to give more than estimates of these figures. The shortfall in availability of information on a consultant's practice is illustrated by the following comments;

"I do operate on a good many children but as I am in no position to give you details of the age groups in question I am returning the form to you. You probably appreciate that secretarial support is hard to come by and in the circumstances I am afraid I am not prepared to go through the theatre register to provide the details you very reasonably request."

"Unfortunately I cannot tell you how many children I operated on at the (hospital name) during the last year as this record is not kept by the Administration. I have asked them to arrange to do so."

"I have filled in this form with the approximate number of children I anaesthetise per annum. I am awaiting a computer breakdown of the actual number of anaesthetics, but this appears for some reason to be delayed."

A short anecdote illustrates the problems of communication. On 14 November 1988, the Administrator wrote to a consultant surgeon asking for his participation. The letter was correctly addressed, other than a slight spelling error in the surname. The consultant received the letter and signed the agreement to participate, dated 22 November 1988. The reply arrived in our office on 9 May 1990, postmarked 8 May 1990. Where did communication break down?

MANAGING THE ENQUIRY - 1989

Data collection - deaths

The Administrator and office staff have maintained regular communication with reporters, including reminders to provide data. As soon as reporting forms were received in the office, the information was put in to the computer database, and a unique number allocated to the record.

After a death had been logged into the computer, distribution of both surgical and anaesthetic questionnaires for the sample deaths was via the consultant surgeon. This consultant was asked to pass the anaesthetic questionnaire on to the consultant anaesthetist with responsibility for the anaesthesia in the last operation before death, and to identify this anaesthetist by returning a completed form to the Enquiry's office.

The Steering Group recommended that "consultants ask their junior staff to complete the questionnaire from the patient's notes." (protocol, section 8). Joint review of the completed questionnaire was suggested as a training process which could be used to develop a framework of clinical practice. Recipients were asked to return the questionnaire within one month. Reminders were sent when appropriate. If the local report form identified a consultant anaesthetist, this person was contacted directly at the reminder stage. It was necessary in many cases to request the assistance of the tutor of the College of Anaesthetists in identification of the relevant consultant.

Data collection - survivor cases

The protocol stated that each death would be compared to a "survivor" and these would be matched by sex, age and mode of admission, effectively a paired case control. The survivor case would always be sought from a consultant in an Authority other than that in which the death occurred. As the first completed surgical questionnaires were received, it became apparent that matching of the cardiac cases would be almost impossible. The complexity of the congenital anomalies in neonatal cardiac surgery ensures that cases really are unique. Survivor cases for cardiac surgery were not therefore sought.

The policy was pursued for the non-cardiac cases; consultant surgeons, in an Authority other than that in which the death had occurred, were asked for matched survivors. It was soon evident that even for non-cardiac surgery this method would not succeed, and after the first 62 survivor cases were requested, the chase was halted. The complexity of the pathology encountered, particularly

the congenital anomalies, made it impossible to match cases in terms of similar operative procedure. A comment on a returned questionnaire summarises the problems;

"I would be surprised if anyone else in the UK has such a case fitting such strict criteria. No suitable case in the last 5 years."

Data collection - index cases

The index case sample is intended to give an overview of all surgery in the year under consideration. Index case questionnaires were therefore sent to all consultant surgeons who had indicated that they (or their team) operated on 40 or more children per year, and to all consultant cardiothoracic surgeons with a paediatric or mixed practice. The covering letter requested completion of the questionnaire with reference to "the first patient aged ten years or under on whom a surgical procedure was performed by yourself or a more junior member of your surgical team, on or after 8.30 am" on a specified date. The chosen date was approximately six weeks before the sending of this request, to prevent case selection by the consultant, and to allow for a 30-day postoperative period. The consultant surgeon was asked to pass a paired questionnaire on to the appropriate consultant anaesthetist.

Difficulties of data collection

Local reporters found it very difficult to obtain the basic data on perioperative deaths.

Many of the problems were highlighted in the report[2] of a project carried out in one District Health Authority to establish the most effective means of identifying and reporting deaths. The results showed that *none* of the information systems captured more than 60% of NCEPOD deaths. Use of any one of the available computer-based information systems in that District would lead to a predicted annual under-reporting of at least 120 deaths. The only accurate system was a manual screen of all the notes of dead patients by the coding clerks at one of the units, where coding took place immediately after death. With the cooperation of District staff, coding as soon as possible after death was started at the other unit, and coding clerks agreed to enter details of all deaths preferentially on to the Patient Administration System. The district's Querymaster programme was modified to provide a weekly list of deaths for the Director of Service Development and Public Health.

The following comment from the report may provide food for thought;

"The coding clerks were, without exception, interested and keen to help. This was thought to be because coding is, by and large, a thankless task with no obvious outcome for the staff involved. We were offering participation in something which should have an effect on patient care."

A short questionnaire on data collection was completed by 88% of NCEPOD local reporters between July and October 1989. The overriding problem faced by local reporters is that the *only* source of information which can provide *all* of the required data is the patient's medical notes. In order to ensure that details of all perioperative deaths are provided, it is necessary for many reporters to search the notes of *all* patients who have died in hospital. Lists of deaths generated via computerised patient administration and information systems often do not include;

i. the name(s) of the anaesthetist(s)

ii. the name of the consultant surgeon, if a patient was admitted under the care of a physician and subsequently transferred for surgical care.

iii. the identity of the clinician performing an invasive procedure

iv. details of minor surgical procedures performed under local anaesthesia or sedation, or in the outpatient or other departments, eg endoscopy

Other problems were commented on;

i. there is often no link between computer systems (eg clinical systems, the theatre system and the Patient Administration System)

ii. the slow movement of the medical notes of deceased patients through an often complicated discharge procedure means that the notes are unobtainable for diagnostic and operative coding for some months. Delays of 6 months or more could occur before entry of the codes into a computerised patient administration system. Data collated at District or Regional level are currently of limited use to local reporters who should provide the information to NCEPOD within one month of the death. The value of coded data locally and centrally is negated by these cumulative delays.

iii. time is wasted in chasing "lost" notes or searching through badly organised or illegible notes.

iv. secretarial and clerical help is inadequate and additional funded secretarial or clerical help is needed if clinical audit and quality control are ever to become a reality.

Only 4 reporters were able to obtain data solely by use of computerised data, while enquiries on availability of such data had been made by 74 (33%) reporters.

Data collection demands between 1 and 35 hours per month of a reporter's time, the average time taken being 4.4 hours per month.

Comments on these questionnaires indicated that many consultant clinicians were ignorant or uninformed about information systems available at Unit or District level. A summary of the comments and "results" of these questionnaires was distributed to all local reporters, to all members of the Steering Group and to the Department of Health (Information branch) in November 1989, with a recommendation that the design of patient information or audit systems should incorporate NCEPOD data requirements. It was also recommended that the coding of diagnoses and procedures should be given higher priority within the organisation of medical records.

Much of the success of the first year of the Enquiry is due to the hard work and enthusiasm of the local reporters despite these and other difficulties. We are extremely grateful to them for their continuing endeavours.

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Published June 1990

REVIEW OF THE DATA RECEIVED

As completed questionnaires on the deaths and index cases were received, any identification of hospital, Authority, patient or clinician was removed from copies of operation notes, anaesthetic records, post mortem reports etc. Data, identified by questionnaire number *only*, was then put in to the computer database for later analysis.

All local reporting forms (deaths) received on or before 31 March 1990 were included in the database. The cut-off date for receipt of reporting forms and questionnaires on deaths was originally set as 31 January 1990. However, many questionnaires, notably from one particular unit, had not been received by this date, and the deadline was extended to 31 March 1990. This unit has still *not* provided the completed questionnaires. Data from questionnaires and reporting forms received after 31 March 1990 have not been analysed.

All index case questionnaires received before 6 March 1990 feature in the analysis.

All the original questionnaires and forms received, and any correspondence relevant to them have now been shredded in accordance with the protocol.

Table G1 **Total number of deaths reported**

Dates of death from 1 January to 31 December 1989
Total number of deaths = 20247

Region/Authority	
Northern	1089
Yorkshire	1596
Trent	1849
East Anglian	722
North West Thames	1026
North East Thames	1436
South East Thames	1599
South West Thames	1241
Wessex	1028
Oxford	649
South Western	1278
West Midlands	1902
Mersey	845
North Western	2019
The Hospitals for Sick Children	52
The National Hospitals for Nervous Diseases	11
Moorfields Eye Hospital	-
The Bethlem Royal Hospital and The Maudsley Hospital	-
The National Heart and Chest Hospitals	76
The Royal Marsden Hospital	-
The Eastman Dental Hospital	-
Hammersmith and Queen Charlotte's SHA	8
Wales	1162
Northern Ireland	380
States of Guernsey	32
States of Jersey	26
Isle of Man	7
Defence Medical Services	94
Independent Sector	120

The number of deaths reported probably reflects the success or otherwise of the local reporters in discovering deaths rather than an accurate picture of the actual numbers of perioperative deaths occurring in each Authority.

A total of 486 inappropriate reports were received, which were not included for the following reasons;

more than 30 days	367
duplicate reports	67
1988 deaths	28
"operator" not a surgeon	16
no operation performed	8

The Royal Marsden Hospital has to date been unable to set up a local reporting system and no deaths were reported to the Enquiry. Despite stringent efforts on the part of the local reporters, Horton General Hospital (Oxford HA) and the Royal Free Hospital (Hampstead HA) were unable to provide full data to the Enquiry. The officers responsible for data protection in these hospitals refused to allow provision of the patient's name or sex. The Data Protection Act 1984 refers to living individuals *only* and it is hoped that data from these hospitals will be available for 1990. The consultant surgeons of Aylesbury Vale HA delayed participation until April 1989.

Difficulties with the overall results reported

The total number of deaths recorded (20247) is less than we anticipated. On the basis of the CEPOD report (HAA deaths 5807, reported deaths 4034) the expected number of 30-day deaths after surgery was no more than 30000. The results we report suggest overall under-reporting of approximately 30%. Yet, on previous findings we anticipated approximately 400 deaths in children aged 10 years and under. Our reported figure is congruent with this. Perhaps a combination of factors account for the discrepancies;

i. we know that some Authorities made no reports

ii. we know that there are grave deficiencies in information systems

iii. local reporters were more "aware" of the deaths of children

Table G2

Age distribution of perioperative deaths reported

Total number of deaths = 20247

	Male (total 10495)	Female (total 9752)	Total
0-10	223	194	417
11-20	108	54	162
21-30	164	82	246
31-40	152	115	267
41-50	377	290	667
51-60	991	631	1622
61-70	2713	1667	4380
71-80	3581	2912	6493
81-90	1961	3136	5097
91+	225	671	896

This age distribution is consistent with known mortality patterns. More elderly people die after surgery than do young people. On the basis of the CEPOD report and other data, we anticipated 400 deaths of children aged 10 years and under. The total reported 417 is congruent with this. There is also some selective reporting, as local reporters were aware that we were sampling children's surgery and probably made special efforts to ensure that our sample data were complete.

Table G3 **Days from operation to death**

	n=20247
0	2293
1	2475
2	1590
3	1294
4	1041
5	934
6	848
7	821
8	797
9	713
10	654
11	567
12	592
13	526
14	481
15	448
16 to 20	1860
21 to 25	1307
26 to 30	1006

Table G4 **Deaths of children aged 10 years and under**

Total number of deaths = 417 (non-cardiac 151, cardiac 266)

Region/Authority	
Northern	19
Yorkshire	42
Trent	32
East Anglian	4
North West Thames	27
North East Thames	5
South East Thames	14
South West Thames	9
Wessex	20
Oxford	10
South Western	38
West Midlands	47
Mersey	44
North Western	14
The Hospitals for Sick Children	49
The National Hospitals for Nervous Diseases	-
Moorfields Eye Hospital	-
The Bethlem Royal Hospital and The Maudsley Hospital	-
The National Heart and Chest Hospitals	8
The Royal Marsden Hospital	-
The Eastman Dental Hospital	-
Hammersmith and Queen Charlotte's SHA	1
Wales	5
Northern Ireland	6
States of Guernsey	-
States of Jersey	-
Isle of Man	-
Defence Medical Services	-
Independent Sector	23

This table must *not* be read in isolation. It is natural that referral centres for complex children's surgery from all over the world report more deaths than places where little or no children's surgery is undertaken.

Table G5 **Completed questionnaires (deaths) received**

	Non-cardiac *n*=141*	Cardiac *n*=262*
Anaesthetic	90	172
Surgical	102	193

*A total of 14 reports (9 non-cardiac, 5 cardiac) were received too late to sent questionnaires for completion.

Ten surgical, and 12 anaesthetic questionnaires were received after 31 March 1990 and are therefore not included in the analysis.

Table G6 **Questionnaires returned - non-cardiac (by region)**

	Number sent	Numbers Returned	
		Surgical	Anaesthetic
Region/Authority			
Northern	7	7	6
Yorkshire	14	8	10
Trent	15	9	8
East Anglian	4	3	3
North West Thames	1	1	1
North East Thames	5	1	1
South East Thames	6	6	6
South West Thames	5	5	4
Wessex	5	5	5
Oxford	10	9	6
South Western	14	4	4
West Midlands	16	14	11
Mersey	7	4	4
North Western	12	8	4
The Hospitals for Sick Children	9	8	6
The National Heart and Chest Hospitals	1	-	1
Hammersmith and Queen Charlotte's Special Health Authority	1	1	1
Wales	5	5	5
Northern Ireland	5	4	4
Independent Sector	-	-	-
TOTALS	142**	102	90

**nine reports were received too late to send questionnaires.

Table G7 **Questionnaires returned - cardiac (by region)**

	Number sent	Numbers Returned	
		Surgical	Anaesthetic
Region/Authority			
Northern	12	10	4
Yorkshire	27	22	19
Trent	13	11	10
East Anglian	-	-	-
North West Thames	26	1*	11
North East Thames	-	-	-
South East Thames	8	7	5
South West Thames	-	-	-
Wessex	13	8	8
Oxford	-	-	-
South Western	24	3	3
West Midlands	31	27	26
Mersey	37	37	25
North Western	2	2	2
The Hospitals for Sick Children	38	38	37
The National Heart and Chest Hospitals	6	6	6
Hammersmith and Queen Charlotte's Special Health Authority	-	-	-
Wales	-	-	-
Northern Ireland	1	1	1
Independent Sector	23	20	15
TOTALS	261**	193	172

* returned by Consultant Paediatric Cardiologist

**five reports were received too late to send questionnaires

Table G8 **Questionnaires returned**

	n=403*
Anaesthetic only	23
Surgical only	56
Both received	239
Neither received	85

*number of questionniares sent

Three of the cases where *neither* questionnaire was received are from the same unit. The consultants informed us that the patients' medical notes were "missing". The unit general manager has not yet replied to the Administrator's request for assistance. A consultant anaesthetist in another unit was also unable to trace the notes.

Table G10 **Completed questionnaires returned - index cases**

Anaesthetic	1367
Surgical	1502

A total of 2030 index cases were requested. Questionnaires were returned by 94 consultant surgeons stating that they had not operated on children in this age group since the stipulated date. The return rate of surgical questionnaires is therefore 79%. Twenty of the index cases were procedures performed without anaesthesia. The return rate of anaesthetic questionnaires is therefore 72%. Fourteen surgical and seventeen anaesthetic questionnaires were received after 6 March 1990 and are therefore not included in the analysis.

We are particularly grateful to the 70 consultant anaesthetists who completed more than one questionnaire;

Two questionnaires returned	65
Three questionnaires returned	4
Four questionnaires returned	1

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We are indebted to the tutors and contacts of the Colleges, Associations and Faculties who assisted with the setting up and running of the Enquiry. We are grateful to Regional and District Chairmen, General Managers and Medical Officers who have given their full support. A particular "thank you" is extended to all of the records officers, coding clerks, secretaries and other administrative staff who have made the local reporters' task possible.

The secretarial and clerical staff in the NCEPOD office (listed below) have provided excellent support to the Clinical Coordinators and Administrator.

Lin Denne (from June 1988)
Julie Allan (from November 1988)
Sharon McGarrity (from November 1989)

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SURGERY

WHO OPERATES ON CHILDREN?

The letter of invitation to participate also requested information on the consultant's paediatric practice. Consultants were asked "Do you, or your junior staff, ever operate on children aged 10 years or under?". The question did not differentiate between major and minor operations. If an affirmative answer was given to this question, figures were requested on the numbers of children operated on each year, in the age groups three to ten years, six months to less than three years and birth to less than six months.

The replies indicate that the majority of surgeons in all regions operate on some children. The answers were usually generous overestimates but there are no readily accessible contemporary data against which to check the figures.

Table S1 **Consultant Surgeons by Authority**

Do you or your junior staff ever operate on children aged 10 years or under?

	Yes	No	Not answered
Northern	257	33	8
Yorkshire	261	32	13
Trent	289	60	13
East Anglian	153	7	3
North West Thames	217	34	11
North East Thames	292	33	18
South East Thames	277	48	11
South West Thames	203	17	10
Wessex	194	22	8
Oxford	172	11	10
South Western	225	22	9
West Midlands	388	60	27
Mersey	152	64	6
North Western	303	46	15
Special Health Authorities	65	17	4
Wales	219	22	7
Northern Ireland	96	30	4
States of Guernsey	8	2	-
States of Jersey	7	1	-
Isle of Man	7	1	-
Defence Medical Services	91	22	1

Tables S2 to S12 Consultant Surgeons by specialty

Table S2

General			*n*=1053
Operate on children			
Yes			879
No			127
Not answered			47
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	-	76	195
<10	96	181	342
10-19	104	210	177
20-50	382	304	93
>50	237	45	9
no figures supplied	60	63	63

127 (12%) of general surgeons never operate on children. A further 195 (19%) do not operate on children aged under six months, 31% of general surgeons therefore do not operate on the smallest children. However 342 (32%) of general surgeons operate on babies less than six months old and undertake fewer than 10 operations on this age group in any one year.

It is difficult to draw any conclusions from these data except to observe that many general surgeons undertake occasional surgery on children. This is understandable with the older children, six months to 10 years, who present with common surgical emergencies, appendicitis and trauma to surgeons in District General Hospitals. Some rethink of the provision of 'general surgical' services to children is perhaps needed so that the surgeons who are doing the work are achieving adequate volumes and experience to maintain their expertise.

Table S3

Accident and Emergency			*n*=139
Operate on children			
Yes			110
No			24
Not answered			5
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	2	10	49
<10	5	22	25
10-19	12	24	3
20-50	36	12	7
>50	37	23	5
no figures supplied	18	19	21

These data are difficult to interpret. Clearly most Accident and Emergency consultants will have to deal with, or at least initiate resuscitation of children in the emergency situation.

Table S4

Obstetrics and Gynaecology			*n*=890
Operate on children			
Yes			637
No			228
Not answered			25
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	21	299	511
<10	571	317	91
10-19	18	-	7
20-50	5	-	3
>50	-	-	-
no figures supplied	22	21	25

The majority of gynaecologists do not operate on small children. The amount of children's surgery undertaken by gynaecologists is insignificant.

Table S5

Neurosurgery			*n*=96
Operate on children			
Yes			90
No			-
Not answered			6
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	-	8	19
<10	34	43	40
10-19	30	22	16
20-50	20	12	10
>50	2	1	1
no figures supplied	4	4	4

All neurosurgeons report having to operate on children. This is understandable, head injuries are frequent in childhood.

Table S6

Plastic Surgery			*n*=102
Operate on children			
Yes			97
No			1
Not answered			4
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	-	1	7
<10	1	7	24
10-19	7	14	28
20-50	33	53	25
>50	49	15	6
no figures supplied	7	7	7

Most plastic surgeons operate on children, though for some of these surgeons operating on children is very infrequent.

Table S7

Urology			*n*=260
Operate on children			
Yes			220
No			31
Not answered			9
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	-	22	94
<10	34	76	80
10-19	43	45	18
20-50	74	51	10
>50	54	11	2
no figures supplied	15	15	16

125 (48%) of urologists do not operate on children aged under six months.

Table S8

Orthopaedic			*n*=791
Operate on children			
Yes			711
No			49
Not answered			31
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	2	60	245
<10	143	304	309
10-19	153	161	69
20-50	277	116	35
>50	87	20	4
no figures supplied	49	50	49

49 (7%) of orthopaedic surgeons do not operate on children at all, a further 245 (31%) do not operate on children under six months old. There is evidence here of subspecialisation in childhood orthopaedic surgery, but again the requirement to manage trauma in district hospials means most orthopaedic surgeons need to operate on the occasional child.

Table S9

Cardiac/Cardiothoracic			*n*=117
Operate on children			
Yes			83
No			28
Not answered			6
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	4	20	35
<10	44	33	24
10-19	11	5	2
20-50	15	15	12
>50	5	6	6
no figures supplied	4	4	4

Table S10

Oral/Maxillofacial			*n*=323
Operate on children			
Yes			232
No			81
Not answered			10
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	-	39	117
<10	31	94	84
10-19	27	43	8
20-50	98	29	3
>50	57	8	1
no figures supplied	19	19	19

Table S11

Ophthalmology			*n*=427
Operate on children			
Yes			401
No			10
Not answered			16
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	1	22	102
<10	27	83	210
10-19	69	121	47
20-50	214	134	21
>50	76	25	2
no figures supplied	14	16	19

Most ophthalmologists operate on children.

Table S12

Otorhinolaryngology			*n*=394
Operate on children			
Yes			370
No			4
Not answered			20
	>3 years-10 years	6 months to 3 years	<6 months
If yes, number per annum			
Nil	2	6	107
<10	2	27	147
10-19	1	32	54
20-50	10	168	22
>50	326	107	9
no figures supplied	29	30	31

Otorhinolaryngological surgeons clearly operate on a substantial number of children in each age group.

SURGICAL DATA ANALYSIS

In the first section of this Report the logistics, both external and internal to NCEPOD, of collecting the replies from consultant surgeons, are described. All the replies were scrutinized for completeness and the data filed on computer. As the data accumulated they were reviewed by the surgical group. This section of the report deals with the replies received and offers a commentary on these data.

Overall, the replies from consultant surgeons are set out in the same sequence as the questions in the surgical questionnaire, which attempted a logic consistent with clinical practice. However, because neonatal cardiac surgery is so specialized and has a particular regionalized organisation, some of the responses from cardiac surgeons are considered in a separate section. Likewise, the review of the post mortem records is handled in a distinct section.

Table S13 (q1) **Specialty of operating surgeon**

	Deaths	Index
Cardiac	*n*=193	*n*=29
Paediatric	140	8
Mixed practice	53	21
Non-cardiac	*n*=102	*n*=1473
Paediatric	48	33
General with special interest in paediatric surgery	7	25
Paediatric urology	2	1
General	3	285
General with special interest in - urology	3	65
- vascular surgery	1	88
- other	3	59
Accident & Emergency	1	42
Craniofacial (team)	-	3
Dental/Oral/Maxillofacial	2	73
Gynaecology	-	-
Neurosurgery	17	13
Ophthalmology	-	184
Orthopaedic	2	196
Otorhinolaryngology	1	276
Plastic	4	63
Thoracic	4	13
Transplantation	4	2
Urology	-	52

Review of the specialty of the operating surgeons reveals few surprises.

Firstly, the index cases. Index case questionnaires were only sought from surgeons doing a substantial amount of children's surgery. As expected, there is a heavy workload of children's surgery, particularly for some general and otorhinolaryngological surgeons. Our finding that out of almost 5000 consultant surgeons only 1960 were operating on more than 40 children aged ten years and under per year suggests that a degree of specialization in this branch of surgery already exists.

Of some concern, however, is the finding that some deaths were reported by surgeons who were not paediatric specialists and who had indicated to us in our original request for information that they undertook very little children's surgery. The prudence of the occasional surgeon undertaking complex childhood surgery must be questioned. Two examples will illustrate this problem.

A premature baby developed a strangulated hernia whilst being managed on a special care baby unit in a District General Hospital. Following a delay in referral the paediatricians persuaded a general surgeon with an interest in urology to operate. The surgeon was clearly inexperienced in this sort of situation and chose the wrong incision. There was an abdominal dehiscence, the child deteriorated and died. Transfer to a specialized paediatric surgical unit might have avoided this.

A two-months-old post premature baby presented with a strangulated inguinal hernia in a District General Hospital. He was operated on by a general surgeon under pressure from the local paediatricians. The anaesthetist had no formal training in neonatal anaesthesia. The patient died on the operating table due to ruptured pulmonary bulla.

In the entire sample, there are five deaths of children presenting with strangulated hernia, one premature, one 16 days old, one two months old, one three months old and one six months old. Small babies, particularly post premature babies, with strangulated hernias present difficult problems with fluid management and anaesthesia. They often have other conditions such as dysplastic lungs, and the average general surgeon is unfamiliar with their management. They should be referred to an appropriate surgeon and anaesthetist.

Table S14 (q3) **Age of patient (deaths)**

	Non-cardiac	Cardiac
up to 1 month	36	60
>1 month to 6 months	15	39
>6 months to 1 year	3	18
>1 year to 3 years	23	32
>3 years to 10 years	25	44

The causes of death in the youngest age group were multiple congenital anomalies. Tumours and trauma feature in the older children.

Table S15 **Cause of death (Non-cardiac)**

Age	Congenital	Neoplastic	Trauma	Other	Total
Up to 1 month	33	1	-	2	36
1 month to 6 months	5	3	1	6	15
6 months to 1 year	-	-	-	3	3
1 year to 3 years	1	4	6	12	23
3 years to 10 years	-	3	12	10	25

Table S16 (q5) **Sex of patient**

	Deaths		Index		Total	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Male	62	102	1021	18	1083	120
Female	40	91	452	11	492	102

The sex ratio shows that males require more surgery than females in childhood. There are also more deaths reported in males than females. This confirms earlier observations[1].

Table S17 (q8) **Ethnic group**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Europid	86 (84%)	162 (84%)	1368 (93%)	26 (90%)
African	3 (3%)	1	26 (2%)	2
Oriental	11 (11%)	21 (11%)	46 (3%)	-
Other	1	-	29 (2%)	-
Not answered	1	9 (5%)	4	1
Total	102(100%)	193 (100%)	1473 (100%)	29 (100%)

This table shows no surprises in view of the racial mix in the UK. The only comment might be about the number of children of "oriental" origin. This includes those from the Indian subcontinent dying after cardiac surgery. There is *no* excess morbidity among Indian/Oriental ethnic group children when those transferred from abroad are excluded. "Oriental" children domiciled in the UK do not have a higher death rate than other UK children.

Emergency and non-emergency admission

Table S18 (q9) **Mode of admission**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Elective	16	98	1176	19
Urgent	9	33	67	5
Emergency	76	62	221	4
Not answered	1	-	9	1

As expected, emergency admissions, 75% of non-cardiac surgery and 32% of cardiac surgery, constitute a significant workload in the surgery of childhood.

Table S19 **Day of emergency admissions**

	Deaths	Index
	n=138	*n*=225
Monday	22	40
Tuesday	28	35
Wednesday	20	34
Thursday	21	29
Friday	15	35
Saturday	18	25
Sunday	14	27

Transfer of children for surgery

Table S20 (q11) **Patients transferred from other hospitals**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Yes	63	97	67	7
No	39	96	1406	22
If yes, from;				
non-NHS authority	2	2	-	-
same district	19	17	22	1
same region	29	29	24	3
outside region	12	40	16	3
overseas	-	7	-	-
not answered	1	2	5	-

Table S21 (q13) **Deterioration during transfer**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Yes	10	7	-	-
No	50	88	57	7
Not answered	3	2	10	-

Table S22 (q14) **Transfer to another hospital considered**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Yes	2	-	6	-
No	96	174	887	23
Not answered	4	19	580	6

It is frequently necessary to transfer patients to specialist units. This applies to low birthweight babies with congenital anomalies, children needing neurosurgical intervention and children with multiple trauma and burns. Of the index cases 67 (out of 1473) non-cardiac cases were transferred and seven (out of 29) cardiac cases were transferred. None of these patients deteriorated during transfer.

When we look at the deaths reported, there were 63 transferred out of 102 non-cardiac cases and 97 out of 193 cardiac cases transferred.

Deterioration during transfer was recorded in seven cardiac cases, in spite of precautions to manage these patients correctly during their transfer. In view of their clinical condition (multiple congenital cardiac anomalies) it is not surprising they deteriorated. It must be stressed that without transfer to specialist neonatal cardiac centres they would *not* have survived.

Of the non-cardiac transfers who deteriorated during transfer and died, four (out of 10) were desperately ill neonates with congenital defects whose deterioration during transfer could be predicted but who again had no chance without transfer. Another was a child deteriorating with a brain tumour, where transfer was essential and did not contribute to the adverse outcome. Two patients were transferred to burns units, one with severe burns and inhalation pneumonitis, another with non-accidental injury. Again, some deterioration during initial transportation was inevitable. However, other factors (discussed elsewhere) contributed to the adverse outcome in these cases. Two patients transferred with multiple trauma are worthy of special comment (see page 79).

Hospital facilities for children

Table S23 (q16) **Ward to which first admitted (non-cardiac deaths)**

Paediatric medical	14
Paediatric surgical	16
Paediatric mixed medical/surgical	8
Paediatric ICU/HDU	15
Neonatal ICU/SCBU	25
Adult surgical[1]	2
Adult ICU/HDU[2]	9
Other[3]	11
Not answered[4]	2

Notes

1. The two patients admitted to adult surgical wards were both children requiring liver transplants, children aged 2 years 6 months, and 3 years 3 months. These were in designated liver transplant units.

2. Eight children in neurosurgical units, seven with head injuries and one with brain tumour; one child with a liver transplant.

3. Three small children with burns in burns units, aged 2 years 9 months, 2.5 months and 1 year 1 month. Two liver transplants in a designated unit. Three children with multiple injuries from accidents in Accident and Emergency departments with immediate transfer to operating rooms/ICU. One child with a brain abscess in a neurosurgical unit. One child who was moribund on admission, ASA 5, with a strangulated inguinal hernia was admitted to the ICU in a District General Hospital. One child was initially admitted to a designated paediatric day unit.

Table S24 (q18) **Specialty of consultant under whom child first admitted**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Consultant Paediatric Physician	29	7	64	5
Consultant Paediatric Cardiologist	2	153	2	10
Consultant Surgeon	67	31	1329	12
Other	4	1	20	1
Not answered	-	1	58	1

Table S25 (q19) **Was care undertaken on a formal shared basis between surgeon and paediatrician?**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Yes	56	168	187	16
No	45	21	1215	11
Not answered	1	4	71	2

This attempted to answer the question "how much paediatric oversight is there of children in (surgical) hospitals?" Clearly, the question cannot be answered definitely or affirmatively for all surgical situations. On the one hand these replies, and others, show that the twin specialties of paediatric cardiology and paediatric cardiac surgery have established good teamwork and no concern need be felt in this area. However at the other end of the spectrum, children in special surgical units, neurosurgical and plastic, seem sometimes to be denied the care of paediatricians and specialized paediatric nurses. The index questionnaires report that overall only 13% of patients are managed in a formal shared way between surgeons and paediatricians.

In 45 non-cardiac deaths reported to us there was no paediatric medical input into perioperative care. While this may be acceptable in specialist paediatric surgical units where the senior and junior staff will be familiar with intravenous regimes and drug dosages for children, it must raise anxieties regarding the care of children in neurosurgical, plastic, surgical and other specialist units. This is further discussed in the anaesthetic section. While some regional units, and units in multi-sited district hospitals will find it difficult to provide shared care in a structured manner,

manner, and this may be considered unnecessary for children undergoing operations of an intermediate nature, such as herniotomy, problems can arise even in elective surgery. It appears highly desirable that children should be managed in an environment where medical and nursing expertise are available to supplement the surgery and anaesthesia.

It also seems that general surgeons are occasionally pressurized by enthusiastic neonatologists to operate on cases outside their usual experience.

The diagnosis and how it was made

Table S26 (q20) **Who made the working diagnosis?**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Medical				
Paediatric Medical House Physician	1	-	6	-
Paediatric Medical SHO	4	3	37	-
Paediatric Medical Registrar	11	1	14	1
Paediatric Medical Senior Registrar	7	15	1	-
Paediatric Medical Consultant	34	143	67	18
Associate Specialist	-	-	5	-
"Casualty Staff"	1	-	-	-
Consultant radiologist (antenatally)	1	-	-	-
Other	-	28	115	10
Surgical				
House Officer	-	-	16	-
Senior House Officer	2	-	163	1
Registrar	23	2	194	1
Senior Registrar	11	6	67	-
Consultant	46	154	884	18
Associate Specialist	-	-	17	-
Clinical Assistant	1	-	-	-
Other	-	-	56	-

Table S27 (q21) **Who made the final decision to operate?**

	Deaths		Index	
Grade of surgeon	Non-cardiac	Cardiac	Non-cardiac	Cardiac
House Officer	-	-	1	-
Senior House Officer	-	-	90	-
Registrar	3	-	164	-
Senior Registrar	9	1	68	1
Consultant	87	192	1090	28
Associate Specialist	-	-	19	-
Other	-	-	20	-
Not answered	3	-	21	-

It is clearly satisfactory to find that in most cases the decision to operate was taken by a consultant. In the non-cardiac death sample the final decision to operate was made by a registrar in three instances, in one case the consultant was consulted and gave the go-ahead to insert a pressure monitor in a child with severe head injury. In a second case of multiple trauma, the man on the spot, a registrar, quite correctly made the decision to start treatment while additional help was sent for. One death was reported where a registrar operated unsupervised, and without contacting a consultant, on a premature baby with a strangulated hernia.

Table S28 (q23) **Day of operation**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Monday	10	47	275	8
Tuesday	22	36	313	10
Wednesday	15	40	306	5
Thursday	15	32	264	5
Friday	22	22	261	-
Saturday	10	10	32	1
Sunday	8	6	22	-

Table S29 (q24) **Grade of most senior operating surgeon**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
House Officer	-	-	5	-
Senior House Officer	2	-	175	-
Registrar	12	-	347	1
Senior Registrar	16	2	120	2
Consultant	71	191	757	26
Associate Specialist	-	-	24	-
Clinical Assistant	1	-	-	-
Other	-	-	31	-
Not answered	-	-	14	-

It is encouraging to see the high degree of consultant commitment to these operations. In the 31 non-cardiac cases when a consultant did not operate, the consultant was consulted beforehand in 29 cases, a senior registrar consulted (or operated) in two. One case, previously alluded to, was operated on by a registrar with no consultant notification or involvement.

Table S30 (q26) **Locums (most senior operating surgeon)**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Senior House Officer	-	-	5	-
Registrar	1	-	30	-
Senior Registrar	3	-	17	-
Consultant	2	1	18	-
Associate Specialist	-	-	4	-
Clinical Assistant	1*	-	-	-
Other	-	-	5	-

*All members of the operating team were locums in this case.

Table S31 (q27) **Grade of most senior surgeon consulted before operation**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
House Officer	-	-	5*	-
Senior House Officer	-	-	56*	-
Registrar	1**	-	143*	-
Senior Registrar	3	-	73	1
Consultant	98	193	1142	28
Associate Specialist	-	-	14	-
Other	-	-	16	-
Not answered	-	-	24	-

*Although these results show considerable consultant involvement, some notice should be made of the fact that in the non-cardiac index sample 204 (14%) of surgical operations were undertaken without consultants being consulted preoperatively.

**The one case in the non-cardiac deaths where a registrar operated without informing a consultant must be deplored. The child was a premature baby with a strangulated inguinal hernia.

Table S32 (q28) **Was there any pressure to operate?**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Yes	28	61	103	7
No	70	130	1358	22
Not answered	4	2	12	-
If yes, from whom?				
Consultant Paediatrician	12	8	16	3
Consultant Cardiologist	1	46	2	4
Consultant Cardiothoracic Surgeon	1	16	3	-
Consultant Surgeon	4	-	28	-
Consultant - other	2	2	6	1
Relatives	4	21	52	2
Organisational considerations	4	16	7	1
Other	6	13	24	-

(multiple answers included)

Surgeons reported that there was pressure to operate in 28 of the non-cardiac cases who died, and in 103 of the non-cardiac index sample. In 28 instances the surgeons say the pressure came from paediatricians.

One example is that of a 28-week premature baby in a District General Hospital who was referred to a general surgeon because of suspected abdominal sepsis. A laparotomy was performed at which no conclusions were reached. The child subsequently died. A diagnosis of necrotizing enterocolitis seems appropriate. A post mortem was done but no PM report was sent to NCEPOD. In retrospect it would be more appropriate for this child to have been referred to a specialised unit for further investigation and treatment by a neonatal surgeon with appropriate experience.

Paediatricians and general surgeons must recognise that small babies differ from other patients not only in size and that they pose quite separate problems of pathology and management. Transfer to regional paediatric surgical units can save lives.

Table S33 (qs29-32) **History/examination before operation (non-cardiac deaths)**

	History	Examination
Paediatric Medical Staff (most senior)		
House Physician	-	1
Senior House Physician	4	5
Registrar	11	10
Senior Registrar	11	12
Consultant	46	46
Associate Specialist	1	-
None	25	26
Not answered	4	2
Surgical staff (most senior)		
House Officer	1**	-
Senior House Officer	3*	1**
Registrar	12	10
Senior Registrar	15	15
Consultant	69	72
Associate Specialist	-	-
Clinical Assistant	1	1
None	-	2
Not answered	1	1

* These three cases are of some interest. They were children admitted under the care of dental surgeons for dental treatment prior to cardiac surgery. The Senior House Officer clerked the patient, the decisions regarding dental and cardiac surgery had been made by appropriate consultants.

** Again, this is an anomaly of the questionnaire design. A child with multiple problems, kyphoscoliosis, bronchiectasis, bronchopneumonia, cerebral palsy and bilateral otitis media was admitted for a mastoid operation under the care of a consultant otorhinolaryngologist who operated himself, the preoperative clerking having been done by a house surgeon. The case was properly handled.

*** This case was a premature baby with necrotizing enterocolitis operated on by a consultant paediatric surgeon. The case was correctly managed and this report is again an anomaly of the questionnaire.

Table S34 (q34) **Identified medical diagnoses at time of surgery**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Respiratory	44	26	140	3
Cardiac	19	193	29	29
Neurological	33	10	50	1
Endocrine	5	2	6	-
Alimentary	43	11	78	1
Renal	15	7	26	-
Musculoskeletal	15	4	185	2
Haematological	12	1	9	3
Prematurity	22	7	16	-
Other	21	12	307	4

Preoperative medication and management resulting in adverse outcome

Question 37 asked "was the patient's medication relevant to the outcome?" Thirteen positive replies were received to this question. Five of these replies, taken with other information in the questionnaires, are worth further comment.

Case A. A nine-year-old female child was admitted as an emergency to a District General Hospital under the care of a locum consultant surgeon who was away on leave. The child had congenital agammaglobulinaemia and bronchiectasis, and had suffered recurrent infections since birth. A diagnosis of appendicitis was made by a locum clinical assistant surgeon and, after consultation with a consultant paediatrician, laparotomy was undertaken by the locum clinical assistant. A locum consultant anaesthetist was responsible for the management of this very sick ASA 4 child. At operation an ileocolic intussusception was found with gangrenous caecum. At this stage the child's condition was deteriorating, so nothing further was done and the abdomen was closed. The child was transferred to an ICU where she died.

Case B. Sometimes, despite every therapeutic endeavour with the best available care, death results. An example is a nine-year-old child who had threadworms and was treated. He then developed acute infective gastroenteritis and was admitted to an infectious disease hospital. Despite intensive therapy he failed to improve and his severe abdominal pain led to a reassessment of the diagnosis. At this stage he was hypotensive and anaemic. Sigmoidoscopy was performed and features of ulcerative colitis found. Rectal biopsy showed pseudomembranous enterocolitis. His overall clinical picture however was more of haemolytic uraemic syndrome. Despite metabolic support, dialysis, vigorous antibiotic and steroid therapy he continued to deteriorate. He was put on a ventilator. Nonetheless he deteriorated further, developed tamponade, had two pericardial aspirations and then a thoracotomy when clots were removed from the pericardial sac. He died. This whole cycle took place over nine days. There was shared care between a consultant paediatrician and a consultant paediatric surgeon. This clinical vignette is included to demonstrate that despite all modern care some children do die.

Table S35 **ASA Grade/Operation Classification**

(Deaths)

	ASA grade									
	1		2		3		4		5	
	NC	C	NC	C	NC	C	NC	C	NC	C
Classification										
Emergency	1	-	1	2	4	2	14	11	19	12
Urgent	2	1	4	3	7	10	23	35	8	7
Scheduled	1	3	3	10	3	32	7	35	-	-
Elective	-	1	1	4	2	5	1	13	-	-

NC = Non-cardiac

C = Cardiac

ASA Grade not given in one non-cardiac case and 7 cardiac cases.

This is a complex matrix to interpret. The ASA Grade (printed in appendix F) expresses the physical condition of the patient and allows an estimate of the likely outcome of operation to be made. Patients in ASA Grades 1 and 2 should survive surgery, patients in ASA 5 have a very small chance of survival. This is confirmed by these data. There is concern that some children in ASA 1 and 2 died. These cases are reviewed elsewhere in this report.

Table S36 (q39) **Who supervised the preoperative preparation on the ward?**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Paediatric Medical				
House Physician	-	-	19	-
Senior House Physician	6	23	137	9
Registrar	21	6	11	1
Senior Registrar	9	31	3	2
Consultant	19	115	17	11
Associate Specialist	-	-	3	-
Other	-	3	18	-
None	43	12	940	6
Not answered	4	3	325	-
Surgical				
House Officer	3	-	-	-
Senior House Officer	12	-	578	3
Registrar	21	16	179	3
Senior Registrar	14	49	48	3
Consultant	42	115	149	15
Associate Specialist	-	-	10	-
Other	1	-	37	-
None	8	3	122	5
Not answered	1	10	350	-
Anaesthetic				
Senior House Officer	1	-	197	-
Registrar	9	38	233	3
Senior Registrar	28	25	83	3
Consultant	54	109	619	22
Associate Specialist	2	3	56	-
Other	-	-	56	-
None	3	-	148	1
Not answered	5	18	81	-

(multiple answers included)

Table S37 (q40)**Precautions/Therapeutic manoeuvres undertaken preoperatively**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Pulse rate recording	101	185	1352	29
Blood pressure recording	92	186	803	28
Central venous pressure measurement	27	125	7	16
Gastric aspiration	70	128	43	8
Intravenous fluids	92	137	149	19
Correction of hypovolaemia	72	83	46	5
Blood transfusion	28	25	12	2
Antibiotics	69	161	143	23
Oxygen therapy	66	157	119	17
Airway protection	37	22	33	1
Tracheal intubation	67	139	15	19
Mechanical ventilation	62	121	128	18
Stabilisation of fractures	5	1	64	-
Nutritional support	30	42	19	1
Vitamin K	27	15	14	2
Others	21	20	116	4

A similar question was asked of anaesthetists, page 127. From this anaesthetic response we know that urinalysis was only performed in 10% of the index cases. Should urinalysis for sugar and protein be routine?

Table S38 (q41) **Supervision of preoperative precautions**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Paediatric medical				
House Physician	-	-	15	1
Senior House Physician	5	18	92	6
Registrar	20	7	12	1
Senior Registrar	10	30	6	2
Consultant	16	76	19	6
Associate Specialist	-	-	2	-
Other	-	2	33	-
None	44	54	946	13
Not answered	7	6	272	-
Surgical				
House Officer	4	1	270	1
Senior House Officer	7	6	360	3
Registrar	21	12	102	1
Senior Registrar	14	32	22	3
Consultant	42	104	102	16
Associate Specialist	-	-	7	-
Clinical Assistant	1	-	-	-
Other	-	-	39	-
None	9	34	432	5
Not answered	4	4	63	-
Anaesthetic				
Senior House Officer	1	-	149	-
Registrar	8	24	188	1
Senior Registrar	25	9	84	3
Consultant	56	119	599	21
Associate Specialist	2	11	49	1
Other	-	-	51	-
None	5	26	214	2
Not answered	5	4	63	1

Table S39 **The operation classification/Day of operation (Deaths)**

	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
	NC	C	NC	C	NC	C	NC	C	NC	C	NC	C	NC	C
Emergency	3	4	11	7	4	2	2	6	9	1	7	5	3	3
Urgent	4	15	7	7	9	10	10	8	8	10	2	4	5	3
Scheduled	1	19	4	13	2	26	3	15	3	9	1	1	-	-
Elective	2	9	-	9	-	2	-	3	2	2	-	-	-	-

NC = Non-cardiac

C = Cardiac

The definitions of Emergency, Urgent, Scheduled and Elective are in appendix F. Most deaths are recorded after Emergency and Urgent operations and these took place every day of the week and at weekends.

Table S40 (q28) **Operation classification (Index Cases)**

	Non-cardiac	Cardiac
Emergency	46	1
Urgent	197	4
Scheduled	170	11
Elective	1015	13
Not answered	45	-

Emergency and urgent surgery for life threatening conditions predominates among the sample deaths. Death is rare in children after scheduled and elective surgery except for tumours. True emergency surgery, for conditions requiring *immediate* intervention, accounts for only 3% of the total surgical workload reported. Urgent work accounts for 13%. Taken together, 16% of children's surgery requires the expeditious access to an operating theatre. Provision of dedicated operating space for emergency and urgent surgery must always be ensured.

Table S41 **Operation classification/grade of most senior operating surgeon (Non-cardiac deaths)**

	Emergency	Urgent	Scheduled	Elective
House Officer	-	-	-	-
Senior House Officer	1	-	-	1
Registrar	7	4	1	-
Senior Registrar	9	6	1	-
Consultant	22	34	12	3
Clinical Assistant	-	1	-	-

Consultants were involved in the decision to allow junior doctors to operate in all but two of these cases. The only criticisms, already made, are of the unsupervised registrar operation on the child with a strangulated hernia and the clinical assistant operating for intussusception.

Delays in operations (Question 49)

There were seven positive responses that delay, other than clinical delay, had contributed to adverse outcomes. Surprisingly among the non-cardiac deaths there were no delays attributed to inadequate resources. But delays waiting for donor organs for liver transplantation for biliary atresia were mentioned. The delays in organising trauma care in two cases are worth highlighting.

A three-year-old boy was taken to the Accident and Emergency Department of a District General Hospital by a General Practitioner, having been run over by a refuse collection lorry. He had suffered severe chest, abdominal and pelvic trauma. On arrival the paediatric team were called and he was seen by a paediatric senior house officer and consultant. There was however a 30 minute delay before the surgical team was contacted. Eventually a surgical registrar, a consultant general surgeon, an anaesthetic registrar and consultant arrived and found a pulseless child. After vigorous resuscitation a thoracoabdominal laparotomy was done in the A&E theatre. This was done within an hour of the child's arrival at the hospital but he died from blood loss due to a ruptured liver.

In a second case, a two-year-old girl, suffering major injuries to the abdomen, was taken to a District General Hospital without facilities to cope with major trauma. Unfortunately there was a delay in transferring her from the site of the accident due to an ambulance breakdown. The junior doctor there was unable to insert a drip. Transfer was then arranged by the Senior House Officer to a second unit where paediatric surgery was available although there was no specific paediatric

intensive care unit. This transfer was done without consultation so that no consultant anaesthetist or surgeon saw the child until 1 hour and 40 minutes after the accident. A six-hour operation was then done to repair a torn inferior vena cava, ruptured liver and spleen. Following this the child was admitted to an adult intensive care unit but died 48 hours later due to anoxic brain damage.

Although it is unlikely that the outcome in these extensively injured patients could have been altered, the examples do highlight organisational shortcomings in the care of the severely injured child.

Districts should consider providing an instant response team when a severely injured patient arrives. Such a team should encompass a range of disciplines and include the necessary expertise to manage paediatric trauma. In the absence of paediatricians, anaesthetists may be expected to take the lead in resuscitation of injured children. Junior anaesthetists are often not appropriately trained to fulfil this role.

Postoperative care

Table S42 (q54) **Facilities in hospitals**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Theatre Recovery Room	85	96	1393	18
Paediatric ICU	60	180	298	22
Adult ICU	66	83	1116	-
Paediatric HDU	41	104	302	10
Neonatal ICU	55	33	349	5
Special Care Baby Unit	49	-	837	9
Not answered	-	3	21	-

This is difficult to interpret, all hospitals reported having facilities for some physiological support and high dependency nursing care.

Table S43 (q55) **Postoperative patient admission**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Theatre recovery room	5	1	569	-
Paediatric ICU	31	112	5	17
Adult ICU	22	11	9	7
Paediatric HDU	4	10	16	-
Neonatal ICU	19	2	5	-
Special Care Baby Unit	5	-	4	1
None of above	16	47	854	2
Not answered	-	10	11	2

There were two reports of consultants being unable to transfer children into an ICU/HDU (question 56). One of these cases is of interest. A six-week-old baby with intestinal obstruction and malrotation was admitted as an emergency under the care of a paediatric surgeon. After operation the child was nursed on an adult ICU, because "neonatal ICU would not admit patient (policy)". The reporting surgeon comments that a paediatric ICU would be more appropriate, and our assessment of the situation would confirm this view.

The second case also raises very different anxieties. A one-year-old child with bilateral dysplastic kidneys and septicaemia, had a cardiac arrest on the ward after having an IV catheter inserted. There was a delay of 2 hours before a space was available on the paediatric ICU. However the clinical condition of the child was hopeless and after discussion between medical staff and parents, and in view of the poor prognosis, active treatment was withdrawn. Admission to an ICU bed would seem unnecessary in the circumstances.

There were three positive responses to question 58 (were ICU/HDU facilities adequate?). However, each of these cases has already been discussed in the text and no new information was learned from this question, the important point being that for some specialized procedures the provision of *children's* rather than general/adult ICU facilities is warranted.

Table S44 (q61) **Postoperative complications**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Significant bleeding	21	22	13	1
Upper respiratory obstruction	2	3	8	2
Respiratory distress	39	29	10	4
Sepsis	38	31	8	1
Anastomotic failure	2	4	1	-
Low cardiac output	38	118	2	3
Hepatic failure	12	15	-	-
Renal failure	28	-	4	-
Endocrine system failure	2	-	1	-
Persistent coma	26	8	-	-
Other organ failure	14	11	2	1
Problems with analgesia	2	-	5	-
Complications of prematurity	13	2	1	-
Other problems	34	40	51	5

Table S45 (q62) **Mechanical ventilation**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Used	84	147	87	21
Complications	11	11	4	-

There were eleven positive replies in the non-cardiac deaths to the question "were there complications with mechanical ventilation?" Ten of these were routine unremarkable problems but one case unearths a potential problem in orthopaedic surgery and needs rehearsing.

A child of three years four months had a rare congenital bone disease which is associated with instability of the cervical spine and dwarfism. An elective operation was undertaken because of severe and life-threatening instability of the cervical spine. The procedure was carefully planned and carried out by a consultant surgeon with considerable experience in the field operating at a University hospital with a consultant anaesthetist in charge of the anaesthesia. There were no problems during the operation but later while the child was being mechanically ventilated in an adult/children's intensive care unit the endotracheal tube was displaced and as a result the child died (the anaesthetic aspects are discussed on page 149).

An operation was being undertaken for a serious life-threatening condition. The consultant surgeon undertaking the case was experienced in the field. The operation was undertaken at a University hospital but there was no specific paediatric intensive care, the ICU being a combined adult/children's unit. Children with this condition are very small. Respiratory problems are very common. Mechanical ventilation is often necessary. Few intensive care units outside major children's hospitals would have experience of managing mechanical ventilation and intubation in this type of very small child. These problems with children are well recognised by orthopaedic surgeons specialising in surgery of the child's spine. This case is a graphic illustration of how important special facilities are for this type of very small child with complicated spinal problems, and suggests that they should be managed in a specialised children's hospital which has the necessary skill in the intensive care unit.

Table S46 (qs63-65) **Non-oral/parenteral feeding**

	Deaths		Index	
	Non-cardiac	Cardiac	Non-cardiac	Cardiac
Non-oral feeding	11	13	10	1
Parenteral feeding	29	42	6	6
Complications?	6	4	1	1

Table S47 (qs76+77) **Mortality/morbidity meetings (deaths)**

	Non-cardiac	Cardiac
Yes	76	173
No	23	13
Not answered	3	7
If yes, will this death be considered?		
Yes	68	136
No	7	32
Not answered	1	5

22% of non-cardiac deaths are from consultants who attend no morbidity/mortality meetings, including some deaths from regional neurosurgical units. Even where regular mortality meetings are held some cases will not be considered.

CARDIAC SURGERY

Introduction

In contemporary surgical practice surgical correction of congenital cardiac anomalies forms a considerable part of the practice of surgery in childhood. Of the total 417 childhood deaths reported to us 266 were under the care of cardiac surgeons. A questionnaire to surgeon and anaesthetist was sent out following each of these reports. 193 cardiac surgical questionnaires were returned, a response rate of 74%. However, one cardiac surgeon, who had agreed to participate reported 19 deaths and was sent that number of questionnaires. Despite extending the time for him to return the questionnaires by 8 weeks, no questionnaires were returned. If we adjust the figures for his default the response rate of the other cardiac surgeons is 80%, a very commendable return.

Congenital heart defects fall into 3 groups -"Simple", "Intermediate" and "Complex". The natural history of these conditions varies widely. The first group are single defects (septal defects, ASD and VSD) or minor degrees of valvular stenosis or regurgitation. In the "Simple" group symptoms may not develop until adult life with subsequent slow deterioration in exercise tolerance. Surgery in childhood in this group is largely prophylactic and operative mortality is low (0-5%). The second group of children are usually symptomatic and there is often a combination of a septal defect (ASD, VSD) and stenosis which may be valvular or within the right or left ventricular outflow tract (Fallot's Tetralogy). Surgical mortality is of the order of 5-10%. The "Complex" group of children are symptomatic and may be severely handicapped and restricted. Up to 85% of infants in this group may not survive the first year of life without surgical help. Staged surgery with initial palliation and later corrective procedures is often necessary. Further surgery may be required when the child grows up. Surgical mortality may be as high as 20-30%. The majority of perioperative deaths reported in this survey fall into the Intermediate and Complex diagnostic groups.

Specialty of operating surgeon

All surgeons were of consultant status: 140/193 (73%) were specialist paediatric consultant cardiac or cardiothoracic surgeons and 53 (27%) had a "mixed" practice - operating not only on children but adults also, and practising cardiac and thoracic surgery. Some of the deaths reported in the "Complex" group had undergone particularly major cardiac reconstructive operations under the care of surgeons having such a "mixed" practice. A case could be made for centralising such operations within the Units where surgeons have particular training and expertise in these procedures.

Age groups:				
1 month or less	60	=	31%)	
1 - 6 months	39	=	20%)	51%
6 - 12 months	18	=	9%	

51% under 6 months: 60% under one year.

Open heart surgery including major cardiac reconstruction and the use of biological and man-made "spare parts" (homograft and prosthetic valves and conduits) have become available to neonates and infants (under 1 year of age) during the past 20 years. Although staged procedures, with initial palliative operations followed by major cardiac reconstruction when the child is older, are still indicated in certain circumstances, there has been a move towards primary reconstructive and corrective surgery wherever this is possible. The quality of life enjoyed by children following major reconstructive surgery is often excellent, even if their longer term outlook is uncertain, some may face the possibility of further "replacement" surgery in the future if they outgrow the calibre of a conduit or heart valve.

Table S48 (q5) **Sex of patient (cardiac deaths)**

Male	102
Female	91

There is an equal distribution of deaths between the sexes.

Ethnic group

162 deaths were reported in Europid children and 21 in Orientals; 18 of the 21 children who were of Oriental origin had particularly severe forms of "Complex" congenital defects and 9 of these were referred from overseas to centres of excellence in this country for this reason. When this is allowed for there is no excess of deaths in UK domiciled Oriental (including Indian sub-continent) children undergoing cardiac surgery, Table S17.

Table S49 **Day of emergency admissions (Cardiac deaths)**

	n=62
Monday	11
Tuesday	12
Wednesday	8
Thursday	10
Friday	7
Saturday	9
Sunday	5

32 % were admitted as emergencies.

Table S50 (q11) **Transferred from other hospitals (Cardiac deaths)**

Was child transferred?

Yes	97
No	96

If yes, from;

non-NHS authority	2
same district	17
same region	29
outside region	40
overseas	7
not answered	2

50% of the children were transferred from other hospitals to Regional and Supra-Regional Paediatric Cardiac Centres. The remainder were admitted to these Centres directly. This ensured that the special facilities and expertise required were available in all cases.

Table S51 (q14) **Was transfer to another hospital considered? (Cardiac deaths)**

Yes	-
No	174
Not answered	19

Table S52 (q16) **What was the specialty of the ward to which the child was first admitted? (Cardiac deaths)**

Paediatric medical	26
Paediatric surgical	16
Paediatric mixed medical/surgical	98
Paediatric ICU/HDU	40
Neonatal ICU/SCBU	6
Adult surgical	-
Adult ICU/HDU	-
Other	2
Not answered	5

Children were admitted to wards appropriately under paediatricians, paediatric surgeons or shared responsibility.

Table S53 (q18) **Specialty of consultant under whose care child was first admitted**

Consultant Paediatric Physician	7
Consultant Paediatric Cardiologist	153
Consultant Surgeon	31
Other	1
Not answered	1

The majority of children were first admitted under the care of a paediatric cardiologist. They were then referred to and were seen preoperatively by the surgeon who performed the operative procedure.

Table S54 (q19) **Was care undertaken on a formal shared basis?**

Yes	168
No	21
Not answered	4

168 children were cared for on a shared basis by paediatric cardiologists, surgeons and anaesthetists as is the usual practice in this specialty.

Table S55 (q20) **Who made the working diagnosis? (Cardiac deaths)**

Medical	
Paediatric Medical House Physician	-
Paediatric Medical SHO	3
Paediatric Medical Registrar	1
Paediatric Medical Senior Registrar	15
Paediatric Medical Consultant	143
Associate Specialist	-
Other	28
Surgical	
House Officer	-
Senior House Officer	-
Registrar	2
Senior Registrar	6
Consultant	154
Associate Specialist	-
Other	-

As is usual in the specialty the diagnosis was made by paediatric physicians/cardiologists or by radiologists.

Table S56 (q21) **Who made the final decision to operate? (Cardiac deaths)**

Grade of surgeon	
House Officer	-
Senior House Officer	-
Registrar	-
Senior Registrar	1
Consultant	192
Associate Specialist	-
Other	-

Final decision to operate was taken by the Consultant Surgeon in 192 of the 193 deaths.

Table S57 (q23) **On what day of the week was the operation performed? (Cardiac deaths)**

Monday	47
Tuesday	36
Wednesday	40
Thursday	32
Friday	22
Saturday	10
Sunday	6

Operations were performed throughout the week with an approximately equal spread with relatively few cases requiring emergency surgery at the weekend. The ability to manage neonates and infants on IPPV and the availability of prostaglandin therapy to maintain patency of the ductus ateriosus in the neonatal period has removed the urgency in creating systemic to pulmonary artery shunts (Blalock/Taussig) in babies whose pulmonary blood flow is ductus dependent.

Table S58 (q24) **What was the grade of most senior operating surgeon? (Cardiac deaths)**

House Officer	-
Senior House Officer	-
Registrar	-
Senior Registrar	2
Consultant	191
Associate Specialist	-

Consultant Surgeons operated on 191 of 193 cases reported. The other 2 surgeons were Senior Registrars. This reflects the usual practice in this specialty; the "intermediate" and "complex" categories of children are not considered to be suitable for delegation to surgeons in training.

Table S59 **What was the grade of the most senior operating surgeon/Day of operation? (Cardiac deaths)**

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Senior Registrar	-	1	-	1	-	-	-
Consultant	47	35	40	31	22	10	6

This table confirms the earlier observation that consultants undertake most operating in this specialty irrespective of the day of the week.

Table S60 (q27) **What was the grade of the most senior surgeon consulted before operation? (Cardiac deaths)**

House Officer	-
Senior House Officer	-
Registrar	-
Senior Registrar	-
Consultant	193
Associate Specialist	-

All decisions to operate are made by consultants in the specialty.

Table S61 (q28) **Was there any pressure to operate? (Cardiac deaths)**

Yes	61
No	130
Not answered	2

If yes, from whom?

Consultant Paediatrician	8
Consultant Cardiologist	46
Consultant Cardiothoracic Surgeon	16
Consultant Surgeon	-
Consultant - other	2
Relatives	21
Organisational considerations	16
Other	13

Table S62 (qs29-32) **Who took the history/examination before operation? (Cardiac deaths)**

	History	Examination
Paediatric Medical Staff (most senior)		
House Physician	-	-
Senior House Physician	4	2
Registrar	2	6
Senior Registrar	14	9
Consultant	164	167
Associate Specialist	-	-
Other	2	2
None	4	4
Not answered	3	3
Surgical staff (most senior)		
House Officer	-	-
Senior House Officer	8	2
Registrar	6	7
Senior Registrar	20	18
Consultant	152	158
Associate Specialist	-	-
Other	-	-
None	5	4
Not answered	2	4

85% of the cases were examined by a Consultant Paediatrician before operation and 82% were examined by the Consultant Surgeon before operation and a further 9% by the Senior Registrar.

Table S63 (q34) **Were there any other identified medical diagnoses at time of surgery? (Cardiac deaths)**

Respiratory	26
Neurological	10
Endocrine	2
Alimentary	11
Renal	7
Musculoskeletal	4
Haematological	1
Prematurity	7
Other	12

Table S64 (q36) **What was the ASA classification of physical status?**

ASA Grade	
Class 1	5
Class 2	19
Class 3	49
Class 4	94
Class 5	19
Not answered	7

(American Society of Anesthesiology Grades 1 to 5.)

59% of the cases were in grades 4 and 5 before operation (severe systemic disorders that are life-threatening or in a moribund condition), and a further 25% were in grade 3.

89% of the children in grades 4 and 5 had "complex" cardiac defects and 11% defects of intermediate severity. However, 78% of children in ASA grades 1-3 also had "complex" defects and 22% "intermediate". This reflects the multifarious way in which congenital heart defects present as the heart has considerable reserve capacity initially and the "natural history" and physical status of the child may be modified substantially by palliative or staged operations.

Table S65 (q39) **Who supervised the preoperative preparation on the ward? (Cardiac deaths)**

Paediatric Medical	
House Physician	-
Senior House Physician	23
Registrar	6
Senior Registrar	31
Consultant	115
Associate Specialist	-
Other	3
None	12
Not answered	3
Surgical	
House Officer	-
Senior House Officer	-
Registrar	16
Senior Registrar	49
Consultant	115
Associate Specialist	-
Other	-
None	3
Not answered	10
Anaesthetic	
Senior House Officer	-
Registrar	38
Senior Registrar	25
Consultant	109
Associate Specialist	3
Other	-
Aone	-
Not answered	18

This is a multiple response question. The important conclusion is that consultant cardiac surgeons had direct involvement in 60% of the cases preoperatively.

Table S66 (q40) **What precautions/therapeutic manoeuvres were undertaken preoperatively? (Cardiac deaths)**

Pulse rate recording	185
Blood pressure recording	186
Central venous pressure measurement	125
Gastric aspiration	128
Intravenous fluids	137
Correction of hypovolaemia	83
Blood transfusion	25
Antibiotics	161
Oxygen therapy	157
Airway protection	22
Tracheal intubation	139
Mechanical ventilation	121
Stabilisation of fractures	1
Nutritional support	42
Vitamin K	15
Others	20

Table S67 (q41) **Who supervised the preoperative precautions? (Cardiac deaths)**

Paediatric medical	
House Physician	-
Senior House Physician	18
Registrar	7
Senior Registrar	30
Consultant	76
Associate Specialist	-
Other	2
None	54
Not answered	6
Surgical	
House Officer	1
Senior House Officer	6
Registrar	12
Senior Registrar	32
Consultant	104
Associate Specialist	-
Other	-
None	34
Not answered	4
Anaesthetic	
Senior House Officer	-
Registrar	24
Senior Registrar	9
Consultant	119
Associate Specialist	11
Other	-
None	26
Not answered	4

Again a multiple entry reply showing the involvement of medical, surgical and anaesthetic staff of all grades, especially consultants in the preoperative management of cardiac cases.

Table S68 **Use of open and closed cardiac surgery (Cardiac deaths)**

Cardiac cases	
Closed	30
Open	162
"Both"	1
Cardiopulmonary bypass	
Yes	161
No	30
Not answered	2

84% of the children reported underwent "open-heart" surgery with the use of cardiopulmonary bypass which is required when it is necessary to operate inside the heart under direct vision. Systemic perfusion and oxygenation is supplied by the heart-lung bypass circuit during the period of intracardiac surgery. 15.5% of the children did not require heart-lung bypass. These operations, such as systemic to pulmonary shunts (Blalock-Taussig), banding of the main pulmonary artery to restrict excessive pulmonary blood flow and the surgery of coarctation of the aorta, all frequently undertaken in the first weeks of life, can be as difficult to perform successfully as open-heart procedures.

Table S69 (q48) **What was the operation classification?**

Emergency	28
Urgent	57
Scheduled	83
Elective	25

Table S70 **Operation classification/day of operation (Cardiac deaths)**

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Emergency	4	7	2	6	1	5	3
Urgent	15	7	10	8	10	4	3
Scheduled	19	13	26	15	9	1	-
Elective	9	9	2	3	2	-	-

Table S71 **Operation classification/grade of most senior operating surgeon (Cardiac deaths)**

	Emergency	Urgent	Scheduled	Elective
Senior Registrar	1	-	1	-
Consultant	27	57	82	25

Table S72 (q54) **Facilities in hospital where death occurred (Cardiac deaths)**

Theatre Recovery Room	96
Paediatric ICU	180
Adult ICU	83
Paediatric HDU	104
Neonatal ICU	33
Special Care Baby Unit	-
Not answered	3

Table S73 (q55) **Ward to which the post-operative patient was admitted (Cardiac deaths)**

Theatre recovery room	1
Paediatric ICU	112
Adult ICU	11
Paediatric HDU	10
Neonatal ICU	2
Special Care Baby Unit	-
None of above*	47
Question not answered	10

*includes those who died in theatre

Table S74 **What were the indications for admission to ICU/HDU? (Cardiac deaths)**

	n=135*
Specialist Nursing	121
Monitoring	135
Ventilation	126
Surgical complications	13
Anaesthetic complications	5
Transfer from hospital without facilities	2
Other	7
Not answered	1

*number admitted to ICU/HDU

Intensive care facilities, staffed by paediatric trained nurses were available in 93% of the cases. Delays in carrying out surgery which may have jeopardised the child's condition were reported in 9 cases when either ICU beds, or ICU trained nurses were not available.

In a further eight cases, delays in operating were considered to be due to length of the surgical waiting list. In two cases, delay in operating was attributed to a shortage of surgeons, "other surgeon (available) technically unable to do operation". Both these cases have been carefully reviewed. They were both intermediate or complex in type and the delay may have been a factor in the deaths reported. However, they, and another five sets of notes illustrate behavioural problems, a lack of teamwork, a failure of consultants to get on with each other. Indeed, one case report suggests there must be war between the anaesthetists and the surgeon concerned, and between the surgeon and the other surgeon in the team.

Table S75 **Were ICU/HDU facilities adequate?**

	n=135*
Yes	129
No	2
Not answered	4

*number admitted to ICU/HDU

Table S76 **Was the discharge from ICU/HDU due to;**

Elective transfer to ward	7
Pressure on beds	1
Death	114
Other	4
Not answered	9

Table S77 (q61) **Postoperative complications (Cardiac deaths)**

Significant bleeding	22
Upper-respiratory obstruction	3
Respiratory distress	29
Sepsis	31
Anastomotic failure	4
Low cardiac output	118
Hepatic failure	15
Renal failure	-
Endocrine system failure	-
Persistent coma	8
Other organ failure	11
Problems with analgesia	-
Complications of prematurity	2
Other problems	40

Table S78 (q62) **Mechanical ventilation (Cardiac deaths)**

Used	147
Complications	11

Table S79 (qs63-65) **Was non-oral/parenteral feeding used? (Cardiac deaths)**

Non-oral feeding	13
Parenteral feeding	42
Complications?	4

Table S80 (qs76 + 77) **Mortality/morbidity meetings (Cardiac deaths)**

Yes	173
No	13
Not answered	7
If yes, will this death be considered?	
Yes	136
No	32
Not answered	5

7.5% of the deaths reported were not discussed at mortality/morbidity meetings and these are not held regularly in all centres. 18% of the cases were not discussed even if such meetings were held.

SURGICAL NOTES

We asked for photocopies of operation and anaesthetic records and post mortem reports. Anaesthetic and post mortem reports are reviewed elsewhere. With the operation notes, there was enormous variability in quality. The notes returned by cardiac surgeons were exemplary in all cases, often illustrated with diagrams. Paediatric surgeons and most neurosurgeons produced good operation notes. At the other end of the spectrum there were some very bad operation notes which indicated a diagnosis but no details of the procedure, notes that did not indicate the side or site of the operation, notes which contained no details of sutures or prosthesis used. The worst example is possibly the operation note on the premature baby performed by an unsupervised registrar, the operation note reads "L.I.H."

Notes are important for adequate clinical care and the recently published "Guidelines for Clinicians on Medical Records and Notes" (Royal College of Surgeons of England March 1990) should be taken as a minimum standard.

CONCLUSIONS ON ALL THE SURGICAL DATA

The data show that most paediatric surgery is undertaken by surgeons with a special interest and training in the care of children. Consultants are involved in both elective and emergency surgery. Most emergency surgery undertaken out of hours and at weekends is done by consultants. The standard of surgery revealed by this Enquiry is very high.

Such problems as remain indicate the need to staff specialized surgical units with paediatric doctors and nurses. More attention must be given to supervising junior doctors, to local audit and quality assurance and the adequacy (or inadequacy) of locums. The quality of operating notes, (other than cardiac and neurosurgical) is poor and needs renewed attention from all concerned.

REFERENCES

1. Graff T D, Phillips O C, Benson D W and Kelly E. Baltimore Anesthesia Study Committee: factors in paediatric anesthesia mortality. Anes and Anal. 1964 43 407-414.

POST MORTEM EXAMINATIONS AND REPORTS

Introduction

The proportion of deaths reported to a coroner was related to the length of postoperative survival, being higher, (97%) in those children who died on the day of operation and falling thereafter.

Of the 295 deaths with completed surgical questionnaires, 224 (76%) were reported to a coroner.

Table PM1 **Deaths reported to a coroner by postoperative survival in days**

Postoperative survival (days)	Number of deaths	Number reported to a coroner (%)
0	93	90 (97)
1	54	46 (85)
2-7	90	66 (73)
8-30	58	22 (38)

Post mortem investigations were then ordered in only 130 (58%). Amongst deaths not reported to a coroner (71) and reported deaths where a coroner did not order a necropsy (94), permission for post mortem examination to be undertaken by the hospital pathologist was requested in 110 and granted in 83. Post mortem permission was usually requested by senior staff (consultant or senior registrar 71 out of 110 requests). Permission for post mortem examination was declined by relatives following 27 deaths. Permission for post mortem examination was more frequently given when requested by a consultant (41 out of 50 requests). One request by the SHO was refused in a death where there was no clear working diagnosis. It is very important that the consultants are immediately informed if permission for post mortem is refused so that they have the opportunity to interview the parents themselves.

In no case was there a failure to undertake a post mortem examination because of the unwillingness or unavailability of the pathologist.

No request for post mortem permission was made following 57 perioperative deaths, 32 of these had been reported to a coroner who did not order a post mortem examination, but in 25 cases the death was neither reported to the coroner nor was permission for a post mortem examination sought from the relatives. Although the reason for failure to request permission for a post mortem examination was asked, this question was not answered on half of the questionnaires returned. The reasons given for not requesting permission for a post mortem examination included prior knowledge of parental wishes where a child with major malformations had undergone several

operations, anticipated refusal on religious grounds in two babies and the need to return the body to the country of domicile in a fourth. In another case, although post mortem permission was not requested, a post mortem lung biopsy was performed with parental consent.

Reasons for no post mortem

The commonest reason given for not requesting a post mortem examination was that it would not contribute to a better understanding of the case. Review of the clinical information and operation records suggests that this view was invalid in many instances. Even in the case of infants where major congenital anomalies were identified intraoperatively, it is likely that additional information would be found if a full post mortem examination was performed. Many of these infants and children had complex cardiac anomalies; the opportunity to re-examine the surgical field at leisure, with better exposure and to be able to correlate anatomy directly with preoperative investigation could help surgeons' awareness of anatomical variations and might also suggest modifications of surgical technique. Even in those cases which have been appropriately investigated preoperatively, unsuspected pathological abnormalities were sometimes demonstrated and significant changes in diagnosis made.

Some deaths where post mortem permission was not sought had a variety of pre and post operative complications and were precisely those where a careful post mortem might make a major contribution to the understanding of clinical problems. These included a baby with oesophageal atresia, tracheo-oesophageal fistula and umbilical hernia who had undergone several operative procedures; a baby with intestinal atresia and meconium ileus, and another with intestinal obstruction due to an incarcerated inguinal hernia. In four deaths where a post mortem was not requested, the working diagnosis was not clearly defined, in one a diagnosis of peritonitis was treated with right hemiocolectomy, another baby with necrotising faciitis of the abdominal wall underwent debridement. Laparotomy for intestinal obstruction was undertaken in another case, division of adhesions was performed but there was no primary diagnosis; and in a fourth case oesophageal varices complicating cirrhosis in a one-year-old child was treated by oesophageal transection. Other cases where post mortem examination was thought unnecessary were a death following surgery for tumour using cardio-pulmonary bypass which was complicated by major blood loss, a child with cerebral metastases from a head and neck tumour, a child with raised intracranial pressure and acute onset diabetes, and one where the chest was reopened in an ICU when cardiac tamponade occurred postoperatively although the source of bleeding was not apparent. In several cases, the operating surgeon was not involved in the decision not to request post mortem examination because the patients had been returned to the care of the referring paediatrician. Two further children, under the care of paediatricians, had surgical interventions and died, in both further post mortem investigation seemed to be desirable, one died in renal failure complicating septicaemia, the second had leukaemia and a number of iatrogenic problems.

problems. In both these circumstances, it is surprising that the opportunity for final, detailed examination was not taken up in view of the many clinical problems.

Attendance at post mortems

Only 102 responders said that they were told of the date and time when post mortem examination on their patient was going to be performed, 62 surgeons were sure that they were not so informed, 3 did not know and 22 responders did not expect to be told presumably because the child had been transferred to the care of another consultant, often in another unit. This information was more likely to be transmitted for hospital post mortem than when post mortem was ordered by the coroner. When informed of the date and the time of the post mortem examination a member of the surgical team attended the post mortem examination following 95 deaths, the consultant surgeon attended 28 examinations, the senior registrar was present at 39, the registrar at 16 and a senior house officer in 11 cases. Other doctors, either paediatricians or anaesthetists attended 6 post mortem examinations. No representative of the surgical team was able to attend during 12 examinations and the identity of the attender (if any) was not known in one case.

It is important that the surgical team has adequate prior warning of the date and time of post mortem. It is of benefit to pathologists that a clinician is present at the early stages of post mortem examination so that all appropriate clinical information is available and points requiring elucidation are clearly stated before dissection begins. It is important too that the coroner instructs his officer or the pathologist concerned to ensure that the surgeon has due warning of the date and the time of the post mortem examination in those cases where investigations are ordered by the coroner. Pathologists have a key role here to liaise with clinicians about post mortem examinations, these examinations are useless unless clinicians are made aware of the findings.

The quality of post mortem reports

Surgeons were requested to return a copy of the post mortem report with the completed questionnaire. To date post mortem reports have been received from 160 cases (75%) out of a possible 213 where post mortem examination was undertaken. In many cases, the time taken for the report to reach the surgeon was not known. The date of receipt of the report by the surgeon was known in 106 cases. These comprise 72 reports following coroner's post mortems, of which 32 (44%) were received within 1 week and 49 (68%) within 4 weeks and 34 reports on hospital post mortems where 21 (62%) were received within 1 week and 30 (88%) within 4 weeks.

Table PM2 **Time taken for surgeon to receive post mortem report**

	Total	<1 week	1-4 weeks	2-3 months	4-6 months	>6 months
Coroners' post mortems	72	32	17	12	6	5
Hospital post mortems	34	21	9	4	-	-

All the post mortem reports received were analysed against a list of desirable features. When the standard of the report appeared unacceptably low reports were further reviewed anonymously by a panel of perinatal pathologists, general histopathologists and a neuropathologist.

Criteria sought were a date, a clear concise clinical history, body weight and measurements, organ weights, descriptions of both the external appearances of the body and of the viscera of sufficient detail and so constructed that any conclusions drawn could be substantiated, plus a summary of the pathological findings and an opinion as to the cause of death. Histological assessment of organs was thought essential, particularly in neonates, but it was clear that in many cases the report submitted was an interim report which comprised naked eye findings only and was not the final report. Microbiological investigations were undertaken, appropriately, in a few cases.

The findings of this review of the post mortem reports is shown in Table PM3 by overall assessment of the standard of the report. The overall standard of post mortem reports was high (50) or very high (59) whilst 45 reports were less detailed but thought adequate in the circumstances. Six were thought to be unsatisfactory.

Table PM3 **Objective review of post mortem reports (total number of reports submitted/reviewed = 170)**

		Clinical History	Body weight + measurement	External description	Description viscera	Histology + other tests	Summary + conclusions
Grade of report							
Very high	60	60	59	60	60	27	60
High	54	50	43	53	54	17	54
Adequate	50	36	38	49	50	7	46
Unacceptable	6	3*	-	4**	6***	-	6

*all very brief

**brief

***some incomplete

Many reports, particularly in children with cardiac anomalies were very detailed and except where the examination had been restricted (by parental wishes) to the heart and lungs, other organs were usually described in appropriate detail.

It is clear from the table that those post mortem reports where the description of findings was detailed and clearly set out were also those where the objective criteria were also met. Many of those undertaken to high or very high standard were those undertaken at the request of the coroner. On review of all these reports of post mortem examinations undertaken on infants and children, there is no evidence of different standards between hospital and coroners' post mortems.

Unrelated cot deaths

Two deaths which fell within the definition of perioperative deaths used by NCEPOD were in fact fortuitous. Both deaths occurred at home more than two weeks after surgery. One baby had undergone bilateral herniotomy, the other a pyloro-myotomy for pyloric stenosis. There was no evidence of intestinal obstruction, inhalation of gastric contents or postoperative infection in either case. Both were investigated at the request of a coroner. Both post mortems were excellent. However, the cause of death remained unexplained after completion of investigations and were certified as unexpected, unexplained death in infancy (cot death).

An almost anticipated death

One death followed dental treatment in a child with Becker muscular dystrophy. Post mortem revealed extensive myocardial degenerative changes with actively progressive fibre lysis and macrophage infiltration. Such changes predispose to a hyperexcitable cardiac state and were anticipated complications.

Additional information from post mortem examinations

Post mortem examination resulted in additional information in non-cardiac cases more often than in infants with congenital heart disease. In non-cardiac deaths, there were additional findings at post mortem in 31 of 44 deaths compared with 58 of 104 cardiac deaths. In the findings of non-cardiac deaths, additional information was thought significant in 27, possibly significant in 3 and academic in one case. Such findings included the site and cause of intestinal haemorrhage, the demonstration of intestinal ischaemia and malrotation, and Listeria monocytogenes septicaemia and adrenal haemorrhage. Erroneous diagnosis of pneumothorax as a cause of sudden deterioration had been made in 2 infants, both of whom had other pulmonary pathology.

Amongst infants with congenital heart disease, the additional information was thought significant in half of the cases in which post mortem reports were available. This was frequently the

demonstration of myocardial ischaemia and the severity of the pulmonary hypertensive changes. Other findings were inappropriate siting of a pulmonary artery restrictive band which occluded the right main pulmonary artery and produced infarction, placement of a suture through an aortic valve cusp leading to valvular incompetence, vegetations on a ventricular septal defect patch as a source of septicaemia and septic embolisation and unsuspected additional anatomical abnormalities.

CONCLUSIONS

Post mortem examinations were always performed by pathologists when the clinicians requested them and when the clinicians had obtained the necessary permission. Clinicians and coroners failed to obtain post mortem examinations in some cases where there was clearly inadequate clinical evidence to make a certain pathological diagnosis of the cause of death. Post mortem examination is an important component of the clinical process and clinicians should ensure that this examination is undertaken particularly when children die after surgery. The value of the post mortem examination, with its unhurried view of the case is important in clinical audit and quality assurance.

ANAESTHESIA

A group of consultant anaesthetists with special interests in anaesthesia for children assisted in the design of the questionnaires and in the interpretation of information which was obtained. This group met on ten occasions for these purposes. NCEPOD is pleased to acknowledge the significant contribution which was made by the group: Drs T R Abbott, G H Bush, M Harmer, J O Morgan-Hughes, P Morris and P F Tatham.

WHO ANAESTHETIZES CHILDREN?

Replies to the invitation to participate were received from 2210 (out of 2294) consultant anaesthetists. Of these, 2109 reported that they anaesthetized children. These anaesthetists were asked approximately how many children in each of three age groups they anaesthetized each year.

Table A1 **Consultant Anaesthetists *n*=2109***

Number of children anaesthetized per annum	>3 years-10 years	6 months to 3 years	<6 months
Nil	3	51	258
<10	127	334	876
10-19	187	411	477
20-50	620	893	345
>50	1108	357	85
no figures supplied	64	63	68

*number of replies from Consultant Anaesthetists who indicated that they anaesthetize children aged ten years or less.

DATA ABOUT ANAESTHESIA

The design of the questionnaire about anaesthesia from which NCEPOD acquires data has developed slowly from earlier versions.[1,2] The objective was always to design a form which not only was logical in terms of an individual patient but also one which would provide objective information. Thus comparisons between various groups (hospitals, types of patients, districts or regions) could at least be contemplated. The comparisons would, by this means, not be solely dependent on subjective opinion and avoid the possibility of the application of extreme standards by assessors.

Notification

The procedure by which anaesthetists were to be notified about any NCEPOD patient was potentially fraught. The first point of contact after the local reporter had notified the NCEPOD office of the occurrence of death was through the consultant surgeon, and it was uncertain when we started this process whether anaesthetists would find the method satisfactory or that it would work. However, to everyone's credit, the system has proved modestly successful and the numbers of questionnaires completed by anaesthetists and returned to the office suggest that collection is fairly efficient.

It should be understood that it was believed to be too difficult for a local reporter to notify NCEPOD of the name of the anaesthetist (where that was ever known). This matter should be resolved in the future.

Index questionnaires

The use of identical questionnaires for index cases (excluding information about death) was an important aspect of the same tactic. The management of preselected cases by each surgical team was reported and of these there were 1367 questionnaires from anaesthetists which formed the basis for comparison. It is obvious that by this means NCEPOD collected an overall view of the management of anaesthesia for children in hospitals in the UK (excluding Scotland) during 1989.

The method of preselection of index cases was not wholly satisfactory. Surgeons who claimed to manage 40 or more children each year were asked to complete a questionnaire about the first case for which they were responsible after 08.30 on a certain date. The date stipulated was chosen *post hoc* (to prevent selection by the surgeon) and after sufficient interval to allow for normal recovery. Notwithstanding there were a very few index cases who did, in the event, die within 30 days and these were transferred to the group of deaths. The 1989 sample of children resulted in the reporting of a large number of relatively minor surgical procedures and, in some respects, this does distort the picture.

NCEPOD is grateful to the 1297 anaesthetists who completed an index questionnaire and to the 70 anaesthetists (see page 44) who completed more than one.

Survivor case questionnaires

Specific matching (by age, sex and type of admission to hospital) for survivor cases was achieved in a few cases and twelve questionnaires were returned by anaesthetists. No attempt was made in respect of cardiac cases because of the very wide spectrum of congenital conditions. The non-cardiac cases were very often impossible to match by these, essentially surgical, criteria. This is a direct result of the relative rarity of deaths in the three age groups which were used (<6 months, <3 years and 3 years to 10 years) and also in the clinical specialty involved. Thus it is natural that the search for evidence of contrasts in the management of anaesthesia between those who survived and those who died proved even more difficult. Previous experience with CEPOD had suggested that many of the more disturbing reports included both surgical and anaesthetic factors and we consider that our current method is the only approach which is both cooperative and objective. Selection of survivor cases by criteria related to anaesthesia which could be applied arbitrarily might be biassed. The attempt was therefore made to obtain survivor cases to match 62 of the non-cardiac deaths. Our failure to achieve more than 18% return of these 62 survivor questionnaires is both as a result of absence of the cases and other factors (clinicians' inertia, absence of notes); we have no method to apportion the relative importance of these factors.

A comparison between the management of two relevant cases is given later. The comparison illustrates the difficulty of the approach which was used, the fact that these cases were in truth not comparable and that, *on the evidence reported* to NCEPOD, the clinical management of the two children was acceptable.

DIFFICULTIES ASSOCIATED WITH ORGANISATION OF CLINICAL SERVICES FOR CHILDREN

It is often necessary for small children to be transferred to specialist (surgical) hospitals for urgent management, but the choice of destination of a child whose life is threatened is important. When the matter is less urgent, or even elective, *all factors*, and not merely the availability of a relevant surgical skill or skill with children must also be considered. A number of these difficulties and some obvious dangers are illustrated in the clinical examples (see page 149).

Table A2 (q2) **Type of hospital**

	Deaths (non-cardiac) *n*=90	Deaths (cardiac) *n*=172	Index *n*=1367
District General	20	-	958
University	35	26	188
Special Children's	28	93	92
Ministry of Defence	-	-	27
Single surgical specialty	4	28	69
Independent	-	15	2
Other	3	10	31

Other types of hospital included 10 cardiothoracic units, 3 DGHs with regional specialties, and one University hospital with a special unit for children and gynaecological patients. We note that there is no classification of hospital types which is acceptable throughout the country, and these different interpretations of our list are not surprising.

STAFF

Cardiac deaths

The most senior anaesthetist present in the operating room for most of these cases was a consultant who worked regularly in this sub-specialty (Table A3). The overall management appeared to be best described as state-of-the-art.

Table A3 **Most senior anaesthetist present at anaesthetic**

	Deaths (non-cardiac) *n*=90	Deaths (cardiac) *n*=172	Index *n*=1367
Senior House Officer	-	-	117
Registrar	3	-	168
Senior Registrar	17	7	95
Consultant	70	163	855
Associate Specialist	-	-	38
Clinical Assistant	-	-	77
General Practitioner	-	-	2
Hospital Practitioner	-	-	3
Question not answered	-	2	12

The staff involved in both series of deaths most often included a consultant anaesthetist: 78% non-cardiac and 95% cardiac deaths. This indicates satisfactory provision of staff.

The absence of consultation, that is discussion, between anaesthetists and surgeons about the management of small patients for complex surgery (Table A4) was surprising. The outcome, with the benefit of hindsight, sometimes seems to have been predictable but the information reported to us is not sufficient to formulate more than a question: should an attempt at surgical correction of major abnormalities be made in these circumstances? These circumstances might include the absence of trainee staff to assist, the absence of adequate monitoring devices, pulse oximetry and monitors of oxygen concentration, in both NHS and independent hospitals. The presence of severe intercurrent disease, such as necrotising enterocolitis, renal failure, respiratory distress syndrome or (even) brain damage, seems likely to prejudice success. These aspects surely justify discussion

between the two disciplines. The fact that at least one hospital states that there is no discussion *after* a death between surgeons and anaesthetists emphasises our concern.

Table A4 (q 22) **Anaesthetist consulted by surgeon before operation**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	69	95	285
No	20	75	1062
Not answered	1	2	20

Non-cardiac deaths

Once again[2] attention must be drawn to the problems of *locum* appointments. Case 4 (see page 150) illustrates the problem in anaesthesia. The matter is no longer confined to trainee staff (SHOs and registrars) but now appears amongst consultants. We know from other information that some of these posts are filled by well trained senior registrars acting up in a longterm, but temporary, position. Others are not. It seems that some appointments to locum positions are made neither with reference to official guidelines[3] nor to the advice contained in the report entitled Consultant Responsibility in Invasive Surgical Procedures[4]. Nowhere is this more important than in the provision of care for children during anaesthesia.

Analysis of other data showed that on average, there were nearly 2 anaesthetists present at these operations. This implies adequate use of clinical resources for training purposes. Similarly, the involvement of consultants with index cases (62%) is acceptable.

Table A5 **Grades of 'solo' anaesthetists**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Senior House Officer	-	-	117
Registrar	3	-	139
Senior Registrar	8	4	65
Consultant	14	22	494
Associate Specialist	-	-	33
Clinical Assistant	-	-	73
General Practitoner	-	-	2
Hospital Practitioner	-	-	3

The 117 *index* questionnaires which stated that the 'solo' anaesthetist was an SHO included 65 scheduled or elective cases, 44 urgent and 8 emergencies. These 8 emergency operations were for fractures, torsion of the testis or suture of lacerations in mature children. Three of the SHO anaesthetists did not inform the consultant on call at any time about these emergency procedures.

Eleven of the 117 index cases were anaesthetized by *locum* SHOs.

TRAINING

Table A6 (q4) **Full-time training in Specialist Children's Hospital (most senior anaesthetist)**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	81	149	827
No	8	18	517
Not answered	1	5	23
If yes, duration	*n*=81	*n*=149	*n*=827
Less than 3 months	7	3	106
3 to 6 months	27	21	383
More than 6 months	44	114	319
Not answered	3	11	19

In all the deaths 88% anaesthetists had full time training in a children's hospital. Such training was usually at least 3 months and 69% had training of more than 6 months.

60% of the anaesthetists amongst *index* cases claimed full-time training for more than 6 months.

Table A7 **Training experience of 'solo' anaesthetists (non-cardiac deaths)**

	None	<3m	3-6m	>6m	Not answered
Registrar *n*=3	1	-	2	-	-
Senior Registrar *n*=8	1	3	2	1	1

The two cases in which the 'solo' anaesthetists claimed no training are described in connexion with Table A12 and in clinical case number 2.

A separate search of the data revealed that 12 deaths occurred when there was no consultant involvement in the anaesthetic and there was also no rota for consultants with special interest in children's anaesthesia; 4 in DGHs, 7 in University hospitals and one in a single surgical specialty hospital.

The answers to the questions about current experience (Tables A8 and A9) were intended to reveal how much current, day-to-day experience of children the respondents had. This experience need not, of course, be relevant to the particular death or index case reported. If, for example, anaesthetists claimed to anaesthetize one infant aged less than six months each week (ie 50 or more per year) it may reasonably be assumed that they are skilled in this age group, which is recognised to be the most taxing, and that therefore they are competent to manage any other child.

Table A8 (q5) **Number of patients aged less than 6 months anaesthetized last year**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
None	1	-	129
1 to 9	15	-	477
10 to 19	9	10	276
20 to 49	19	30	221
50 or more	42	119	163
Not answered	5	13	101

Table A9 (q6) **Number of patients aged six months to three years anaesthetized last year**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
None	-	-	23
1 to 19	11	2	303
20 to 49	14	32	431
50 to 99	13	27	271
100 or more	48	98	276
Not answered	4	13	63

Non-cardiac deaths

Half (44, at least) of the children who died after *non-cardiac* surgery were anaesthetized in the presence of an anaesthetist who had anaesthetized fewer than one small infant per week during the past year. Some of these patients were very ill indeed (29 were ASA 5, that is, moribund).

There were 11 questionnaires amongst non-cardiac deaths in which the most senior anaesthetists stated that they had anaesthetized *fewer than 20 children aged between six months and 3 years* during the previous year. (Their figures are, of course, personal estimates). Six of the children were anaesthetized for specialised (neurosurgery) or super-specialised surgery (liver or heart transplants). Case 5 is one. One was a six-week-old infant, ASA 4, who had a laparotomy for abdominal sepsis. A neonate ASA 5 had endotoxaemia and was anaesthetized in a District General Hospital by a consultant. A 6-week-old infant, ASA 5 had a perforated colon with Hirschsprung's disease and was anaesthetized in a University Hospital by a consultant. The latter three children were anaesthetized by consultants in non-specialist hospitals but not one of the hospitals had special rotas for consultants with particular and current experience in children's anaesthesia.

One six-day-old neonate was anaesthetized by a consultant anaesthetist in a *special children's hospital.* This consultant had no full time training in anaesthesia for children and claimed to have anaesthetized 4 infants aged less than 6 months and 12 children less than 3 years in the previous year!

Cardiac deaths

70% of the children were managed by anaesthetists who were in regular current practice amongst children.

The two deaths after cardiac surgery (Table A9) occurred in University hospitals in which the consultant anaesthetists claimed that they were responsible for 10 infants and 10 children in the previous year. The selection of *index cases* was such that a substantial proportion of patients were anaesthetized by anaesthetists without substantial current experience with children.

Table A10 **Previous year's work**

	Deaths (non-cardiac)	Index
<20 infants (<6 months)	13.8%	64.5%
<50 children (<3 years)	23.0%	55.4%

The marked contrast between the anaesthetists involved in the non-cardiac deaths compared with those who anaesthetized the index cases is apparent in Table A10 (derived from Tables A8 and A9).

Table A11 (q7) **Special on call consultant rota for infants and children (excluding special children's hospitals)**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Hospital type			
District General	2 (*n*=2)	-	13
University	18 (*n*=8)	15 (*n*=4)	90
Ministry of Defence	-	-	-
Single surgical specialty	-	1	10
Independent	-	6 (*n*=1)	-
Other	-	-	1
Not answered	2	6	10

n=number of *different* hospitals

The fact that about 2% DGH index questionnaires stated that a specialist anaesthetist rota existed for the care of children should surprise no-one and 8% deaths occurred in these hospitals. 23% deaths occurred in *university* hospitals wherein nearly half index questionnaires suggest that special rotas exist. (The existence of a rota does not mean that specialist knowledge is either used or available for particular patients).

Table A12 (qs8 to 10) **Consultant Anaesthetist informed (if most senior anaesthetist present was not a consultant)**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Before anaesthetic	*n*=20	*n*=7	*n*=512
Yes	13	4	96
No	6	2	355
Not answered	1	1	61
During anaesthetic	*n*=20	*n*=7	*n*=512
Yes	6	1	25
No	12	5	407
Not answered	2	1	80
After anaesthetic	*n*=20	*n*=7	*n*=512
Yes	10	3	28
No	8	3	408
Not answered	2	1	86

There were four reports in which the consultant was not informed at any stage. All four children were anaesthetized by senior registrars three of whom were working in single surgical specialty hospitals (neurosurgical) and alone were involved in the management of three hopeless cases. The fourth case was a cot death.

Table A13 (q21) **Availability of child's weight**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	74	170	1301
No	15	1	62
Not answered	1	1	4

The fact that in about 95% of all the cases reported to NCEPOD there was a record of the child's weight available to the anaesthetist is encouraging.

Table A14 (q23) **Patient visited before operation**

	Deaths (non-cardiac)			Deaths (cardiac)			Index		
Hospital type	Yes	No	(N/A)	Yes	No	(N/A)	Yes	No	(N/A)
District General	15	3	(2)	-	-		771	176	(11)
University	32	3		23	2	(1)	158	28	(2)
Special Children's	26	2		90	3		76	16	
Ministry of Defence	-	-		-	-		16	11	
Single surgical specialty	3	1		22	5	(1)	52	16	(1)
Independent	-	-		15	-		2	-	
Other	3	-		10	-		27	4	

(N/A = not answered)

81% of children amongst index cases in District General Hospitals and 85% in University Hospitals were visited by the anaesthetist before surgery.

Table A15 (q23A) **Patient visited before operation - was parent/guardian present?**

Hospital type	Deaths (non-cardiac) *n*=70			Deaths (cardiac) *n*=160			Index *n*=1102		
	Yes	No	(N/A)	Yes	No	(N/A)	Yes	No	(N/A)
District General	7	7	(1)	-	-		653	63	(55)
University	16	11	(5)	20	2	(1)	132	12	(14)
Special Children's	12	11	(3)	54	33	(3)	64	9	(3)
Ministry of Defence	-	-		-	-		14	2	
Single surgical specialty	2	1		9	11	(2)	41	6	(5)
Independent	-	-		11	3	(1)	2	-	
Other	1	2		8	-	(2)	22	2	(3)

(N/A = not answered)

Many of the parents of children who subseqently died were not present at the visit before operation. This is understandable since many of the children were extremely ill and others had suffered road traffic accidents. The fact that in 68% of index cases the parent was able to be present is gratifying, and in 61% of these the anaesthetic was discussed.

Table A16 (q23B) **Parent/guardian present - was anaesthetic discussed?**

	Deaths (non-cardiac) n=38			Deaths (cardiac) n=102			Index n=928		
Hospital type	Yes	No	(N/A)	Yes	No	(N/A)	Yes	No	(N/A)
District General	4	3		-	-		586	62	(5)
University	12	3	(1)	20	-		126	4	(2)
Special Children's	11	1		50	3	(1)	60	3	(1)
Ministry of Defence	-	-		-	-		14	-	
Single surgical specialty	2	-		8	1		39	2	
Independent	-	-		10	-	(1)	2	-	
Other	1	-		8	-		22	-	

(N/A = not answered)

Table A17 (q24) **Investigations before operation**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Investigations	84	170	447
No investigations	6	1	892
Not answered	-	1	28
Which investigations?			
Haemoglobin	80	168	332
Packed cell volume (haematocrit)	60	160	223
White cell count	71	164	252
Sickle cell test (Sickledex)	4	8	32
Serum electrolytes Na	70	166	121
K	68	164	118
Cl	31	100	53
HCO_3	40	81	53
Blood urea	59	139	103
Creatinine	49	142	68
Serum albumin	31	95	29
Bilirubin	29	77	27
Glucose	44	93	41
Urinalysis (ward or lab)	27	83	132
Blood gas analysis	41	81	17
Chest x-ray	62	158	73
Electrocardiography	17	155	29
Respiratory function tests	1	2	4
Echocardiography	10	142	26
Cardiac catheterization	2	110	10
Other	24	40	88

Most deaths had some investigations done before operation, those that did not were children who had emergency surgery for major trauma. 65% of index cases however had no investigations before surgery. This may reflect the nature of the operations and the large number of ASA 1 patients (Table A43) who had no intercurrent medical diagnoses (Table A41). Diabetes or proteinuria may easily be missed if urinalysis is omitted; it is disturbing to note that this simple ward test is only performed in 10% index cases.

Table A18 **ASA Grades/classification of operation**

Non-cardiac deaths

	ASA grade				
	1	2	3	4	5
Emergency	0	1	2	7	20
Urgent	1	4	3	21	8
Scheduled	1	2	6	8	-
Elective	0	1	2	1	-

(ASA grade not given in 1 case, classification of operation not given in 1 case)

ASA 1.

One child had an operation for a glioma in a neurosurgical centre. The other was a neonate who was recovering from a successful repair of gastroschisis and in whom a central line was inserted under general anaesthesia uneventfully but the child died several hours later during the injection of metronidazole through it; resuscitation was unsuccessful.

ASA 2.

There were two children who died at home: it is believed that these deaths were unrelated to anaesthesia or surgery: both occurred three weeks after surgery and both were labelled as 'cot deaths'. One followed 18 days after an uneventful Ramstedt's operation in a mature 6-week-old who weighed 4kg. No other information is available. The other was a four-month-old infant who was born at 30 weeks' gestation. A bilateral herniotomy was done uneventfully. A coroner's autopsy was performed but the report was not made available to us but the presence of bronchopulmonary dysplasia was mentioned in conversation to the clinicians involved.

One case is the subject of a legal enquiry and complete data were not obtainable by NCEPOD. There were two patients who died after neurosurgery for a head injury and one who suffered major haemorrhage after removal of an abdominal medulloblastoma. A five-week-old child who died after a laparotomy for perforated colon was (wrongly) graded by the anaesthetist as ASA 2, but is included in the table; the surgeon suggested ASA 4 and this appears to be realistic on the data supplied to NCEPOD. Case reports of the other two children are given elsewhere (Cases 1 and 5).

ASA 4.

There are similar explanations for the deaths of these children after elective or scheduled operations as in the cardiac group.

Table A19 **ASA Grades/classification of operation**
Cardiac deaths

	ASA grade				
	1	2	3	4	5
Emergency	-	-	1	5	6
Urgent	-	-	3	36	23
Scheduled	-	1	20	56	2
Elective	-	3	7	8	1

ASA 5 grades.

The two scheduled operations were in neonates for complex cardiac surgical conditions. The elective operation was for Fallot's tetralogy in a five-year-old.

Table A20 **ASA Grades/classification of operation**
Index cases

	ASA grade				
	1	2	3	4	5
Emergency	28	9	-	2	-
Urgent	111	45	4	2	-
Scheduled	92	38	16	6	-
Elective	877	113	10	1	-

(The ASA grade was not reported in 9 cases, classification of operation not given in 6 cases)

12.5% ASA 1 patients in the index series were nevertheless classified as emergency or urgent cases but most (85%) ASA 1 and 2 (index) were scheduled or elective cases.

Table A21 (q42) **Type of anaesthetic**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
General alone	82	170	1068
Local infiltration	-	-	8
Regional alone	-	-	-
General and regional	-	1	181
General and local infiltration	5	-	109
Sedation alone	-	-	-
Sedation and local infiltration	1	-	1
Sedation and regional	-	-	-
Other	1	-	-
None	1	-	-
Not answered	-	1	-

There were two cases in which the type of anaesthetic did not fit into this classification.

In one, two registrars (one with six months training in paediatric anaesthesia) managed an emergency laparotomy and thoracotomy. The child was eight years old and was unconscious after a road traffic accident which involved a lorry. There was a fractured mandible and airway obstruction. Asystolic cardiac arrest had already occurred before admission to the Accident and Emergency Unit of a District General Hospital. The operations were done by the consultant in Accident and Emergency on a Tuesday afternoon but although the consultant anaesthetist was informed no one else came to help the registrars. The thoracotomy was "to establish the cardiac rhythm and to inspect the thoracic aorta". 100% oxygen was administered by tracheal tube and a muscle relaxant was used to aid closure of the abdomen. The child remained dead.

In the other, a similar accident fatally injured a 3.5-year-old child who was admitted to the Accident Department of a District General Hospital. The child's trachea was intubated without relaxants and a thoracotomy performed. Two consultant anaesthetists and a registrar were involved in the unavailing efforts.

RECORDS OF ANAESTHESIA

The considerable advances in techniques of monitoring during the last quinquennium were not matched by appropriate improvements in the design of anaesthetic records. The fact that a particular monitoring or measurement device was used at some time during a procedure is neither useful information nor indeed logical. Retrospective review of anaesthetic records should reveal *when* the device was used (that is, induction, maintenance, or recovery). Furthermore, the records should indicate the result of the measurement. The particular example of this deficiency is the almost total lack of provision of a row (or column) for recording values of variables on the grid framework customarily, but not always, available for blood pressure and pulse rate.

An entirely novel disadvantage of retrospective enquiries emerged in one case: the anaesthetic record was already destroyed (after it was microfilmed) by the time the anaesthetist came to complete our questionnaire. NCEPOD received the latter 7 March 1990 although the death occurred 5 January 1989. Anaesthetists in the independent sector were quite commonly unable to provide information about the investigations before operation or an anaesthetic record.

Anaesthetic records were not found in the patients' notes in between 3 and 5% of <u>all</u> cases.

Table A22 (q46) **Anaesthetic record in notes**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Hospital type			
District General	18	-	917
University	32	24	182
Special Children's	27	91	90
Ministry of Defence	-	-	27
Single surgical specialty	4	27	67
Independent	-	11	2
Other	3	10	30
Not answered	1	2	9

MONITORING

The lists of monitoring devices (Tables A23 to A25) include most methods and devices in common use. The list is not prescriptive. Some methods or devices may not be appropriate for all cases.

Table A23 **Monitoring methods/devices (Non-cardiac deaths)**

	Room		
	Anaesthetic	Operating	Recovery
None	1	-	1
Pulse: manual	33	37	21
Pulse: meter	6	17	9
Indirect BP (non invasive)	27	58	23
Direct arterial BP	11	30	18
CVP	7	22	14
Left atrial pressure	-	-	-
Pulmonary arterial pressure	-	-	-
ECG	39	72	31
Pulse oximetry	36	69	31
Oesophageal or precordial (chest wall) stethoscope	17	40	4
Temperature	15	46	24
Ventilation volume	7	24	13
Airway pressure	15	47	19
Expired CO_2 partial pressure (concentration)	11	43	8
O_2 analyser-fresh gas	9	33	10
O_2 analyser-inspired gas	9	34	12
Inspired anaesthetic vapour	3	10	1
Peripheral nerve stimulator	2	11	2
Ventilator alarm-disconnect	12	44	16
Urine output	17	31	23
Other	3	3	7

Non-cardiac deaths

Monitoring of these cases was in general at a very high standard. Nevertheless it is noteworthy that no single monitoring device was used in all anaesthetics. 80% of these patients were monitored with an ECG, 77% with oximetry, and 64% had indirect blood pressure measurements made. Temperature and expired carbon dioxide were measured in about half these patients but oxygen analysis was done in fewer than 40% of cases.

Table A24 **Monitoring methods/devices (Cardiac deaths)**

	Anaesthetic	Operating Room	Recovery
None	2	-	-
Pulse: manual	106	30	36
Pulse: meter	12	7	6
Indirect BP (non invasive)	27	12	33
Direct arterial BP	57	151	76
CVP	46	149	78
Left atrial pressure	2	67	26
Pulmonary arterial pressure	3	29	8
ECG	104	151	79
Pulse oximetry	77	88	59
Oesophageal or precordial (chest wall) stethoscope	11	10	1
Temperature	46	148	78
Ventilation volume	28	89	58
Airway pressure	68	124	77
Expired CO_2 partial pressure (concentration)	8	29	2
O_2 analyser-fresh gas	23	50	19
O_2 analyser-inspired gas	29	63	34
Inspired anaesthetic vapour	2	2	1
Peripheral nerve stimulator	2	2	2
Ventilator alarm-disconnect	49	110	76
Urine output	53	139	80
Other	7	16	8

Cardiac deaths

Most children were anaesthetized with the benefit of appropriate monitoring devices. The improvement in the provision of these essential tools is gratifying and must be partly responsible for the high standards of care which this study has revealed.

There are, however, one or two aspects which deserve comment.

It appears that in some hospitals, pulse oximetry and capnography are not provided either at all or not in the anaesthetic room. Cyanosed, ASA grade 4, and small children were anaesthetized in the anaesthetic room and invasive monitoring (arterial and central venous lines) established without any monitoring apart from ECG. These invasive techniques are not easy to perform in sick children and may take even experts significant time to succeed. Considerable physiological change can happen during this interval. Non-invasive automatic blood pressure recorders and pulse oximetry are obviously as relevant and desirable *before* surgery, as *during* surgery; yet these devices were not always used and often not attached until after the child was moved into the operating room. Some anaesthetists recorded the fact that anaesthesia was induced in theatre and full monitoring was established at the start of this procedure. This is not always appropriate, perhaps particularly for sick children and their parents, since avoidance of emotional disturbance (crying or struggling) at induction of anaesthesia may be especially important in children with severe cardiac disease.

Automatic ventilation of the lungs was frequently provided by means of the Penlon ventilator and Newton valve, presumably attached to a Mapleson E breathing system. The absence of use of a capnograph with this arrangement does not represent modern safe practice[5] nevertheless it was used in only 5% cardiac cases in the anaesthetic room and 17% in the operating room.

It was interesting also to note that those hospitals in which pulse oximetry was not available also failed to provide apparatus to measure inspired oxygen concentration. For example a neonate (2.6kg) with cyanotic heart disease had a central Waterston shunt created in a single surgical specialty hospital. Anaesthesia and surgery were conducted with the aid of direct blood pressure measurement but without oximetry or oxygen analysis of inspired gases. The child died several days later in another hospital.

Invasive monitoring. There is understandable reluctance on the part of anaesthetists to use invasive monitoring in very young patients, and when the techniques are not frequently practised. This omission can have disastrous consequences, see for examples, clinical cases 1 and 2.

Capnography. There are systems for automatic ventilation during use of which it is impossible to monitor volumes of expiration. These systems are quite satisfactory themselves but for their efficacy to be demonstrated and confirmed it is essential that expired carbon dioxide be measured continuously.

Table A25 **Monitoring methods/devices (Index cases)**

	Anaesthetic	Operating Room	Recovery
None	43	13	47
Pulse: manual	1033	782	982
Pulse: meter	96	244	60
Indirect BP (non invasive)	186	631	389
Direct arterial BP	16	32	28
CVP	5	20	19
Left atrial pressure	1	4	3
Pulmonary arterial pressure	2	5	3
ECG	525	1149	193
Pulse oximetry	282	872	203
Oesophageal or precordial (chest wall) stethoscope	170	216	19
Temperature	29	120	76
Ventilation volume	20	97	13
Airway pressure	39	177	24
Expired CO_2 partial pressure (concentration)	22	238	10
O_2 analyser-fresh gas	55	229	12
O_2 analyser-inspired gas	32	227	14
Inspired anaesthetic vapour	23	46	3
Peripheral nerve stimulator	9	50	5
Ventilator alarm-disconnect	27	153	21
Urine output	6	23	29
Other	17	28	20

There were 11 questionnaires in which there was an unequivocal record that *no monitoring* was used at all (ie at any phase of the anaesthetic). 4 of these were procedures done under local analgesia performed by junior surgeons and no anaesthetist was present. Most (8) were very minor procedures which lasted less than 15 minutes, however, one case was a tonsillectomy: the consultant anaesthetist in a DGH intubated the trachea and paralysed a three year-old child in order to ventilate the lungs for a 45-minute operation. "My writing on the form is illegible" was the comment written on the questionnaire. Nevertheless there was no monitoring.

84% of these patients were monitored with an ECG, 64% with an oximeter and 46% had indirect arterial blood pressure measured.

9% index questionnaires indicated that patients had temperature measured during the operation and in 17% the oxygen concentration was measured.

Controlled ventilation of the lungs was used in 336 cases (see table A27): a disconnect alarm was used in 45% of these. Muscle relaxants were used on 430 occasions during maintenance of anaesthesia (see Table A53): a peripheral nerve stimulator was used in 12%. The simplest monitor of breathing, a chest wall or oesophageal stethoscope, was used in 16% of cases.

The figures for the use of monitoring devices during *recovery* are substantially less than for the period of the operation and, in particular, the 15% usage of oximeters is notable.

Table A26 (q50) **Non-medical help**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	89	168	1348
No	1	-	12
Not answered	-	4	7
If yes,			
	n=89	*n*=168	*n*=1348
Trained anaesthetic nurse	18	33	308
Trained ODA	69	138	977
Trainee anaesthetic nurse	-	1	51
Trainee ODA	4	9	47
Operating department orderly	5	3	65
Other	4	13	85
Not answered	-	-	19

(Multiple answers are included)

The absence of non medical help in the single non-cardiac death was recorded about an urgent case that took place at (21.00hrs) on a Friday evening in a specialist children's hospital. The 7-year-old child had a cerebral abscess, was anaesthetized by a senior registrar and a registrar, and had already had major cardiac and alimentary surgery. The absence of assistance did not appear to contribute to the child's death three weeks later.

It is clear from these tables that non-medical help was available for most cases but the adequacy of that help was not determined. If those rows above the dotted line represent attendance at separate cases almost all anaesthetists, including those for most index cases, were helped by trained staff.

Table A27 (q26) **Mode of ventilation**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Spontaneous	4	-	1025
Controlled	86	168	336
Not answered	-	4	13
If controlled,			
Manual	37	35	151
Machine	53	140	182
Not answered	-	-	6

(Multiple answers are included)

The four children who breathed spontaneously during non-cardiac surgery and yet subsequently died were undergoing relatively minor procedures during the management of complex conditions. One child, with Fallot's tetralogy had a laryngoscopy after plication of the diaphragm; one was to have a 'portocath' changed during chemotherapy; one who had grommets inserted before a cortical mastoidectomy had both cerebral palsy and widespread bronchiectasis; and one child was to have a dental clearance before cardiac surgery (and further information was not made available).

Table A28 (q55) **Blood loss assessment**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	81	143	752
No	7	22	600
Not answered	2	7	15
If yes,			
Visually only	27	28	593
Swab weighing	34	12	76
Sucker volume	37	65	99
Colorimetric	5	2	7
Other	7	76	13
Not answered	-	1	4

Four non-cardiac patients did not require the assessment since no blood loss was to be anticipated. Blood loss could be anticipated in three non-cardiac patients (two laparotomies and one craniotomy), did occur, and yet there was no indication of its assessment on the questionnaire.

22 of the replies about cardiac cases stated that blood loss was *not* assessed. Blood loss obviously *was* assessed during surgery in these cases by means other than those specified (cardiovascular pressures and reservoir volumes on the bypass machine) and most of the other replies about cardiac cases did indicate this fact.

Table A29 (q56) **Untoward incidents during anaesthesia**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	37	108	61
No	53	62	1291
Not answered	-	2	15
If yes,			
Air embolus	-	1	-
Airway obstruction	-	2	11
Bradycardia	7	31	4
Bronchospasm	1	1	4
Cardiac arrest (unintended)	9	42	-
Convulsions	-	-	-
Cyanosis	6	13	7
Arrhythmia	5	41	6
Hyperpyrexia (>40^{0}C or very rapid increase in temperature)	-	2	-
Hypotension	25	81	12
Hypoxia	9	23	7
Pulmonary aspiration	3	-	-
Pneumothorax	3	-	-
Other	5	16	19
Not answered	-	-	2

Non-cardiac deaths

Hypoxaemia occurred on 9 occasions. These were 4 very sick (ASA 5) children in whom this was present before operation and was successfully corrected on tracheal intubation and controlled ventilation of the lungs. There were two cases of chronic renal failure and gross septicaemia; one case of neurogenic pulmonary oedema; one diaphragmatic hernia and one child with major head, thoracic and abdominal injuries. It is clear that in all these cases there was sufficient gross pathology to account for the events and, interestingly, oximetry was used in all of these cases.

There were five *other* complications. Two were deaths on the table: one neurosurgical for severe cerebral injury and one laparotomy for gross sepsis. Major surgical haemorrhage was reported during liver resection once. Distension of the abdomen interfered with postoperative ventilation after laparotomy so that respiratory acidosis and hypoxaemia persisted until death in two children.

Cardiac deaths

The *air embolus* occurred during surgery on cardiopulmonary bypass for a ventricular septal defect. Appropriate resuscitative measures were unavailing.

The two cases reported as *hyperpyrexia* were not since the temperature neither exceeded 40^0C nor did it increase rapidly.

There were two deaths in which *airway obstruction* occurred. Gross pulmonary oedema was associated with a very complex congenital heart defect in one case. The other concerned a 1.3kg neonate with a patent ductus whose tracheal tube slipped into the right main bronchus during mediastinal manipulation. The procedure was performed in a single surgical specialty hospital but the child died soon after with renal failure secondary to necrotising enterocolitis and an unclosed ventricular septal defect.

The *other* complications (16) included eight children who could not be weaned from cardiopulmonary bypass. Excessive surgical haemorrhage was recorded in three patients. Surgical compression of the lung, sufficient to hinder proper ventilation, was reported once. There was one minor incident of technical difficulty with pressure monitoring. Overwhelming pulmonary oedema occurred once. Severe arrhythmias occurred twice.

Index cases

There were relatively few untoward incidents reported amongst the index cases.

There were 11 index questionnaires in which *airway obstruction* was recorded. These were all transitory events. Six of the patients were monitored with oximetry, in one of whom a tracheal tube kinked for less than 1 minute and the oxygen saturation decreased to 85%. All the events were apparently treated promptly and a satisfactory outcome followed.

Hypoxaemia was reported during seven anaesthetics. Six of these patients were monitored with oximetry. Two cases are informative.

Laparotomy for intussusception in one six-month-old infant was performed in a DGH. The consultant had anaesthetized one child each month of this age during the last year. Tracheal administration of nitrous oxide, oxygen and halothane was achieved with manual ventilation, but without muscle relaxant. Hypoxaemia, judged by oximetry, occurred intermittently and was associated with inadequate anaesthesia.

The other case occurred in a single surgical specialty hospital and was that of a two-year old child who was having his lacrimal ducts syringed. Induction was with cyclopropane but laryngospasm from light anaesthesia required that a tracheal tube be passed under nitrous oxide, oxygen and enflurane. The situation was resolved satisfactorily; a pulse oximeter was not used.

Table A30 (q57) **Mechanical failure of equipment**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Failure of equipment for IPPV	1	-	-
Failure of equipment for cardiopulmonary bypass	-	1	-
Other	2	2	4

There were six cases amongst all the *deaths* in which mechanical failure of equipment was reported. These failures did not contribute to the subsequent deaths. There was a faulty wire of a pacemaker which was promptly replaced. A syringe pump failed and resulted in the temporary delivery of a small dose of inotropic agent in a cardiac surgical patient. The low level pressure alarm on the venous return side of a bypass machine failed. A consultant anaesthetist was unable to obtain satisfactory ventilation of the lungs with a Nuffield ventilator and Newton valve but manual ventilation was satisfactory. A laryngoscope bulb failed (despite earlier test); incidentally this DGH undertook neurosurgery but there is no automatic ventilator for use with children in the operating room. The printer for a capnograph failed in another case.

There were four *index* questionnaires which reported mechanical failure. Airway obstruction occurred in a 9-year-old child anaesthetized by a consultant anaesthetist who was using a laryngeal mask airway for the first time. Airway obstruction revealed by oximetry, resulted from a kink in a tracheal tube connector once. Faulty radiographic equipment caused prolongation of surgical procedure in one other case and in the fourth report no explanation was given.

Table A31 (q65) **Early complications within 24 hours after operation**

	Deaths (non-cardiac) *n*=85*	Deaths (cardiac) *n*=119*	Index
Yes	68	108	45
No	13	6	1289
Not answered	4	5	33
If yes,			
Airway problems	4	3	9
Bleeding sufficient to require postop transfusion or reoperation	17	42	8
The need for mechanical ventilation of the lungs	48	82	5
Septicaemia	17	9	2
Renal failure sufficient to require dialysis	10	28	-
Central nervous system failure (persistent coma) failure to recover consciousness, convulsions	21	7	-
Other	23	64	16
Not answered	1	1	11

*excludes patients who died in theatre

Non-cardiac deaths

The 4 *airway problems* included one each of the following instances. Intermittent positive pressure ventilation of the lungs after an operation for laryngomalacia; brain death after craniotomy for a tumour in the posterior fossa; change of tracheal tube during routine postoperative ventilation after thoracotomy; one unexplained. None of these instances seemed directly related to the deaths.

Cardiac deaths

The 3 cases in which *airway problems* were reported all patients all happened for other reasons (than the problems with the airway) to patients who received routine ventilation of the lungs after surgery.

Index cases

The 9 cases in which *airway problems* were reported included two instances of acute respiratory infection and two of transient bronchospasm. Another child had laryngospasm in the recovery room. Another (33kg) required tracheal re-intubation, after 0.075mg intravenous buprenorphine caused apnoea. Excessive secretions caused the upper airway to be obstructed temporarily in one child. One child had breathing difficulties during feeding after surgery to the lip. There was neither explanation nor an anaesthetic record, in one other child.

Table A32 (q68) **Complications with postoperative analgesic drugs**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
	n=52	*n*=103	*n*=669
Yes	2	3	9
No	50	99	659
Not answered	-	-	1

n=number of cases in which postoperative analgesic drugs administered

Deaths

There were 5 reports. The lungs of the first three patients were being ventilated. 0.25mg morphine was given intravenously to a neonate who weighed 1.02kg; the blood pressure promptly recovered after intravenous fluids. An unspecified amount of intravenous papaveretum, prescribed to be given as required, had a similar hypotensive effect in another cardiac surgical patient and was successfully treated. Another child was known to be at risk from hypotension after cardiac surgery and was therefore given intravenous ketamine but intermittent inhalation of isoflurane was also used for additional sedation but hypotension remained a problem. Two milligrams of intravenous papaveretum were given to a child (17kg) who had a cardiac transplant: treatment for pain was required but respiratory depression was sufficient to prompt reintubation of the trachea and positive pressure ventilation of the lungs. The other case in which problems arose is reported elsewhere (Case 1) and is the only example in which the use of analgesics after operation seems to have contributed to the fatal outcome.

Index cases

There were 9 reports. Seven of these were nausea and (or) vomiting after a variety of analgesic drugs. A syringe pump failed to deliver any analgesia in one case. It was also reported here that one child vomited on removal of laryngeal mask airway.

Table A33 (q75) **Morbidity/mortality reviews**

	Non-cardiac	Cardiac
Yes	84	135
No	6	33
Not answered	-	4
If yes, will case be discussed?		
Yes	33	44
No	51	91

Many of the negative answers are from one hospital in which communication between surgeons and anaesthetists is at a noteworthy low level. However the same problem exists in the independent sector and a consultant anaesthetist replied "No, not in private practice". The absence of information on an anaesthetic record from these hospitals does not help.

The index questionnaire did not, this year, ask about morbidity review meetings so we are unable to comment about the general availability of fora for discussion.

SURVIVOR CASES

The difficulties of matching a death with a survivor are mentioned on pages 1-2. NCEPOD received 12 questionnaires from anaesthetists about survivors (and 15 from surgeons) out of a possible 62 which were requested. However, many surgeons replied that they had no suitable case on which to report. When forms were received such were the discrepancies in age, diagnoses and operative procedures, that there seemed to be no virtue in an attempt to make comparisons, particularly since preliminary screening of the questionnaires from *anaesthetists* revealed no differences.

The example below gives some idea of the problem.

Two cases of diaphragmatic hernia

Both operations took place in special children's hospitals. The anaesthetists had equivalent training and experience.

Survivor	Death
Staff	
Consultant anaesthetist and locum registrar	Senior registrar anaesthetist (consultant came to help) and SHO
Consultant surgeon	Senior registrar surgeon (after consultation)
Age	
FTND 2nd day of life	FTND 3rd day of life
Weight	
3.15kg	3.2kg
Laboratory results	
Haemoglobin 18.2gm/100ml	11.4gm/100ml
White blood cells 19 x 10^9/litre	26 x 10^9/litre
Sodium 126mmol/l	119 mmol/l
Potassium 4.4mmol/l	6.7 mmol/l
Chloride 101mmol/l	93mmol/l
Bicarbonate 20mmol/l	11mmol/l
Urea 8.0mmol/l	2.6mmol/l
Blood gas analysis. Not done	Report unavailable
Treatment before theatre	
Antibiotics	Lungs ventilated with assistance of atracurium and morphine infusions. Saturation 95% but inspired oxygen not noted.
80ml 10% dextrose (0.18% saline) and 30ml albumin before surgery	30ml 10% dextrose (0.18% saline) and 15ml plasma protein fraction
ASA3	ASA4
Operation classification	
Scheduled (11.15hrs,Tuesday)	Urgent (10.30hrs, Friday)
Duration of surgery	
1 hour	1 hour 20 mins

Intravenous fluids during surgery	
8ml dextrose 10% (0.18% saline)	30ml dextrose 10% (0.18% saline)
Monitoring	
Manual pulse, indirect BP, pulse oximetry and capnography	Indirect BP, ECG, pulse oximetry, stethoscopy and urine output
Outcome	
Discharged to another hospital 17 days later and continued to thrive.	Died on 15th day of life. Macroscopically hypoplastic lung at post mortem.

There were no other differences reported to us.

The neonate who died was apparently anaemic with a leucocytosis and the reported (to us) serum electrolytes were abnormal: none of these appears to have had immediate effect on outcome.

CASE SUMMARIES

Case 1

A small child (11.3kg) sustained 2% (*sic*) burns on the buttocks was admitted to a Burns unit. The child died 13 hours after uneventful anaesthesia and surgery for debridement. The estimated blood volume was 880ml but 200ml saline and 150ml starch were given during the procedure for an estimated fluid loss of 200ml. The haemoglobin after operation was 8.8gm/100ml (there was no report before operation) and a blood transfusion of 200ml over 4 hours was prescribed together with 45ml/hour of "dextrose saline". Intravenous analgesia was also prescribed to be by a, continuously variable rate, infusion of papaveretum (0.5mg/hr - 4mg/hr) which, from 23.00 until death at 05.15 was 2mg/hr. (This range, it should be understood, would in an adult be 3.5-28mg per hour and 14mg/hr for the last six hours). Difficulty in breathing and 'bubbly respirations' were reported. There is no information about other events immediately before death.

Case 2

A 3-year-old child with Morquio's syndrome had a posterior occipitocervical fusion. The patient was otherwise fit before operation but died either one or three days after operation (the two questionnaires do not agree) in a general intensive therapy unit for adults and children in a University hospital. Anaesthesia was administered by an anaesthetist who had not given any anaesthetics to children aged less than six months in the last year but had given 30 to children less than 3 years of age. There were specialist children's anaesthetists on call in this hospital. No specific attempts to maintain body temperature were used and blood loss was assessed by observation of the volume in the sucker. It was known that tracheal intubation was difficult since an anaesthetic was given on the previous day; the tracheal tube was left in place after operation but "fell out".

Case 3

A two-year-old child was seriously injured in a road traffic accident. An ambulance broke down between the site of the accident and its destination. She was taken at first to a small hospital. The SHO (Accident and Emergency) on duty there was unable to start an intravenous infusion. Transfer to a University Hospital was arranged between two SHOs and culminated in the admission in turn to a children's ward by a paediatric SHO. The relevant and immediately available junior staff and consultants (surgeons and anaesthetists) were not contacted until 1 hour and 40 minutes after the accident. The two hospitals concerned are four miles apart. There were major abdominal injuries whose management was jeopardised by these non-clinical factors. The child died two days later in an intensive care unit for adults and children.

Case 4

A locum consultant anaesthetist was responsible for the management of a very sick (ASA 4) child who was 9.75 years of age. The surgeon was a (post FRCS) locum clinical assistant. The child was hyponatraemic, dehydrated, had pus in the middle ear and was known to have agammaglobulinaemia. Laparotomy revealed an ileocaecal intussusception but meanwhile the child's condition had deteriorated to cardiac arrest. No premedication was given. Thiopentone 50mg was given to induce anaesthesia in this 20-kg child. No vapours were used. A rapid sequence induction with cricoid pressure was used and after 20 minutes of manual ventilation of the lungs with 50% oxygen and nitrous oxide, the child was pronounced dead. Monitoring was with non-invasive blood pressure, ECG and pulse oximetry, but the anaesthetic record is blank. Neither the training in paediatric anaesthesia which the consultant had received nor the current experience was recorded. [The form was completed by the College Tutor]. No central venous line was used and the resuscitation attempts appeared superficially to be satisfactory.

Case 4(a)

(This case report is actually from the series of index cases, for definition see page 114 but the admission details, age and operation are sufficiently close to Case 4 for the information to be used as a report on a survivor).

The child was 10 years old on emergency admission to a District General Hospital. She was european and weighed 28.7kg. The operation, performed by a consultant surgeon, was for colocolic intussusception and was a hemicolectomy. Anaesthesia was provided by a registrar and senior house officer who did not inform a consultant at any stage. There is no special on call consultant rota for children. The registrar had a little experience with children aged less than 3 years and had anaesthetized 20 children in the last year. The child was described as ASA 2 because of untreated asthma and the (unproven) diagnosis of Peutz-Jegher syndrome. There were no other abnormal findings before operation. Supplementary venous access was established and anaesthesia, after use of cricoid pressure and preoxygenation, was with etomidate, suxamethonium, pethidine, droperidol, nitrous oxide and enflurane. The lungs were ventilated artificially with a Nuffield Penlon ventilator. Monitoring was with non-invasive blood pressure, ECG, inspired oxygen and expired carbon dioxide. The operation lasted two hours. All the details are recorded precisely in the anaesthetic record. Analgesia was provided afterwards with an intravenous infusion of up to 8mg/hour of pethidine (278(mcg/kg)/hr).

Case 5

A two-month-old child (ASA 2) had an irreducible right inguinal hernia and was admitted to a District General Hospital. Birth was premature at 32 weeks' gestation, intensive neonatal care was necessary for three weeks and this included intermittent positive pressure ventilation of the lungs. A left-sided herniotomy was done two weeks before without complications.

A registrar conducted the anaesthetic, after consultation with a consultant anaesthetist, who was not otherwise involved. The registrar had anaesthetized 10 children aged less than six months and 15 aged less than 3 years during the last year. An awake tracheal intubation was accomplished 3.25 hours after a milk feed and manual ventilation of the lungs with nitrous oxide, oxygen and isoflurane continued for the urgent operation. Relaxant drugs were not used. Monitoring included an ECG, pulse oximetry, automatic blood pressure, temperature and stethoscopy. There is neither a record of administration of intravenous fluids nor of intravenous access. The trachea was extubated at the end of surgery and the baby then transferred to an incubator. The record is not entirely clear about events at this stage. Hypoxia, cardiac arrest and re-intubation of the trachea certainly happened and death ensued. Autopsy showed pneumothorax, ruptured bullae and collapse of the right lower lobe, half the middle lobe and the upper lobe of the lung. No report on the histology of the lung was made available to us.

Case 5(a)

A consultant anaesthetized a five-month old boy with bilateral inguinal herniae (ASA 1) who was admitted electively as a day case to a District General Hospital. No premedication was given and an inhalation induction for anaesthesia was used with nitrous oxide, oxygen and halothane. An intravenous cannula was inserted and fentanyl administered. Monitoring was by manual palpation of the pulse, a pulse meter, and an ECG. Atropine was necessary to treat bradycardia during anaesthesia. The child was discharged home the same day.

CONCLUSIONS (ANAESTHESIA)

The tables and narrative must be inspected and inferences drawn by the reader. The group of consultant anaesthetists who advised the writer were prevented by the protocol from expressing opinions about each case, nevertheless they did form them about the standards of practice as revealed both in the series of deaths and in the index cases.

1. It should be noted that most of the deaths occurred in very sick children whose condition was often compounded by many complex congenital abnormalities.

2. It was, in general, pleasing to see that children were managed by consultant staff, most of whom had relevant and current experience with children. There were, however, two types of hospitals wherein this desirable provision could not always be attained: the District General Hospital, which had to cope with multiple injuries in an infant and the specialist, quaternary, referral centre. The staff of both types of hospital, though expert in their own field, were not necessarily also particularly expert with small children: this is understandable but more attention might need to be given to this matter.

3. The frequency with which non-invasive blood pressure, ECG and pulse oximetry was used is noted on pages 132-137. The use, in contrast, of non-invasive and inexpensive monitors, particularly of breathing (precordial or oesophageal stethoscopy), but also of temperature measurement, is very low and regrettably so.

4. The absence of recognised standards for the provision of services of anaesthesia for children makes it inappropriate for NCEPOD to comment about minimal requirements of training and current practice in anaesthesia for children: the group of consultant anaesthetists recognise, not only that there is a problem, but also that it should be addressed.

5. The method whereby *index* and *survivor* cases are selected is not satisfactory. Criteria for the selection of index cases which are relevant for study by surgeons are not necessarily so for selection of cases for study by anaesthetists.

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TABLES

Table A34 (q3) **Grades of all anaesthetists present at anaesthetic**

	Deaths	Index
Senior House Officer	19	355
Registrar	116	292
Senior Registrar	137	153
Consultant	233	855
Associate Specialist	2	41
Clinical Assistant	1	87
GP	-	5
Hospital Practitioner	-	3
Other	-	2*
Not answered	2	7
Not appropriate (eg anaesthetised by a surgeon)	-	3

*- Observer
- Lecturer

Table A35 (q3) **Grades of all anaesthetists present at anaesthetic (Cardiac deaths)**

Senior House Officer	2
Registrar	84
Senior Registrar	84
Consultant	163
Associate Specialist	1
Clinical Assistant	-
Not answered	2

Table A36 (q3) **Locums**

	Deaths (non-cardiac) (10 cases total)	Deaths (cardiac) (10 cases total)	Index (118 cases total)
Senior House Officer	2	-	19
Registrar	1	2	24
Senior Registrar	3	6	13
Consultant	6	3	55
Associate Specialist	-	-	2
Clinical Assistant	-	-	3
GP	-	-	-
Hospital Practitioner	-	-	-
Other	-	-	1*

Table A37 (q11) **Advice sought from another colleague**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	26	12	94
No	64	158	1293
Not answered	-	2	10
If yes, from whom?			
Senior House Officer	1	-	1
Registrar	-	-	21
Senior Registrar	3	-	9
Consultant	23	12	66
Associate Specialist	-	-	-
Clinical Assistant	-	-	-
General Practitioner	-	-	-
Hospital Practitioner	-	-	-
Other	2*	-	-

*Consultant paediatrician

(Advice was sought from more than one individual in some cases).

Table A38 (q12) **Help from a colleague**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	34	8	120
No	51	155	1197
Not answered	2	9	50
If yes, from whom?			
Senior House Officer	5	-	39
Registrar	6	2	30
Senior Registrar	7	3	10
Consultant	20	4	48
Associate Specialist	-	-	-
Clinical Assistant	-	-	-
General Practitioner		-	-
Hospital Practitioner		-	-
Other	1*	-	-

*SHO, Registrar and Consultant Paediatrician

Table A39 **Age of patient**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
	n=90	*n*=172	*n*=1367
up to 1 month	26	51	927
> 1 month to 6 months	18	43	273
> 6 months to 1 year	2	14	64
> 1 year to 3 years	22	27	88
> 3 years to 10 years	22	37	13
Date of birth not given	-	-	2

Table A40 **Ethnic group**

	Deaths						Index					
	a	b	c	d	e	f	a	b	c	d	e	f
Hospital type												
District General	2	-	-	-	-	-	909	10	35	1	-	3
University	50	2	7	-	-	2	166	7	13	2	-	-
Special	106	3	11	-	-	1	80	6	5	1	-	-
Children's												
Ministry of	-	-	-	-	-	-	27	-	-	-	-	-
Defence												
Single Surgical	27	-	4	1	-	-	58	3	7	-	-	1
Specialty												
Independent	6	-	5	-	3	1	2	-	-	-	-	-
Other	12	-	1	-	-	-	31	-	-	-	-	-
Totals	221	5	28	1	3	4	1273	26	60	4	-	4

a = European
b = African
c = Asian
d = Oriental
e = Other
f = Ethnic group not given

Table A41 (q25) **Coexisting medical diagnoses**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
None	22	168	1065
Respiratory	38	31	139
Cardiac	71	172	41
Neurological	4	14	40
Endocrine	70	1	4
Alimentary	27	13	16
Renal	12	12	12
Musculoskeletal	8	4	31
Haematological	17	10	15
Genetic abnormality	6	29	29
Other	20	20	61

Table A42 (q27) **Drug therapy before surgery**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
None	15	34	1101
Antibiotic	51	59	100
Anticonvulsant	8	5	9
Antidiabetic	1	3	3
Antiarrhythmic	1	6	1
Antihypertensive	5	12	1
Bronchodilators	2	10	76
Cardiac glycoside	-	44	5
Cytotoxic	5	-	2
Diuretic	20	99	9
Phenothiazine derivatives	3	4	12
Steroid	8	4	18
Other	42	78	93

Table A43 (q28) **ASA Grades**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Class 1	2	-	1112
Class 2	8	4	206
Class 3	13	31	30
Class 4	37	105	10
Class 5	29	32	-
Not answered	1	-	9

Table A44 **ASA Grades (Index cases)**

	1	2	3	4	5	Not answered
Hospital Type						
District General	808	131	9	2	-	8
University	144	30	8	5	-	1
Special Children's	59	21	10	2	-	-
Ministry of Defence	23	3	1	-	-	-
Single surgical specialty	53	13	2	1	-	-
Independent	1	1	-	-	-	-
Other	24	7	-	-	-	-
Totals	1112	206	30	10	-	9

96% index cases were ASA 1 or 2 patients

Table A45 (q31) **Premedicant drugs administered**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	23	93	915
No	67	79	447
Not answered	-	-	5
If yes, which drugs?			
Atropine	16	50	392
Chloral Hydrate	-	7	10
Diazepam (eg valium)	3	3	56
Droperidol	1	4	47
Fentanyl	-	-	0
Glycopyrronium (Robinul)	-	-	0
Hyoscine	-	24	81
Lorazepam (eg Ativan)	-	1	4
Ketamine	-	-	0
Methohexitone	-	-	1
Morphine	1	15	21
Papaveretum (Omnopon)	-	29	71
Pethidine	-	1	39
Temazepam	1	5	61
Promethazine (eg Phenergan)	-	1	17
Thiopentone	-	-	4
Trimeprazine (Vallergan)	2	29	499
Other	4	21	196

Table A46 (q35) **Respiratory therapies in use before operation**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	57	80	16
No	33	88	1335
Not answered	-	4	16
If yes,			
Oxygen therapy	34	32	8
Artificial airway	25	15	5
Ventilatory support	46	59	8
Not answered	-	-	3

(Multiple answers included)

Table A47 (q38) **Classification of operation**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Emergency	30	12	39
Urgent	39	62	162
Scheduled	17	79	152
Elective	4	19	1008
Not answered	-	-	6

Table A48 (qs39-41) **Duration of operation**
(from time of start of anaesthetic to transfer out of operating room)

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Up to 30 minutes	2	-	591
>30 minutes to 1 hour	23	4	451
>1 hour to 2 hours	27	9	167
>2 hours to 4 hours	22	42	46
>4 hours	10	81	9
Not answered	6	36	103

Table A49 (q44) **Intubation of trachea at induction**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	69	146	719
No	20	21	640
Not answered	1	5	8
If yes,			
Orotracheal	56	55	669
Nasotracheal	13	94	37
Other	-	1	6

NB - more than one route used in some cases

Table A50 (q45) **Muscle relaxants used for intubation**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
	n=69	*n*=146	*n*=719
Yes	44	126	564
No	15	11	149
Not answered	10	9	6

Table A51 (q47) **Intravenous fluids during operation**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	83	164	194
No	7	4	1169
Not answered	-	4	4
If yes,			
Crystalloid			
Dextrose 5%	1	35	10
Dextrose 4% saline 0.18%	36	40	111
Dextrose 10%	12	11	5
Saline 0.9%	11	4	16
Hartmann's	3	26	31
Half strength Hartmann's (or saline) and 5% glucose	2	1	12
Other	11	34	15
Colloid			
Modified gelatin (Gelofusin, Haemaccel)	12	5	6
Albumin 4%	11	10	3
Starch (HES)	3	2	1
Dextran	-	1	1
Plasma protein fraction	18	39	9
Other	13	19	3
Blood			
Whole blood	35	125	25
Red cell component	10	10	7
Other component	12	43	5

Table A52 (q51) **Measures taken to maintain body temperature in operating room (if duration of operation 60 minutes or longer)**

	Deaths (non-cardiac) *n*=69	Deaths (cardiac) *n*=132
None	4	4
Ambient room temperature adjustment	44	98
Water/air/electric underblanket	55	122
Overhead heater	5	4
Specific lagging of patient	32	44
Warmed intravenous fluids	32	82
Inspired gas humidification	25	94
Other	3	24
Not answered	-	1

Table A53 (q54) **Muscle relaxants during anaesthetic**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	81	170	430
No	8	-	881
Not answered	1	2	56

Table A54 (q58) **Specific recovery area available**

	Deaths (non-cardiac)	Deaths (cardiac)	Index
Yes	65	64	1296
No	16	45	61
Not answered	4	10	10
Not applicable (ie died in theatre)	5	53	-

Table A55 **Facilities available (non-cardiac deaths)**

	DGH	University	Special Children's	MOD	Single Surgical Specialty	Independent	Other
SCBU	12	22	5	-	-	-	-
Neonatal ICU	4	23	19	-	-	-	-
HDU solely for children	3	7	12	-	-	-	-
HDU for children and adults	-	7	-	-	2	-	-
ICU solely for children	2	12	27	-	1	-	-
ICU for children and adults	15	26	-	-	3	-	2
Children's ward	16	28	28	-	1	-	3
Children's bed in adult ward	3	5	-	-	1	-	-

This question was not answered on *two* questionnaires.

Table A56 **Facilities available (cardiac deaths)**

	DGH	University	Special Children's	MOD	Single Surgical Specialty	Independent	Other
SCBU	-	10	3	-	4	2	-
Neonatal ICU	-	11	29	-	1	-	-
HDU solely for children	-	4	44	-	11	15	2
HDU for children and adults	-	2	-	-	3	3	-
ICU solely for children	-	13	84	-	20	2	8
ICU for children and adults	-	15	-	-	7	15	2
Children's ward	-	22	92	-	22	5	8
Children's bed in adult ward	-	1	-	-	-	-	-

This question was not answered on 10 questionnaires.

Table A57 **Facilities available (index cases)**

	DGH	University	Special Children's	MOD	Single Surgical Specialty	Independent	Other
SCBU	630	122	8	2	1	1	5
Neonatal ICU	160	97	51	2	1	1	1
HDU solely for children	90	44	35	2	3	1	-
HDU for children and adults	99	33	-	6	16	-	8
ICU solely for children	19	54	85	1	3	-	1
ICU for children and adults	733	2	-	14	6	2	13
Children's ward	899	177	92	20	56	2	22
Children's bed in adult ward	156	25	-	7	11	-	11
Not answered	6	5	-	-	-	-	1

15% index questionnaires stated that the hospital had beds for children on adult wards: 11% children actually went to such beds on discharge from recovery.

37% index questionnaires indicate that children may be admitted to 'mixed' adult and children's intensive therapy units; 12% questionnaires indicate that there is a unit solely for children; 12% 'mixed' high dependency units, and 13% solely for children. (These percentages include questionnaires from special children's hospitals).

Table A58 (q66) **Analgesic drugs given in first 48 hours after operation**

	Deaths (non-cardiac) *n*=85*	Deaths (cardiac) *n*=119*	Index
Yes	52	103	669
No	29	12	644
Not answered	4	4	54

*excludes patients who died in theatre

Table A59 (q67) **Other sedative/hypnotic drugs given**

	Deaths (non-cardiac) *n*=85*	Deaths (cardiac) *n*=119*	Index
Yes	15	59	31
No	64	54	1280
Not answered	6	6	56

*excludes patients who died in theatre

Table A60 **Place of death/ASA Grade (non-cardiac deaths)**

	ASA grade				
	1	2	3	4	5
Theatre	-	1	-	1	3
Recovery	-	-	-	1	-
Special Care Baby Unit	-	-	2	6	2
Intensive Care Unit	1	4	9	22	22
High Dependency Unit	-	-	-	-	-
Ward	1	1	1	7	1
Other	-	2	1	-	1

Table A61 **Place of death/Operation classification (non-cardiac deaths)**

	Emergency	Urgent	Scheduled	Elective
Theatre	3	2	-	-
Recovery	-	-	-	1
Special Care Baby Unit	3	6	1	-
Intensive Care Unit	22	25	9	3
High Dependency Unit	-	-	-	-
Ward	1	5	5	-
Other	1	1	2	-

Table A62 **Place of death/ASA grade (cardiac deaths)**

	ASA grade				
	1	2	3	4	5
Theatre	-	-	8	35	11
Recovery	-	-	-	-	-
Special Care Baby Unit	-	-	-	-	-
Intensive Care Unit	-	4	22	64	21
High Dependency Unit	-	-	-	2	-
Ward	-	-	1	1	-
Other	-	-	-	2	-
Not answered	-	-	-	1	-

Table A63 **Place of death/Operation classification (cardiac deaths)**

	Emergency	Urgent	Scheduled	Elective
Theatre	4	26	23	1
Recovery	-	-	-	-
Special Care Baby Unit	-	-	-	-
Intensive Care Unit	8	34	51	18
High Dependency Unit	-	1	1	-
Ward	-	-	2	-
Other	-	-	2	-
Not answered	-	1	-	-

Table A64 (q73) **Discharge destination (Index cases)**

Home	1315
Another hospital	17
Convalescent home	-
Rehabilitation	3
Other	1
Not answered	31

APPENDICES

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
ASSOCIATION OF SURGEONS OF GREAT BRITAIN AND IRELAND
ROYAL COLLEGE OF SURGEONS OF ENGLAND
COLLEGE OF ANAESTHETISTS AT THE ROYAL COLLEGE OF SURGEONS OF ENGLAND
FACULTY OF COMMUNITY MEDICINE OF THE ROYAL COLLEGES OF PHYSICIANS OF THE UK
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

*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.

APPENDIX B

CONSULTANT ANAESTHETISTS who have returned completed questionnaires (and have been identified by consultant surgeons)

Northern

A E Arrowsmith
J I Andrews
J Baldasera
M Berry
M R Bryson
J Carter
P Cauchi
P Chandrasiri
K Clark
R J H Colback
I Conacher
A Conn
H B Contractor
D C Crawford
S G H Cruickshank
D J H Daniel
B Dennison
R S Drummond
R M Freeman
E N S Fry
R Gautam
N Ghosh
R Goodwin
G Harris
D W Heaviside
N M Heggie
E Holmes
L A G Jayasekera
M K Johnson
D F Jones
E L Katcha
C M Kumar
G W Kuvelker
M Lothian
L J Mackay
I M J Mair
M Mehta
A C McKnight
J M Newbery
P T F Newnam
K W Nightingale
M L Paes
M A Quader
D Raitatha
N Redfern
P Richie
A B Shanks
J J H Sherriff
M Stafford
L M Thompson-Hill
D C Townsend
I Ulyett
C J Vallis
G van Mourik
B E Welsh
R Will
D W Wood

Yorkshire

K Aggarwal
N K S Al Quisi
P Banerjee
S Basu
M Bembridge
P J Bickford-Smith
I Blacker
E Bland
S Brayshaw
R J Brooks
P M Brown
J Caddy
R R Chatrath
D A Child
D Clark
A T Cohen
J B Conlon
A D Crew
P C Cutler
J A Dewar
J B Dyson
A H Entress
M Evans
S Firn
R P Foo
L G Gardner
J Gibson
W Hinton
J M Hipkin
D S Hutton
D G Jackson
B Kamath
J D Kinnell
P A Knappett
P Komierowski
P J A Lesser
I Locker
P J Moss
J M McDowell
P E North
J Panday
D Powell
Q L A Robinson
W J Price
L A M Sharaf
I D Somerville
A F Stakes
S Swindells
P G Tannett
J Thomson
R A Truesdell
M J Wade
J M Ward-McQuaid
J M N Waterland
R G Wheatley
G T Whitfield
D P Winder
C J Wright
A Yates

Trent

B A Abercrombie
D W Atherley
I Barker
G N Batchelor
A P G Beechey
N R Bennett
Bexton
J R Bowers
V Boyd
J L Breckenridge
P T Bull
Carmichael
Chatterjee
B R Cotton
W J Colbeck
P S Cossham
C Day
R J Eastley
R Edwards
D Fell
G D Flowerdew
J M Frayne
S P Gerrish
J Goddard
D E Hoffler
C D Hanning
K M Harrison
T J Hawkins
E S Howell
T J Hughes
J E Hunsley
A D Jardine
S Kethar-Thas
R L J Kohn
D G Lewis
J L Martin
A J Matthews
P J Mawson
I McLellan
B R Milne
L Mulrooney
A Murray-Wilson
D M Newby
C O Onugha
P R Rayner
A J N Renshaw
N H Pereira
H Raithatha
D G Raitt
P J Randall
M T Ross
D Rogerson
H G Schroeder
H A O Shater
K M Sherry
D M Shewan
H K Stacey
C M Stray
P E Tatham
D A B Turner
M J Wolfe
R Wyatt
P Yeoman

East Anglian

C N Adams
A J B Barclay
G L Barker
M H Cook
A M C Cooper
R E Davies
N M Denny
D J Elliott
S Farquharson
M Farrell
R N Francis
P Furniss
C Glazebrook
G Gordon-Grey
S G C Harrison
J M F Hartley
M Herrick C Hodgson
P C W Hunt
J R Jenkins
C Jolly
R M Jones
J Kneeshaw
M Lindop
R A M Mann
P J Morris
A Naunton
J Newell
W G Norcutt
J S M Ogden
T Ogg
J Pearce
V Price
R Purnell
S Ross
P Sachdeva
A K Samaan
M Smith
G W Thomas
D J Turner
H Wanninayake
B Wilkey
M M Wright

North West Thames

D M Bailey
M Burbidge
P Chakrabarti
A Coleman
R Cormack
J C Dawson
B M Dempsey
N Fletcher
P Forrester
J A Gil-Rodriguez
R K Gupta
V Gurjar
F J Griffiths
J Hurst
N G Jeffs
G M Kane
K Konieczko
P C Lung
R E MacLaurin
M McKibbon
B Master
M A Moxon
M Meurer-Leban
A Nicol
G M O'Sullivan
R Owen
P L Pantin
D Pathirana
M E Pickering-Pick
W J K Rickford
P N Robinson
Z P Shah
I P Slee
M E Stanford
I Symons
E H Thomas
A P Triscott
G R Veitch
E Walsh
B R Warltier
P T Watters
D White
L P J Wickramasinghe
J E J Yates

North East Thames

T G Allum
R S Atkinson
P M Bashir
A V Beaugie
J Bevan
D M Birley
M Biswas
A Brain
A Bristow
C H W Browne
B J Collett
K Collins
M Cronin
D Davies
G M Davies
A R Deacock
D C Erwin
M Fanning
E Gibbs
G B Gillett
R W Griffin
E Grundy
S A I Helwa
M Hetreed
B D Higgs
J D Hill
P G Hollywood
G S Ingram
R Jayaweera
R Jones
M J Jordan
W Konarzewski
P Lee
J J Maher
A K Mathur
R F J Matthews
L M Mendonca
R M Mehta
J Mulryan
A M Murray
D B Pallot
N Poobalasingam
V Punchihewa
T Rajasekaran
R Rajendram
A Ramachandran
G B Rushman
N Sampson
S M Srivatsa
V Taylor
D Thomas
H Utting
L Vella
Z Zych

South East Thames

M Abbott
R Arnold
P E Bailey
R C H Baxter
H G C Bradfield
J E Brett
J Briffa
J Broadfield
J Broadley
J M Brown
C Child
J H Cook
I M Corall
W B Coutinho
P Daly
N G S Fisher
B Francis
A C L Fraser
S W Gammanpila
M Geadah
A M Haines
M S Hamer
M Hanna
A Haque
P B Hewitt
O Hifzi
G R Hollister
H T Hutchinson
F Krurer
C M H Miller Jones
J R Lethbridge
R M Liscombe
C G M Lynch
B H D Magrath
Mathur
K McCarthy
M S H Mikhael
J E Morris
L Muthukuda
P J Nash
N I Newton
A Olivellet
J O Ostlere
N L Padfield
R S Parsons
H Patel
H T Patel
A C Pearce
R M E Pinchin
J A R Pook
C J F Potter
E A Proctor
B Steer
M A Thompson
R J Thompson
M M Twohig
A J Walmsley
K J Wark
R R Watkin
P A D Williams
T J Wilson
H J Wilton

South West Thames

J K Bell
M Benedict
E Berwick
C Brookes
J S Catling
C B S Child
D Cohen
M H Davies
H P Didier
A Edwards
I Findley
H B A Griffiths
M Grounds
S Hawkins
A J Heber
R H A Hoyal
M G Hulse
A Landes
S M Kilpatrick
M A Kraayenbrink
J M Leigh
S Ling
D J R Lyle
J C Missen
C Moon
W Pais
P Radford
J E Redmen
A M Rollin
M Rooms
G Smith
J Stanford
I K Stanley-Jones
L St John-Jones
J R Stoneham
I A Sutherland
P T Sweet
A Tappin
A C Thurlow
D Tillett
P Walton
H R Waters
R H Whitburn
D G White
A C Williams
C Williams

Wessex

T R Abbott
P J Appleton
P C B Babington
R F Barrett
P J C Baxter
C P Beeby
L A Brown
J F Cam
K J Davies
N J H Davies
D Desgrand
A K Dewar
D Dickson
J C Edwards
C D G Evans-Prosser
Foxell
E J Galizia
K Gill
B Green
Hebblethwaite
S Hill
J R Hoyle
D I Hughes-Davies
J E Hurley
D M Jackson
P James
J A Jellicoe
E Lawes
S P K Linter
D J Lintin
A D Logan
R N Luxmore
D MacDougall
J M Manners
V Martin
D McCallum
R A Moody
M S Nielson
R Porteous
E A Putnam
D W Robins
R A Seagger
C J Shannon
M A Skivington
P M Spargo
R J Summerfield
M P Tattersall
G van Hasselt
P A Ventham
W D White
M Wilson
J H Winder
J R B Young

Oxford

A Bainton
G M L Baer
M Bray
J C Burnell
E M Darwood
W G Edge
N Enraght-Moony
E M C Ernst
F E Evans
R M M Fordham
J Freeman
V A Goat
E G Hadaway
R M Hall
J Henville
R D Jack
R H Jago
B Jayaratne
B Kahn
N Kay
J H Kerr
A B Lodge
L Loh
R H K Marsh
R D Marshall
P McKenzie
G Patterson
J Porter
V S Ram
M Rimmer
S N Saxena
N Schofield
Sinclair
T G C Smith
J Stevens
M Styles
B Thornley
M E Ward
E Young

South Western

J I Alexander
C J H Andrews
P G Ballance
H G R Balmer
S Bolsin
T M Bull
D R Cadle
J Carter
T I Cash
J M Chapman
W B Clarkson
D Cochrane
J C Coghill
C Collins
R C Desborough
J Dixon
R J Eltringham
R Forward
J G Francis
W G Grayling
G Hall
P B Harvey
M M Hills
R M H Hogson
J Hyland
M T Inman
L Jakt
G Jephcott
R T Kipling
S K Lahiri
R J Lenz
J Lytle
S Masey
J S Miller
J T Mulvein
J W O'Higgins
B W Perriss
B Poley
J E Pring
V J Prior
C Prys-Roberts
P J Ravenscroft
P A Ritchie
G S Routh
J F Searle
D H Short
L E Shutt
A D Simcock
Sowden
J A C Strachan
R M Tackley
M B Taylor
A Walker
E M Walsh
G Wray
P N Young

West Midlands

S J Almond
J D Anderson
S J P Ariaraj
J Ballance
M Barrow
M G Barry
J M Beasley
B Bhar
R A Botha
N J Burbridge
U H Chhaya
P J M Clifton
J S Dallimore
J M Davies
I Davis
V H Daya
I F Duncan
C Emmett
D W Eyre-Walker
M H Faroqui
Franklin
M E Fryer
Ganado
T V Gnanadurai
R M Haden
I D Hall
B Hayes
G A H Heaney
R T Hegde
I P Hine
G M Hitchings
E R S Hooper
R B Hopkinson
I T Hudecek
J Hurdley
P Jayaratnam
S E F Jones
C J Knickenberg
C L Knight
A Kuipers
A S T Lamb
M E Lauckner
A Leslie
M Lewis
M A H Lewis
J Lilley
D Macaulay
D W R MacFarlane
C J D Maile
A Mannan
A Marczak
J E Marshall
J W Martin
S P Mather
W J D McCulloch
S W Millar
R Miller
M D Milne
J F Murray
S Nethisinghe
A Patel
S Paul
R Pearson
G H Phillips
Pinnock
S Raju
J Richardson
N J Robson
B Roscoe
N Rose
D M Ross
Roylance
N P Salmon
M Sealey
W G Sellwood
R Smethurst
B E Smith
M Stokes
J T Styles
A Sutcliffe
P C M Taggart
M Taylor
I D Thompson
J H Tomlinson
R J N Turner
M Vater
P Whitehurst
I Williams
V Williams
B M Wood

Mersey

P D Booker
I M Boyd
C Breeze
G H Bush
J J Chambers
P Charters
C L Charway
R M Clark
M Cunliffe
J R Dalton
G Edwards
N V Ferguson
I F M Graham
J J Hazlett
C S Ince
M Jones
J M Kelly
A Morrison
A Murray
D K Mwanje
D A Nightingale
E Preston
J E Robinson
S B Rawal
C R Ryan
D Scott
A J Shribman
A C Skinner
R W Stevens
R E Thornington
J W H Watt

North Western

J Aslam
T M Bird
J A Bourne
S M Brownlie
A J Charlton
J M Chishti
D G D Davidson
M Darowski
B L Davis
O Dearlove
R M Doshi
J W Dowdall
P W Duncan
M E Eltoft
E J Fazackerley
P Ford
J Friend
J M Fryer
R G Ghaly
J A Glass
H L Goldwater
B K Greenwood
G W Hamlin
J Hargreaves
A R Harrison
J B Hicks
S Holgate
E L Horsman
P W Jackson
I W Jones
S J Keens
A A Khawaja
V R Koppada
A Krishnan
Y F Law Chin Yung
A S Laurence
P F S Lee
S V Lees
C Loyden
Luthra
H Matheson
J F McGeachie
G Meakin
S Mehta
A Mollah
P Morris
N H Naqvi
H Padmanabhan
M R Patrick
C J Pemberton
G Phillips
A G Pocklington
A Razak
J Rigg
M Rucklidge
R K Shah
E A Shaw
S F Stainthorp
B G Swales
D Tandon
G Teturswamy
E E M Thompson
M A Tobias
G K Vanner
A P Vickers
J M Watt
J G Williams
J H Wright

Special Health Authorities

E Battersby
R Bingham
E Facer
C Gillbe
W Glover
J W W Gothard
D J Hatch
I J James
A Lloyd-Thomas
A MacKersie
R L McAuliffe
M J H Scallan
R L McAuliffe
M J H Scallan
J C Simpson
G B Smith
E Sumner
D A Zideman

Wales

G Arthurs
P Barry
J Brookes
J Butler
S Catling
J Clarke
P Clyburn
K Craddock
R Cross
H Davies
D J Dye
A E Edwards
H Edwards
M Harmer
D J Hoad
J N Horton
H M Jones
A P J Lake
I D Klepper
E Major
R A Mason
R Michael
R H Morgan
F J Mukasa
W S Ng
T F J Parker
I Pathiratne
K C Phillips
F J Pickford
D A Ryan
M Sage
S J Seager
P A Schwarz
D A Thomas
D W Thomas
M H Thorpe
M J Turtle
R S Vaughan
A J Wadon
D Wakely
M J Whitehead
A B Williams
W Williams
B I Willis
C C Wise
P V Woodsford

Northern Ireland

G W Black
I H Black
R H Bolton
W N Chestnut
P M Crean
T M Gallagher
F M Gibson
A M Hainsworth
W H K Haslett
W Holmes
S R Keilty
R King
R Lalsingh
P G Loughran
W J Love
M Lutton
A M B Marsh
D M Mcauley
W McCaughey
A C McKay
T J McMurray
M R Milhench
R Scott
K Watson
M L Wilson-Davis

Guernsey

D S Brand
G Pratt
S Rebstein

Jersey

H R Dingle

Isle of Man

M J Biggart
J D Leece

Defence Medical Services

R E O Daum
S J Hunter
S B Merrill
S Inglis
R A Moody
C J Parnell
J T G Rogerson
D L Swain
A Yates

APPENDIX C

CONSULTANT SURGEONS who have returned completed questionnaires

Questionnaires were sent for all sample deaths. Index case questionnaires were sent to all consultants operating on 40 or more children per year, plus all cardiothoracic surgeons.

Northern

R W Allchin
E D Allen
J Anderson
P M Atkinson
R Attard
J G Banks
R Behl
J B M Black
M J M Black
G S Blair
L H Boobis
R C Bosanquet
P H Brakenbury
C H Bulman
D S Cameron
R G Checketts
D Clarke
A I M Cook
W M Cooke
W A Corbett
P J Crawford
A L Crombie
R B Cubey
J C Cumming
E Dayan
H B Devlin
C Diamond
G H Dunstone
P J English
H P Epstein
L M Flood
R F Gillie
L Gilliland
T P Griffith
D W Hand
J E Hawkesford
M Hawthorne
D W Herring
C J Hilton
M P Holden
I Hopper
R Hornby
I H Hubbard
A Innes
K Ions
J H James
J H Kilshaw
J F Kelly
D Kilby
R Kirby
T Layzell
M A C Leonard
M J Lyons
I W Mackee
S M Marks
H F Marshall
F W Martin
D B Mathias
G McLatchie
B J McNeela
D Meikle
M J Metcalfe-Gibson
D D Milne
R J Montgomery
J Murgatroyd
R A Ord
A L G Peel
A H Petty
T A Piggot
R Porter
J Potter
K B Queen
L Rangecroft
J R Rhind
J Richardson
R E W Ridley
C Roberts
H I Robinson
I L Rosenberg
R Ruckley
F A Salem
P R Samuel
J E S Scott
B P Sethi
J E G Shand
J L Sher
S P Singh
R P S Smith
S R Smith
J G Stephen
Tang
J T Taylor
R M R Taylor
R W Thomson
J Wagget
F Walker
P Ward-Booth
A J Warrington
A R Welch
R G Willis
R Y Wilson
T T Win
C Wood

Yorkshire

M J Abberton
D J Adams
N V Addison
R S Adib
P N Agarwal
P D Angus
I Appleyard
I A Archer
J G D Baker
A G Batchelor
D J Beard
J M Beck
G G Bird
P P K Bose
D A Boyd
J G Bradley
R A Bradwell
K G Brame
T G Brennan
A C Broughton
G J A Brown
F S C Browning
G A Bunch
W Buswell
M M Cameron
J Carlin
J E Cleary
A M Corrigan
D G Da Costa
S K Datta
S B Davies
S B Desai
R M L Doran
D P Dyson
M H Edwards
J D Fenwick
D M Fletcher
M W Flowers
I D Fraser
A G Gandhi
R W Glashan
V K Goddard
R J R Goodall
M R Gooding
M J Gough
A R H Grace
B K Gray
A N A Halaka
R Hall
G Hannah
D R Hanson
R R Henein
M H Heycock
P J van Hille
J S Hillman
W Holms
J B M Holroyd
D J Hopkins
D Huchinson
J R Innes
C R Kapadia
S P J Kay
J D C Kelly
G L M Kings
S H Leveson
V S D Logan
P J Lyndon
R C MacDonald
A K Marsden
J McFie
A W F Milling
V K Modgill
P J Moore
C J R Newbegin
P M O'Hare
Y N Pande
M D Parekh
K C Paton
H J Pearson
S P B Percival
J J Price
C H Raine
S Sabanathan
J R C Sainsbury
N R Saunders
S K Sharma
D T Sharpe
J H Shoesmith
J P Sloan
G J C Smelt
G M R Smith
S L Smith
J J F Somerville
R D Spicer
P A H Stewart
M J Stower
D F M Thomas
A G Tucker
C E Vize
D R Walker
J R Weatherill
C L Wengraf
C A Westwood
E B Wheatley
C M White
E Whitehead
M Whittaker
G S Willetts
K W Wilson
C K Yeung
H Yusuf

Trent

W A Anderson
N Andrews
D J Austin
N J Badham
J S Bailey
F Bailie
D Bardsley
W W Barrie
R P E Barton
M Bell
J R S Blake
G G Bodiwala
P J Bradley
P D Bull
J Bullock
V A Burton
G B Coombes
R J Cuschieri
T Gwilym Davies
M Deane
J A S Dickson
R C W Dinsdale
P K Donnelly
D Douglas
P M G Drummond
N W Everson
R K Firmin
J T Flynn
D P Fossard
E Freedlander
K P Gibbin
D E H Glendinning
J J Goiti
D B Goulstine
G H Greatrex
J P Green
R W Griffiths
S J Haggie
E G Hale
S M Haworth
H P Henderson
A P J Henry
H Holliday
D T Hope
J S Hopkins
B R Hopkinson
D A W Hoskinson
K B Hughes
I M Hutton
J M S Johnstone
J M Jones
R B Jones
L Kapila
B L Kathel
N J Kay
M J Kelly
J E A Knowles
W G Lambert
A J Lamerton
J M Lancer
R J Lemberger
A E MacKinnon
B Majumdar
M J Mayell
H W McFarlane
W D McNicoll
S B Mehta
Miller
T Milward
K K F Mohamad
J R Moloney
E W Morris
A Moulton
G Newton
S H Norris
S M O'Riordan
R E Page
C A L Palmer
H E Porte
J V Psaila
N Pyrgos
D N Quinton
H Qureshi
S Ramnani
C H Rance
R Raymakers
C C Rigby
M Saleh
J H Sandford-Smith
P Selwyn
J D Shaw
R Shetty
J M Simms
G W Simonds
J G Smart
B D Smith
T W D Smith
I M Strachan
H Sunderland
M C Taylor
V R Talati
H J McKim Thomas
I H Thomas
K E Thomas
R S A Thomas
D T L Turner
D Valerio
R T Waddington
J Wardrope
D F L Watkin
P G Watts
B G Way
J A K Wightman
J M Wilkinson
G H A Woodruff
A A Zaidi
M M Zaman

East Anglian

H M Adair
D Adlam
L A Amanat
T J Archer
N Astbury
P Aukland
P D Black
H N Blackford
R C Campbell
R H Cawood
B Cvijetic
L J Deliss
D C Dunn
A C Eaton
P D M Ellis
R Franklin
A N Gibbs
R Gray
W Gray
R A Greatorex
D Hardy
G H Heyse-Moore
A Higgins
A Holmes
J T Holmes
A Innes
J Jackson
N V Jamieson
R N Jones
J Keast-Butler
S J S Kent
W T Lamb
B G H Lamberty
R E Lewis
A M Logan
I J Lord
N A H Mahmoud
B J Main
K S Mangat
D A Moffat
A Moore
T J O'Neill
M S Owen-Smith
J A M Philipson
H W S Pigott
D N L Ralphs
R Rees
B A Ross
J R Sansom
I H K Scott
P Sewell
N C Shaw
G Southgate
H G Sturzaker
S G Thompson
A G Turner
R Vaughan
J Wallwork
P G Watson
P A Webber
R H Whitaker
M Wickstead
T W Young
M Yung

North West Thames

L N Allen
R H Armour
H Bail
B M W Bailey
W N W Baker
A G Beeden
R Birch
J Bolger
J W P Bradley
R J Carr
A Catterall
A G Cox
S J Cox
J C Crisp
D M Davies
P W Davis
Dinning
B W Ellis
J S Elston
R M England
M J Evans
S W Fountain
M V L Foss
J R Garnham
A D Giles
G Glazer
G W Glover
D H Harrison
R Harrison
M M Henry
J Horner
G Jantet
J V Jeffs
R D Kapadia
D Kaplan
J S Kenefick
D Khadjeh-Nouri
J M Kingsmill-Moore
R P Knowlden
M Lennox
J Lewis
J Lynn
I S MacKay
P J Mahaffey
M B R Mathlone
W M Mee
N Menzies-Gow
P Mitchenere
B D G Morgan
J F Newcombe
J C Nicholls
M J Notaras
E P N O'Donoghue
O'Riordan
M Ormiston
D A Owen
G M Parfitt
J B Phillips
M R Pittam
J W A Ramsay
D T Reilly
P Richards
R L Rothwell-Jackson
R J Ryall
G Sagor
R Sanders
B A Shorey
M Stallard
M Stearns
S S Tachakra
J F Tattersfield
J Meyrick Thomas
J Thompson
E R Townsend
J C F Townsend
G C Vafidis
G P Walsh-Waring
M K Wang
N B Waterfall
D J Williams
N J Young
R A L Young

North East Thames

J Ackroyd
F Afshar
B S Ashby
P M Atkinson
A J Ball
J Beaugie
R P Boggon
J P Bolton
G B Brookes
A A Brown
G Buchanan
T R Bull
D I Choa
J E Clarke
M A Clifton
C B Croft
R J Croft
C Davey
M H Devereux
R J Earlam
P Emery
N D Evans
M Z Faraq
C Fowler
Fraser
D V Furlong
P Goldstraw
C J Good
D Grace
Graham
Grant
G Hamilton
B M Handel
D F N Harrison
Hazel
K E F Hobbs
A A Hooper
J L Hungerford
A Jackson
S M T Jaffery
J D Jagger
R Jeffery
J D Jeremiah
A V Kaisary
N Kayali
M H Keene
J Harvey Kemble
N Ker
I G Kidson
R S Kirby
P Kitchen
K M N Kunzru
K Lafferty
R J Lavelle
I M Laws
D Learmont
C D R Lightowler
B Littler
M R Lock
M G Lyall
D M Mackinnon
D Madan
Magri
A R L May
M Mehta
T Morley
R Motson
H G Naylor
N Offen
N W M Orr
D Osborne
S P Parbhoo
J B Pearson
R M Phillips
M C Pietroni
R Pusey
G J Radcliffe
A Ransford
G M Rees
B F Ribeiro
K Rolles
A H M Ross
J Rumble
M C P Salter
N S Shah
M Singh
E G W Slater
B Sommerlad
R G Springall
M B Stanton
R D Stedeford
A E Stuart
A P Su
R Sudlow
A Swanston
L K H Therkildsen
P A Thomas
Thompson
C Walker
J E G Walker
C C Ware
N P Warwick-Brown
P Webb
J M Wellwood
R J J Wenger
J Wyllie
H L Young

South East Thames

M R Agrawal
A J Allaway
P Allen
N C Andrew
A P Ardouin
M D Awty
P Banks
P F Bates
T Bates
P J Bathard-Smith
J S R Baxter
J P Beavis
M E Beckett
D I Beeby
P G Bentley
S A Booth-Mason
T A Boxall
N Bradley
P L Brooks
D M Calvert
R L Coakes
J R Cobbett
T D Cochrane
R E C Collins
M E Conybeare
S Crabtree
P Curran
A Deane
P B Deverall
J E Dussek
R S Edwards
W G Edwards
H W Elcock
K P Ferris
E S Field
G H Forman
P L Girolami
M Gleeson
N J Griffiths
V T Hammond
H Harper
T A Harrison
R M Heddle
J Hibbert
R W Hoile
C E A Holden
E R Howard
J M Howat
D L Hunter
A Johns
C A Jones
E R L Jones
P Jones
G S Kanegaonkar
D Keown
A S Khambata
G Koffman
J D Langdon
J O N Lawson
J L Lewis
V Lobo
M A Mason
A J McIrvine
C M Milton
A Montgomery
C G F Munton
R W Norris
A Fitzgerald O'Connor
W R O'Flynn
R A Owen
J H Palmer
P J Pheils
D S Porter
S Powell
R C Radford
D L P Rees
D J Richards
P H Rowe
M Rowntree
N Salama
J Salmon
W A Scott
R J Sergeant
E Simpson
K Singh
F D Skidmore
P W Skinner
H D Smith
M A Smith
J T Snow
L M South
I B M Stephen
M Stewart
T A M Stoker
B J Stoodley
K C Tan
J N Thomas
J H Topham
T J Turnbull
K W R Tuson
P J Webb
J S Weighill
M D Wells
S M Whitehead
R P Wilding
J P Wilson
A P Wyatt
A K Yates
R Yeo

South West Thames

A R Al-Sheikhli
A H Amery
C J Anders
S M Arnold
G W Arthur
E C Ashby
M J Bailey
R C Beard
B A Bell
J Blake
P T Blenkinsop
P S Boulter
P T Calvert
S Capps
P Cheong-Leen
J A Clarke
S N Das
P K B Davis
D W Dempster
D R Donaldson
G Farrington
I Fraser
W F P Gammie
E M Gordon
J A A Govan
D A Hadley
R Hollingsworth
S J K Holmes
F T Horan
Howat
S Janvrin
P Jarrett
A C John
D Knight
J R Knight
R C Lallemand
M D Lee
R G Lightwood
C G Marks
D Mendonca
D R Michell
V L Moore-Gillon
J A C Neely
M D O'Riordan
B Parker
D C Parr
J R Pepper
R Pool
K R P Rutter
F A W Schweitzwer
H C Seward
A S Shalom
M Sharp
Shedden
G Sockett
M J Solan
J A Southam
R Southcott
P J Stiles
M Sutcliffe
R S Taylor
M H Thomas
G M Thompson
D Uttley
G Warrington
N F Weir
D Wright

Wessex

G F Abercrombie
P Adlington
N Alison
P B Ashcroft
R Bajwa
J D W Barnard
K De Belder
P Bliss
D L Boase
A Bracewell
D Burge
D Cain
R J Canter
J Carruth
J E Carvell
C A C Charlton
N M P Clarke
T J C Cooke
J P Donnelly
E E Denman
A R Elkington
J Elsby
D Etchells
B T Evans
P Fenton
J Fieldhouse
D R A Finch
Fitzgerald
H J Frank
P Gartell
R E Glass
D M Griffiths
M Griffiths
W E G Griffiths
P M Grimaldi
M L Grover
G Hall
G S M Harrison
F G Haselden
R J Heald
M T Higazi
Hopkin
B C Irwin
R K Jackson
P J Jeffery
M G Johnson
C B Jones
S Keightley
R K Lamb
R H S Lane
R E Lea
D M Lobb
I M R Lowden
D B Mackie
J I McGill
J C McGrand
R S McKim
D D Meikle
L Mohapatra
C W Moisey
J L Monro
D Moss
J H Neame
S Parvin
J Pickard
Porter
P H Powley
C J Randall
A Resouly
A B Richards
J A Robertson
C Rowe-Jones
Shepherd
R B Smith
W F W Southwood
J D Strong
G Thomas
M R Thompson
S S To
A G Tyers
H C Umpleby
J Vinnicombe
B H Walmsley
T H Walsh
D Weeden
P Wellington
A White
D Worgan
A H Young

Oxford

C B T Adams
P Awdry
B N Bailey
G S Barrett
M K Benson
J W Blaxland
M Briggs
J D Bromage
P Brown
D W G Budd
P D Burge
J Capper
J Chapman
S K Choudhuri
N J Cobb
J Cockin
J Collin
P H Cooke
S E Copeland
N Cox
K Cronin
O W Davison
B L Dowling
N E Dudley
D M Evans
P Farrugia
R G Faber
D P Fawcett
J N Fergus
A P Freeland
D P Goodwin
M H Gough
A H Grabham
M Greenall
J L Grogono
D B Hamer
N J Henderson
T Heyworth
B Hopkisson
R M Ingram
A Jefferis
R E Jenner
A B Jones
R O Jones
M Kettlewell
A G Kilcoyne
R A Kipping
S Knight
R Lee
M C Mace
N Marks
J A McAllister
P McArthur
S O'Malley
R J Parker
M Poole
S J A Powis
R Pyke
J Rayne
A Richards
A H N Roberts
J J Schofield
D E Sibson
C J Smallwood
R G Souter
S M Soysa
R D Stewart
P J Teddy
A K Thomas
C Tomlins
M A Too Chung
J H Tweedie
E M Walker
R A N Welham

South Western

C E Ackroyd
N J Barwell
P J Bedford
P G Bicknell
B P Bliss
R A Bradbrook
M W M Bridger
A P Brightwell
A J M Brodribb
C Brown
Calvert
W B Campbell
W A F Carruthers
A N Chakraborty
J M Chapman
J Clough
M Cole
C D Collins
G Conrad
M J Cooper
T C Crewe
C J Cutting
N L Dallas
A S Davies
J P Dhasmana
R Donovan
N Edwards
R P Ellis
P E L Evans
I Eyre-Brook
H D Fairman
D Fisher
T Flew
R P Foster
G C Fox
J D Frank
M W L Gear
M S Golby
A Gough
R H B Grey
D Griffiths
H E D Griffiths
M V Griffiths
H R Guly
D S Halpin
J F Hamlyn
D J Hanley
M Hardingham
D L Harris
C T Hart
J C Dean Hart
D R Harvey
S Haynes
B Heather
A Hinchliffe
R G Hughes
J D Hutchison
T T Irvin
J S Jacob
D Jameson-Evans
C K Jones
S M Jones
M Joyce
J O Kilby
R Kinder
N J Knight
P Knipe
A J Knox
G N Lumb
M MacKenzie
R K Mal
R H Markham
A R Maw
M Maxted
S McCabe
J A W McKelvey
L Oldham
K M Pagliero
R W Pigott
L H Pobereskin
N Price
J N Ramus
W J Rich
J Robinson
R K Roddie
G Rooker
J Shaw
I P Stewart
G D Sturrock
Tasker
C Teasdale
V T Thaller
W H F Thomson
P Townsend
G Turner
J Tricker
C M Vickery
R Watkins
S C Wells
D Wilkins
J D Wisheart

West Midlands

I Ahmed
A Allan
E K Alpar
P R Armitstead
J Atkins
A Aukland
E T Bainbridge
A Ballham
S K Banerjee
K Barber
A J G Batch
H C Batra
D C Baxter-Smith
P C Bewes
L L Beynon
H M Bishop
J Black
M E Blakemore
R J Blunt
C Bradish
W J Brawn
J E Bridger
I A R Brown
N E Brown
R Brown
J A C Buckels
T E Bucknall
R G Buick
B R Bullen
H R Cable
I G Calder
D A Campbell
D J Campbell
J B Campbell
A J Chadwick
C Cheyne
J Clegg
W G Coddington
N C Cook
J J Corkery
R J Cullen
A R Curry
V C Dalal
A R Das Gupta
V C David
J S Davies
H C De Castella
J M Dolphin
R G M Duffield
T Duffy
E M Eagling
D M East
D H Edwards
J B Elder
D J Ellis
D S Evans
G A Evans
T J Fetherston
A R Fielder
T R Fisher
P Foggitt
J F Forrest
I Fraser
C P Freeman
M E French
J M Gibson
W Gillison
S Glick
P Gornall
J P Gowar
G F Grave
G A Green
R P Grimley
P W V Gurney
M C Handscombe
G S S Hanna
P H Harper
R J Harrison
A M Hay
A D Hockley
G B Hopkinson
A W Hughes
R A Hurlow
A P Johnson
P Johnson
A O B Johnstone
M A Jones
P L Kander
B R Kesby
M A A Khan
L J Lawson
P J Leopard
P L Levick
W M Lien
J C Lotz
J E D MacLaren
R T Marcus
J B Marczak
K A Martin
H R Matthews
R N Matthews
K D Fortes Mayer
J W McIntosh
P McMaster
M J Merlin
C J Meryon
B G Millar
V Moshakis
F Murphy
D S Murray
T J Muscroft
J D Nancarrow
W F Neil
H Norcott
E C O'Neill
Obeid
A L Pahor
G S Pathakji
J H Patrick
M R Paul
Pearce
K Pearman
M F Porter
K M Porter
A L Prior
D W Proops
M P Quinlan
T N Reddy
A P Reid
Rennie
C J Renton
A Rhodes
G J Rice
R S Rihan
W R Roberts
P E Robin
A D Rowse
A J Sear
B Sethia
P M Shenoi
R T J Shortridge
S H Silverman
R M Simons
A Simpson
J M Smail
P J G Smart
A W Sollom
Stansbie
A G Stevenson
C J Tallents
S A Taylor
D M Thomas
D R Thomas
A G Thompson
J R Totten
A Turner
M J C Wake
D C T Watson
D Wedgwood
G M Weidmann
A While
B N Williams
C R Williams
H T Williams
J T Williams
H E Wilshaw
F Wilson
C Windsor
R L Wolverson

Mersey

R G Ainley
J B Bache
Bark-Jones
B G Bolton-Maggs
J R Bryson
D Cade
D Campbell
M E Cavendish
J F Clegg
D B Clements
M R Colmer
R C M Cook
L M de Cossart
R S Croton
R E Cudmore
J C Dorgan
J S Elkington
G F G Findlay
G E Foster
R E Franks
M Gipson
A R Green
P Hardy
I D Harrison
M R Heal
L A Holbrook
J Humphreys
R V Jeffreys
J S Jesudason
R H Johnson
Jones
L Klenerman
D R Llewelyn
D Lloyd
M C Lynch
N A Mackinnon
J A Massey
D M Matheson
R McKay
C J E Monk
R W K Neill
M A Neugerbauer
O'Bara
M O'Driscoll
A Patterson
C O Peckar
C S L Peiris
M F Ramadan
T G Ramsell
J H Rogers
Sandeman
M D M Shaw
J M Shennan
A J M Simison
D N Smith
J H Stillwell
A C Swift
P K H Tam
J F Taylor
R B Trimble
M K Tutton
P N Wake
Wishart
G D Wood

North Western

H P Adhikary
A O Akingbehin
Alexander
A J Banks
W G T Bell
V Bhalerao
A Bianchi
J C Bradley
J K Brigg
M J A Britten
K G Buckler
P Canty
D B Case
S Chatterjee
J R Cherry
J Cornah
C B Costello
R A Cowie
D J Cowley
R D P Craig
P J Davenport
R P Davies
J B Day
R A Dendy
A J N Dennison
C L Dodd
C M Doig
M Duari
T B Duff
T H Dunningham
P C England
W T Farrington
J C Faux
Fitzgerald
D J Fitzmaurice
L Forrest
K M Fussell
C Galasko
P Gallagher
R Gandhi
J B Garland
J B Garston
P D Gooder
D Gordon
D C S Gough
A E Green
J H Green
M Grundy
S J Gude
R L Gulati
R Gupta
C N Hall
P Hardcastle
A R Hearn
E M Hoare
M C Holbrook
N R Hulton
A D Johnson
K Kaushal
I A Khan
R D Kingston
M E Lambert
J M Laughton
R A M Lawson
W R Lawson
B N Livingstone
J C Lowry
J P Lythgoe
N MacGillivray
J M Main
B Maltby
N K Maybury
A McGeorge
S Meehan
K B Mills
J E Milson
M T Morrell
M A Morris
A M Morrison
M E Morton
J Mosley
W Y Nassar
B M Newman
R W Nicholson
J Noble
P H O'Reilly
C I Orton
D G Ostick
W G Paley
W N Pathak
B G S Peach
R S Phillips
A N Rahman
W D Richmond
R A Roddie
D H Rose
E S Rosen
E R S Ross
W N Samarji
Singh
M Small
B A de Sousa
D J Stewart
P A Sykes
P Taylor
P H Taylor
R G N Thompson
J C Tresadern
D E Walker
A Watson
M E Watson
F J Weighill
C G H West
M R Wharton
P R White
M Cooper Wilson
A Zarod

Special Health Authorities

A C Bird
R Brereton
D P Drake
M J Elliott
J Evans
P Fells
J A Fixsen
N Grant
R Hayward
B S Jay
B Jones
E Kiely
J P Lee
C Lennox
M de Leval
C Lincoln
A Plint
N S C Rice
D N Ross
D F Shore
L Spitz
J Stark
C C Walker
J E Wright
V Wright
V C Wulff-Cochrane

Wales

D W Aird
Bhattacharya
L Beck
D Bird
R Blackett
P Booth
P A Braithwaite
C J Bransom
I Breckenridge
M J K M Brown
E G Butchart
P Chandra
M Clayton
J F Coakley
P J Coyle
M K H Crumplin
C J Davies
H Leighton Davies
B Davis
E M Downes
J L A Dowse
J L Edwards
P W Edwards
A G Evans
H J R Evans
I T G Evans
C Fielder
C J Fontaine
M E Foster
M F Green
M Gregory
G H Griffith
I P Griffiths
Z Hammad
J Harvey
B R Hayes
C M Hill
C S Holland
W V Humphreys
M H Jamison
D B R Jones
W I Jones
W W Kershaw
M Y Khan
O Klimach
J B Laine
M Lalla
J Lari
R D Leeming
M H Lewis
R L Leyshon
M C Mason
B McKibbin
M A P Milling
R G Mills
C J Mintowt-Czyz
B V Nabar
R H P Oliver
J E Osborne
D W Patton
A Pickering
J M Price-Thomas
J K Pye
A G Radcliffe
S M J Rahman
B I Rees
S Richards
J G Roberts
M Roberts
C W Rowse
V Shah
K Shute
B A Simpson
J Stamatakis
D E Sturdy
S Sullivan
K Sutherns
P J Sykes
M Taube
K J J Tayton
R S Todd
J J Tolia
J Vafidis
M Vaziri
K Vellacott
N W D Walshaw
M W Waterworth
R Weeks
P J E Wilson
H S Winsey

Northern Ireland

J A Archbold
P G Bateson
J C Bell
G Blake
V E Boston
M D Brennen
S Brown
R Campbell
J Cleland
J Colville
B Cranley
T E Dane
T K Day
G R Dilworth
C R Fee
D J Gladstone
W J H Graham
M J G Hawe
W G Humphreys
S T Irwin
J G Kinley
A G Leonard
J G W Matthews
A McKibbin
A H McMurray
G A B Miller
D G Mudd
T O Mulligan
H O J O'Kane
J J O'Neill
J W R Peyton
D J Pinto
S Potts
G F W Price
P C Pyper
R M Slater
J Shaw
T C Taylor

Jersey and Guernsey

N Allen
R Allsopp
R P Clifford
K R De
J D Fleet
N P Ingram
I MacMichael
T N D Peet
A B Seth-Smith
N D Shah

Isle of Man

N R Batey
J O Lee
S L Manuja

Defence Medical Services

Batton
J Bertram
P F Brasher
R Dale
D J Davison
R N Downes
P J Fagg
M Farquharson-Roberts
Frampton
J Gerwat
J Holland
N Ismaili
I L Jenkins
D J Jones
R J Leicester
M Mahoney
D McCarthy
B C McDermott
A P Meredith
A R Mugridge
F Nofal
B J O'Reilly
A H Osborne
M J Payne
D R Richardson
A J Rintoul
P C Runchman
I B Tiwari
C D Warren-Smith
J M Wilson

APPENDIX D

LOCAL REPORTERS (1989)

Northern

Dr S M Bell
Consultant Pathologist
Shotley Bridge General Hospital
Consett

Dr M K Bennet
Consultant Pathologist
Freeman Hospital
Newcastle upon Tyne

Dr A G Hastings
Consultant Histopathologist
Ashington Hospital

Dr J D Hemming
Consultant Pathologist
Hexham General Hospital

Dr K A Jasim
Consultant Histopathologist
Bishop Auckland General Hospital

Dr F Johri
Consultant Histopathologist
N Tyneside General Hospital

Dr V M Joglekar
Consultant Pathologist
Furness General Hospital
Barrow-in-Furness

Dr R A Jones
Consultant Pathologist
Middlesbrough General Hospital

Dr E D Long
Consultant Histopathologist
Cumberland Infirmary
Carlisle

Dr I M J Mathias
Consultant Anaesthetist
Queen Elizabeth Hospital
Gateshead

Dr A Morley
Consultant Pathologist
Royal Victoria Infirmary
Newcastle upon Tyne

Dr J H McElroy
Consultant Histopathologist
The Royal Infirmary
Sunderland

Dr K Pollard
Consultant Histopathologist
S Shields General Hospital

Dr D Scott
Consultant Pathologist
Newcastle General Hospital

Dr D Smith
Consultant Histopathologist
W Cumberland Hospital
Whitehaven

Dr E W Walton
Consultant Pathologist
N Tees General Hospital
Stockton-on-Tees

Dr C Williams
Consultant Histopathologist
Memorial Hospital
Darlington

Mr C W Wood
Consultant Surgeon
Hartlepool General Hospital

Dr D Wood
Consultant Anaesthetist
Dryburn Hospital
Durham

Yorkshire

Dr S Aparicio
Consultant Histopathologist
St James's University Hospital
Leeds

Dr A M Barlow
Consultant Histopathologist
Huddersfield Royal Infirmary

Dr P Da Costa
Consultant Pathologist
Killingbeck Hospital
Leeds

Mr R Goodall
Consultant Surgeon
Royal Halifax Infirmary

Dr C Gray
Lecturer in Pathology
University of Leeds

Dr P Gudgeon
Consultant Histopathologist
Dewsbury District Hospital

Dr M Hamilton
Consultant Histopathologist
Harrogate District Hospital

Dr D C Henderson
Consultant Histopathologist
Friarage Hospital
Northallerton

Dr J M Hopkinson
Consultant Histopathologist
York District Hospital

Dr D S Hutton
Consultant Anaesthetist
Scunthorpe Hospital

Dr A M Jackson
Consultant Histopathologist
Scarborough Hospital

Dr S Knott
Consultant Microbiologist
Wharfedale General Hospital

LOCAL REPORTERS (1989)

Yorkshire (continued)

Dr G Kurien
Consultant Pathologist
Scunthorpe General Hospital

Dr G Nunn
Consultant Anaesthetist
Pinderfields Hospital
Wakefield

Dr A V Sheard
Director of Public Health
E Yorkshire Health Authority

Dr I W C MacDonald
Consultant Histopathologist
Pontefract General Infirmary

Dr W M Peters
Consultant Histopathologist
District General Hospital
Grimsby

Dr E G F Tinsley
Consultant Histopathologist
Airedale General Hospital
Keighley

Dr Naylor
Consultant Histopathologist
Bradford Royal Infirmary

Dr Reynolds
Specialist in Community Medicine
Hull Health Authority

Trent

Dr D C S Durrant
Consultant Histopathologist
Pilgrim Hospital
Boston

Dr A Fletcher
Consultant Histopathologist
Leicester Royal Infirmary

Dr J Harvey
Consultant Histopathologist
Lincoln County Hospital

Dr E H Mackay
Consultant Histopathologist
Leicester General Hospital

Dr M A Parsons
Consultant Pathologist
Royal Hallamshire Hospital
Sheffield

Dr T Farnan
Consultant Pathologist
Derbyshire Royal Infirmary

Dr J M Frayne
Consultant Anaesthetist
Barnsley District General Hospital

Dr J Heaton
Consultant Pathologist
Victoria Hospital
Worksop

Dr A A Mousley
Director of Public Health
Central Notts Health Authority

Dr J Stonham
Consultant Anaesthetist
Grantham & Kesteven Hospital

Dr J Finbow
Consultant Pathologist
Doncaster Royal Infirmary

Dr P B Gray
Consultant Histopathologist
Chesterfield and North Derbyshire Royal Hospital

Mr R B Jones
Consultant Surgeon
Rotherham District General Hospital

Dr S Muller
Consultant Pathologist
Glenfield General Hospital

Proffessor D R Turner
Professor of Pathology
University Hospital
Nottingham

East Anglian

Dr H K Al-Rufaie
Consultant Pathologist
Newmarket General Hospital

Dr P M Dennis
Consultant Pathologist
Peterborough District Hospital

Dr P F Roberts
Consultant Histopathologist
Norfolk & Norwich Hospital

Dr N J Ball
Consultant Histopathologist
James Paget Hospital
Great Yarmouth

Dr D Eakins
Consultant Histopathologist
Queen Elizabeth Hospital
Kings Lynn

Dr R W J Smith
Specialist in Community Medicine
E Suffolk Health Authority

Dr Biedrzycki
Consultant Pathologist
West Suffolk Hospital
Bury St Edmunds

Professor G A Gresham
Professor of Morbid Anatomy & Histopathology
Addenbrooke's Hospital
Cambridge

Dr A Whitehead
Consultant Histopathologist
Hinchingbrooke Hospital
Huntingdon

LOCAL REPORTERS (1989)

North West Thames

Dr W K Blenkinsopp
Consultant Pathologist
Watford General Hospital

Dr A Davey
Consultant Histopathologist
Hillingdon Hospital

Dr J Dawson
Consultant Anaesthetist
Ashford Hospital

Dr A L Fattah
Consultant Histopathologist
Queen Elizabeth II Hospital
Welwyn Garden City

Dr R D Goldin
Sen Lecturer Pathology
St Mary's Hospital
W2

Dr J N Harcourt-Webster
Consultant Histopathologist
St Stephens Hospital (until closure)

Dr S F Hill
Consultant Histopathologist
St Albans City Hospital

Dr G Hughes
Consultant Haematologist
W Middlesex Hospital
Isleworth

Dr I Lindsay
Consultant Histopathologist
Charing Cross Hospital

Dr D A S Lawrence
Consultant Pathologist
Luton & Dunstable Hospital

Dr Lovell
Consultant Histopathologist
Central Middlesex Hospital

Dr D G Madders
Consultant Histopathologist
Lister Hospital
Stevenage

Dr J McAlpine
Consultant Histopathologist
Edgware General Hospital

Dr A O'Reilly
Consultant Histopathologist
Hemel Hempstead Hospital

Dr R Owen
Consultant Anaesthetist
Ealing Hospital
(since November 1989)

Dr G M Pitt
Consultant Anaesthetist
Ealing Hospital
(until October 1989)

Dr A Price
Consultant Histopathologist
Northwick Park Hospital
Harrow

Dr D Shove
Consultant Histopathologist
Barnet General Hospital

Dr M Walker
Senior Lecturer Pathology
St Charles' Hospital
W10

Mr N Waterfall
Consultant Surgeon
Bedford General Hospital

North East Thames

Dr S I Baithun
Consultant Histopathologist
St Andrew's Hospital
E3

Dr I Ellis
Director of Public Health
Southend Health Authority

Dr P Ellis
Consultant Pathologist
Oldchurch Hospital
Romford

Dr S Gould
Senior Lecturer Pathology
University College Hospital
WC1E

Dr W J Harrison
Consultant Histopathologist
N Middlesex Hospital
N18

Dr D Jenkins
Consultant Histopathologist
Whittington Hospital
N19

Dr E G Jessop
Director of Community Medicine
NE Essex Health Authority

Dr R G M Letcher
Consultant Histopathologist
St Margaret's Hospital
Epping

Dr D Lowe
Consultant Histopathologist
St Bartholomew's Hospital
EC1

Dr L E McGee
Consultant Histopathologist
King George Hospital
Ilford

Dr J E McLaughlin
Consultant Histopathologist
The Royal Free Hospital
NW3

Dr M C Parkinson
Consultant Histopathologist
The Middlesex Hospital

LOCAL REPORTERS (1989)

North East Thames (continued)

Dr M Rao
Specialist in Community Medicine
NE Essex Health Authority
(until 01.11.89)

Dr H A S Reid
Consultant Histopathologist
Chase Farm Hospital
Enfield

Dr J Richards
Specialist in Community Medicine
Tower Hamlets Health Authority

Mr A H McL Ross
Consultant Surgeon
Broomfield Hospital
Chelmsford

Dr S G Subbuswamy
Consultant Histopathologist
St Andrew's Hospital
Billericay

Dr D A Thomas
Consultant Anaesthetist
Harold Wood Hospital
Romford

Dr K M Thomas
Consultant Histopathologist
Whipps Cross Hospital
E11

South East Thames

Dr E J Aps
Consultant Histopathologist
Queen Mary's Hospital
Sidcup

Dr J Bennett
Specialist in Community Medicine
Brighton General Hospital

Dr M E Boxer
Consultant Histopathologist
Royal E Sussex Hospital
Hastings

Dr M Cotter
Consultant Histopathologist
Orpington Hospital

Dr Granger
Consultant Cytopathologist
Lewisham Hospital (until March 1989)

Dr V K Hochuli
Specialist in Community Medicine
Maidstone

Dr S Humphreys
Consultant Histopathologist
King's College Hospital
SE5

Dr A R Kittermaster
Consultant Pathologist
Kent & Sussex Hospital
Tunbridge Wells

Dr A D H Lakhani
Director of Public Health
West Lambeth Health Authority

Dr C W Lawson
Consultant Histopathologist
William Harvey Hospital
Ashford

Professor D A Levinson
Professor of Pathology
Guy's Hospital

Dr A E Limentani
Director of Public Health
Canterbury & Thanet Health Authority

Dr Menon
Consultant Pathologist
Brook General Hospital
SE18

Dr A Palmer
Consultant Community Physician
Medway Health Authority

Dr Pinto
Consultant Pathologist
Greenwich District Hospital

Dr A M T F Rashid
Consultant Pathologist
Joyce Green Hospital
Dartford

Mr T G Reilly
Medical Records Manager
Eastbourne District General Hospital

Professor J R Tighe
Professor of Histopathology
St Thomas' Hospital
SE1

Dr E K Wiredu
Consultant Pathologist
Lewisham Hospital
(until 31.12.89)

LOCAL REPORTERS (1989)

South West Thames

Dr A Beresford
Consultant Pathologist
Cuckfield Hospital
Haywards Heath

Dr D J Cooper
Consultant Histopathologist
Worthing Hospital

Dr S Dilly
Consultant Histopathologist
St George's Hospital SW17

Dr G F Goddard
Consultant Anaesthetist
Frimley Park Hospital

Mr J E Hale
Consultant Surgeon
East Surrey Hospital
Redhill

Dr M Hall
Consultant Pathologist
St Peter's Hospital
Chertsey

Mr S Janvrin
Consultant Surgeon
Crawley Hospital
(until 04.10.89)

Mr R D Leach
Consultant Surgeon
Kingston Hospital

Dr B Manners
Consultant Histopathologist
Royal Surrey County Hospital
Guildford

Mr J A C Neely
Consultant Surgeon
Crawley Hospital
(from 05.10.89)

Dr M W N Nicholls
Consultant Microbiologist
St Richard's Hospital
Chichester

Dr E H Rang
Specialist in Community Medicine
Merton & Sutton Health Authority

Dr K Schafler
Consultant Pathologist
Queen Mary's University Hospital
Roehampton

Dr M Semple
Consultant Haematologist
Epsom District Hospital

Dr S M Thomas
Consultant Histopathologist
Mayday Hospital
Croydon

Wessex

Dr B J Addis
Consultant Histopathologist
Salisbury General Infirmary

Dr A Anscombe
Consultant Pathologist
West Dorset Hospital
Dorchester

Dr K Boyd
Consultant Pathologist
Christchurch Hospital

Dr E W Hall
Consultant Pathologist
Royal United Hospital
Bath

Dr J S Howell
Consultant Histopathologist
Poole General Hospital

Dr E M Husband
Consultant Histopathologist
Basingstoke District Hospital

Dr M Lesna
Consultant Histopathologist
Royal Victoria Hospital
Bournemouth

Dr N J E Marley
Consultant Pathologist
St Mary's Hospital
Portsmouth

Dr J W Parsons
Director of Community Medicine
Swindon Health Authority

Mr P H Powley
Consultant Surgeon
Princess Margeret Hospital
Swindon

Dr J M Theaker
Consultant Histopathologist
Southampton General Hospital

Dr A C Vincenti
Consultant Pathologist
Royal Hampshire County Hospital
Winchester

Mr P Wellington
A & E Consultant
Royal Isle of Wight
County Hospital

LOCAL REPORTERS (1989)

Oxford

Dr M H Ali
Consultant Histopathologist
Wexham Park Hospital
Slough

Dr J V Clark
Consultant Histopathologist
Northampton General Hospital

Dr K Fleming
Consultant Histopathologist
John Radcliffe Hospital
Oxford

Dr B E Gostelow
Consultant Histopathologist
Kettering General Hospital

Dr S Jalloh
Consultant Histopathologist
Milton Keynes General Hospital

Dr A Le Roux
Consultant Histopathologist
Horton General Hospital
Banbury

Dr R Menai Williams
Consultant Histopathologist
Royal Berkshire Hospital
Reading

Dr J Rivett
Consultant Histopathologist
Stoke Mandeville Hospital
Aylesbury

Dr M J Turner
Consultant Histopathologist
Wycombe General Hospital

South Western

Dr Adam
Consultant Pathologist
Taunton & Somerset Hospital

Dr J Berry
Consultant Pathologist
Bristol Royal Hospital for Sick Children

Dr B W Codling
Consultant Pathologist
Gloucestershire Royal Hospital

Dr D W Day
Consultant Histopathologist
Torbay Hospital

Dr A C Hunt
Consultant Pathologist
Derriford Hospital
Plymouth

Dr D A Hunt
Specialist in Community Medicine
Cheltenham & District Health Authority

Dr N B N Ibrahim
Consultant Histopathologist
Frenchay Hospital
Bristol

Dr R Kipling
Consultant Anaesthetist
Yeovil District Hospital

Dr M F Lott
Consultant Pathologist
Weston Super Mare General Hospital

Dr R Pitcher
Consultant Histopathologist
Royal Cornwall Hospital
Truro

Dr C M D Ross
Consultant Histopathologist
N Devon District Hospital
Barnstaple

Dr E Sheffield
Consultant Pathologist
Bristol Royal Infirmary

Dr H W Simpson
Consultant Histopathologist
Royal Devon & Exeter Hospital

Dr H White
Consultant Pathologist
Southmead Hospital
Bristol

West Midlands

Dr T G Ashworth
Consultant Histopathologist
Walsgrave Hospital
Coventry

Dr N Bajallan
Consultant Histopathologist
George Eliot Hospital
Nuneaton

Dr J Carpenter
Director of Public Health
East Birmingham Health Authority

Dr J Christie
Consultant Pathologist
Russells Hall Hospital
Dudley

Dr H V Duggal
Acting Director of Public Health
Mid Staffordshire Health Authority
(until July 1989)

Dr A Dyas
Consultant Microbiologist
Solihull Hospital (from August 1989)

LOCAL REPORTERS (1989)

West Midlands (continued)

Dr G H Eeles
Consultant Histopathologist
The Alexandra Hospital
Redditch
(from September 1989)

Dr R A Fraser
Consultant Pathologist
Royal Shrewsbury Hospital

Dr T A French
Consultant Pathologist
North Staffordshire Royal Infirmary
Stoke-on-Trent

Dr A R Goldsmith
Consultant Pathologist
Manor Hospital
Walsall

Dr B Jones
Consultant Histopathologist
Selly Oak Hospital
Birmingham

Professor E L Jones
Dept of Pathology
The Medical School
University of Birmingham

Dr A M Light
Consultant Pathologist
Good Hope General Hospital
Sutton Coldfield

Dr B McCloskey
Director of Public Health
Worcester & District Health Authority

Dr F McGinty
Consultant Pathologist
County Hospital
Hereford

Dr Nottingham
Consultant Histopathologist
Hospital of St Cross
Rugby

Dr R H B Protheroe
Consultant Pathologist
East Birmingham Hospital
(until July 1989)

Dr F Raafat
Consultant Pathologist
Children's Hospital
Birmingham

Dr D I Rushton
Sen Lecturer Pathology
Birmingham Maternity Hospital

Dr W R Shortland-Webb
Consultant Histopathologist
Dudley Road Hospital
Birmingham

Dr J Simon
Consultant Histopathologist
Sandwell General Hospital
West Bromwich

Dr J A Sorrell
Director of Public Health
South East Staffordshire Health Authority

Dr B R Sparke
Consultant Histopathologist
The Alexandra Hospital
(until August 1989)

Dr O Stores
Consultant Pathologist
Russells Hall Hospital
Dudley

Dr V Suarez
Consultant Histopathologist
Staffordshire General Infirmary
(from August 1989)

Dr H Thompson
Reader in Pathology
The General Hospital
Birmingham

Dr Vella
Consultant Pathologist
Warwick General Hospital

Dr S P Ward
Consultant Histopathologist
The Wolverhampton Royal Hospital

Dr J Whitwell
Consultant Pathologist
Midland Centre for Neurosurgery & Neurology

Mersey

Dr M S Al-Jafari
Consultant Histopathologist
Warrington District General Hospital

Dr J Burns
Senior Lecturer in Forensic Pathology
Royal Liverpool Hospital

Dr C T Burrow
Consultant Histopathologist
Walton Hospital
Liverpool

LOCAL REPORTERS (1989)

Mersey (continued)

Dr A H Clark
Consultant Histopathologist
Arrowe Park Hospital Wirral

Dr K Deas
Director of Public Health
Chester Health Authority

Mr P Lynch
Consultant Surgeon
Southport General Infirmary

Dr E J Hunt
Senior Consultant in
Community Medicine
St Helens & Knowsley HA

Dr W E Kenyon
Consultant Histopathologist
Broadgreen Hospital
Liverpool

Dr J M Morgan
Consultant Histopathologist
Leighton Hospital
Crewe

Dr W Taylor
Consultant Histopathologist
Fazakerley Hospital
Liverpool

Professor D van Velzen
Prof of Fetal & Infant
Pathology
Royal Liverpool Children's
Hospital

Dr A R Williams
Consultant Histopathologist
Macclesfield District General
Hospital

Dr H D Zakhour
Consultant Histopathologist
Clatterbridge Hospital
Warrington

North Western

Dr J Coyne
Consultant Pathologist
Whithington Hospital
Manchester

Dr A S Day
Consultant Pathologist
Tameside General Hospital
Ashton-under-Lyne

Mr M Duari
Consultant Surgeon
Burnley General Hospital

Dr T Freemont
Senior Lecturer Pathology
Manchester Royal Infirmary

Mr P Gallagher
Consultant Surgeon
Stepping Hill Hospital
Stockport

Dr G Garrett
Consultant Morbid Anatomist
Oldham & District General
Hospital

Dr I Gupta
Consultant Histopathologist
Royal Albert Edward
Infirmary
Wigan

Dr B N A Hamid
Consultant Histopathologist
Trafford General Hospital
Manchester

Dr I K Hartopp
Consultant Anaesthetist
North Manchester General
Hospital

Dr Hasleton
Consultant Pathologist
Wythenshawe Hospital

Dr E Herd
Consultant Pathologist
Bury General Hospital

Mr A D Johnson
Consultant Surgeon
Ormskirk & District General
Hospital

Dr A W Jones
Consultant Histopathologist
Hope Hospital
Salford

Dr M Lendon
Senior Lecturer in
Paediatric Pathology
Royal Manchester Children's
Hospital

Dr C Nicholson
Consultant Pathologist
Preston Infirmary

Dr A Mene
Consultant Histopathologist
Blackburn Royal Infirmary

Dr J A Morris
Consultant Histopathologist
Lancaster Moor Hospital
Lancaster

Dr J Sarginson
Specialist in Community
Medicine
Rochdale Health Authority

LOCAL REPORTERS (1989)

North Western (continued)

Mr D Stewart
Consultant Surgeon
Chorley & District Hospital

Dr K S Vasudev
Consultant Histopathologist
Victoria Hospital
Blackpool

Dr S Wells
Consultant Histopathologist
Bolton General Hospital

Special Health Authorities

Mr G Bennett
Consultant Surgeon
National Heart Hospital

Mr N M Breach
Consultant Surgeon
Royal Marsden Hospital

Professor Corrin
Dept of Pathology
Brompton Hospital

Professor A Garner
Professor of Pathology
Moorfields Eye Hospital

Dr D A Jewkes
Consultant Anaesthetist
National Hospital for
Nervous Diseases

Mr K W Lee
Consultant Pathologist Eastman
Dental Hospital

Dr P Lewis
Reader in Histopathology
Hammersmith Hospital

Dr E G J Olsen
Consultant Pathologist
National Heart Hospital

Professor R A Risdon
Department of
Histopathology
The Hospital for Sick Children

Mr M F Sturridge
Consultant Surgeon
The London Chest Hospital

Wales

Dr N Dallimore
Consultant Pathologist
Llandough Hospital
Penarth
(until July 1989)

Dr R B Denholm
Consultant Histopathologist
West Wales General Hospital
Carmarthen

Dr A G Douglas-Jones
Consultant Pathologist
University Hospital of Wales
Cardiff

Dr Gough
Consultant Pathologist
Llandough Hospital
Penarth
(from August 1989)

Dr M Hughes
Consultant Histopathologist
Ysbyty Gwynedd Hospital
Bangor

Dr R J Kellett
Consultant Pathologist
Nevill Hall Hospital
Abergavenny

Professor B Knight
Prof of Forensic Pathology
Cardiff Royal Infirmary

Dr G R Melville-Jones
Consultant Histopathologist
Withybush General Hospital
Haverfordwest

Mr L A Murray
Consultant Pathologist
Llanelli General Hospital

Dr P R G Needham
Consultant Histopathologist
Glan Clwyd Hospital
Rhyl

Dr A M Rees
Consultant Histopathologist
Princess of Wales Hospital
Bridgend

Dr R C Ryder
Consultant Histopathologist
Prince Charles Hospital
Merthyr Tydfil

Dr M Salmon
Community Physician
Gwent Health Authority

Dr C G B Simpson
Consultant Pathologist
Bronglais General Hospital
Aberystwyth

Dr P J Snow
Brecon Medical Group Practice

LOCAL REPORTERS (1989)

Wales (continued)

Dr D Stock
Consultant Histopathologist
East Glamorgan General Hospital
Pontypridd

Dr R B Williams
Consultant Histopathologist
Wrexham Maelor General Hospital

Dr S Williams
Consultant Pathologist
Singleton Hospital
Swansea

Northern Ireland

Mr B Cranley
Consultant Surgeon
Daisy Hill Hospital
Newry

Dr Z Desai
Consultant Haematologist
Mater Infirmorum Hospital
Belfast

Dr J N Hamilton
Consultant Anaesthetist
Altnagelvin Area Hospital
Londonderry

Dr W Haslett
Consultant Anaesthetist
Ulster Hospital
Dundonald

Dr W Holmes
Consultant Anaesthetist
Erne Hospital
Enniskillen

Dr B Huss
Consultant Anaesthetist
Lagan Valley Hospital
Lisburn

Mr D G Mudd
Consultant Surgeon
Waveney Hospital
Ballymena

Professor T G Parks
Prof of Surgical Science
Belfast City Hospital

Mr P C Pyper
Consultant Surgeon
Mid-Ulster Hospital
Magherafelt

Dr F Robinson
Consultant Anaesthetist
Tyrone County Hospital
Omagh

Dr J Sloan
Snr Lecturer Pathology
Royal Victoria Hospital
Belfast

Dr M Thompson
Consultant Radiologist
Downe Hospital
Downpatrick

Jersey

Dr D Spencer
Consultant Histopathologist
St Helier General Hospital
St Helier

Guernsey

Dr Gunton-Bunn
Consultant Pathologist
Princess Elizabeth Hospital

Isle of Man

Dr J M Deguara
Consultant Pathologist
Noble's Isle of Man Hospital

Independent Sector

Hospital managers were designated as local reporters.

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

ANAESTHETIC QUESTIONNAIRE (DEATHS)

QUESTIONNAIRE No. A | | | | |

DO NOT PHOTOCOPY ANY PART OF A COMPLETED 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. 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 11A

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 the patient's notes).

In case of difficulty, please contact the NCEPOD office on 01-831-6430 (direct line).

1 If you were not involved in any way with this anaesthetic and have filled out the questionnaire on behalf of someone else, please indicate your position.

a Chairman of Division
b College Tutor
c Duty Consultant
d Other Consultant

1

2 In what type of hospital did the anaesthetic take place?

a District General
b University
c Special Children's
d Ministry of Defence
e Single surgical specialty
f Independent
g Other (please specify)

2

3 Grade(s) of all anaesthetist(s) present at this anaesthetic. If locum, please indicate, by inserting a figure 1 in the *right hand box.*

a SHO
b Registrar
c Senior Registrar
d Consultant
e Associate Specialist
f Clinical Assistant
g General Practitioner
h Hospital Practitioner
k Other (please specify)

Grade	*Locum*
	3

We want to know about the experience with children of the most senior anaesthetist in the operating room on this occasion (questions 4–6 inclusive refer).

4 Did he/she have full time training in a specialist children's hospital or unit at any time?

Yes = 1 No = 2 ☐ 4

If yes, how many months' duration was this? ☐ 4A

5 How many patients aged less than 6 months did he/she anaesthetise last year? (estimate)

☐☐☐ 5

6 How many patients aged 6 months or more (but less than 3 years) did he/she anaesthetise last year? (estimate)

☐☐☐ 6

7 Is there a special, as distinct from a general, on call consultant rota for infants and children?

Yes = 1 No = 2 ☐ 7

8 Was a consultant anaesthetist informed about this case before the anaesthetic?

Yes = 1 No = 2 Not applicable = 3 ☐ 8

9 Was a consultant anaesthetist informed during the anaesthetic?

Yes = 1 No = 2 Not applicable = 3 ☐ 9

10 Was a consultant anaesthetist informed after the anaesthetic?

Yes = 1 No = 2 Not applicable = 3 ☐ 10

11 Did the anaesthetist seek advice from another colleague at any time?

Yes = 1 No = 2 ☐ 11

If yes, grades of anaesthetists from whom advice sought:

Grade(s)

a SHO
b Registrar
c Senior Registrar
d Consultant
e Associate Specialist
f Clinical Assistant
g General Practitioner
h Hospital Practitioner
k Other (please specify)

☐ 11A

12 Did a colleague come and help at any time?

Yes = 1 No = 2 ☐ 12

If yes, grade of anaesthetist who came to help:

a SHO
b Registrar
c Senior Registrar
d Consultant
e Associate Specialist
f Clinical Assistant
g General Practitioner
h Hospital Practitioner
k Other (please specify)

☐ 12A

13 Date of admission to hospital eg 03 02 89 (3 February 1989)

day month year

						13

14 Date of operation

day month year

						14

15 Date of patient's birth

day month year

						15

16 If less than 6 months old please also give gestational age at birth (in weeks).

_____ weeks

17 To which ethnic group did the child belong?

a European
b African
c Asian
d Oriental

	17

18 What operation was planned?

NCEPOD office use only

19 What operation was performed, if different?

NCEPOD office use only

20 What other procedures, which required anaesthesia, were performed during the previous 3 months?

NCEPOD office use only

21 Was a record of the child's weight available to you?

Yes = 1 No = 2 | | 21

If yes, what was this weight? _____ kg

If no, the estimated weight was _____ kg

22 Were you consulted by the surgeon (as distinct from informed), before the operation?

Yes = 1 No = 2 | | 22

23 Did you visit the patient before operation?

Yes = 1 No = 2 | | 23

If yes, was the parent or guardian present at this time?

Yes = 1 No = 2 Not applicable = 3 | | 23A

If yes, did you discuss the anaesthetic with them?

Yes = 1 No = 2 Not applicable = 3 | | 23 B

24 Were any investigations done before the operation?

Yes = 1 No = 2 ☐ 24

If yes, which of the following?

PLEASE WRITE MOST RECENT RESULTS IN SPACE BELOW THE TEST NAME AND INDICATE WHICH TEST(S) BY INSERTION OF THE APPROPRIATE LETTER IN A BOX

a Haemoglobin

b Packed cell volume (haematocrit)

c White cell count

d Sickle cell test (Sickledex)

e Serum electrolytes Na

f K

g Cl

h $HC0_3$

j Blood urea

k Creatinine

(continued on next page)

24 continued

m Serum albumin

n Bilirubin

p Glucose

q Urinalysis (ward or lab)

r Blood gas analysis

s Chest x-ray

t Electrocardiography

w Respiratory function tests

x Echocardiography

y Cardiac catheterization

z Other (please specify)

☐ 24A

☐ 24A continued

25 Coexisting medical diagnoses (specify disorder)

Diagnosis(es)

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)

25

NCEPOD office use only

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

Yes = 1 No = 2

26

If yes, specify drug and reaction:

27 What was the drug therapy before surgery?

PLEASE SPECIFY THERAPY IN SPACE BELOW CATEGORY

Drug

a none

b antibiotic

c anticonvulsant

d antidiabetic

e antidysrhythmic
antiarrhythmic

f antihypertensive

g bronchodilators

h cardiac glycoside

k cytotoxic

m diuretic

n phenothiazine derivatives

p steroid

q other (please specify)

27

28 ASA Status (enter Class number)

Class 1
Class 2
Class 3
Class 4
Class 5

28

If ASA 3, 4, or 5 specify the conditions from which the patient suffered.

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 localised and does not entail a systemic disturbance.

CLASS 2

Mild to moderate systemic disturbance caused by either the condition to be treated surgically or by other pathophysiological processes.

CLASS 3

Severe 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.

PREPARATION

29 When was the last fluid/food given by mouth before the operation?

☐☐☐☐ 29
(use 24 hour clock)

Please specify nature and volume if known.

30 Was a nasogastric tube passed before induction?

Yes = 1 No = 2 ☐ 30

31 Were premedicant drugs administered?

Yes = 1 No = 2 ☐ 31

If yes, please indicate which drugs by inserting appropriate letter(s) in first column and state dose, route and time.

Drug	*Dose mg*	*Route**	*Time given*
☐	☐☐☐☐	☐	☐☐☐☐ 31A
☐	☐☐☐☐	☐	☐☐☐☐
☐	☐☐☐☐	☐	☐☐☐☐
☐	☐☐☐☐	☐	☐☐☐☐

(use 24 hour clock)

a Atropine
b Choral hydrate
c Diazepam (eg valium)
d Droperidol
e Fentanyl
f Glycopyrronium (Robinul)
g Hyoscine
h Lorazepam (eg Ativan)
k Ketamine
m Methohexitone
n Morphine
p Papaveretum (Omnopon)
q Pethidine
r Temazepam
s Promethazine (eg Phenergan)
t Thiopentone
w Trimeprazine (Vallergan)
x Other (please specify)

*(Route: Oral = 1 Subcut = 2 IM = 3 IV = 4 Rectal = 5)

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

Yes = 1 No = 2 ☐ 32

If yes, please specify *nature* and rate of administration

32A **Crystalloid**

Fluid (enter letter for each)	*Volume prescribed per hour (mls)*	*Total (mls) given in 12 hours before operation*
☐	☐☐☐	☐☐☐☐ 32A
☐	☐☐☐	☐☐☐☐
☐	☐☐☐	☐☐☐☐

a Dextrose 5%

b Dextrose 4% saline 0.18%

c Dextrose 10%

d Saline 0.9%

e Hartmann's (compound sodium lactate)

f Half strength Hartmann's (or saline) and 5% glucose

g Other (please specify)

32B **Colloid**

Fluid	*Volume prescribed per hour (mls)*	*Total (mls) given in 12 hours before operation*
☐	☐☐☐	☐☐☐☐ 32B
☐	☐☐☐	☐☐☐☐
☐	☐☐☐	☐☐☐☐

a Gelatin (gelofusine, haemaccel)

b Albumen 4%

c Starch (HES)

d Dextran

e Plasma Protein Fraction

f Fresh Frozen Plasma

g Other (please specify)

32C **Blood**

Fluid	*Volume prescribed per hour (mls)*	*Total (mls) given in 12 hours before operation*
☐	☐☐☐	☐☐☐☐ 32C
☐	☐☐☐	☐☐☐☐

a Whole blood

b Red cell component

c Other component (please specify)

33 Is there a fluid balance chart in the notes?

Yes = 1 No = 2 ☐ 33

If yes please send a complete copy of it to the NCEPOD office with this questionnaire. We will remove/delete identification.

34 Were other vasoactive and/or inotropic drugs used?

Yes = 1 No = 2 ☐ 34

If yes, specify:

Drug(s)

a Inotropes ☐

b Prostaglandins ☐ 34A

c Vasodilators ☐

d Vasopressors ☐

e Other (please specify) ☐

Please state maximum dose mcg/kg/minute for each

35 Were any respiratory therapies in use before operation?

Yes = 1 No = 2 ☐ 35

If yes, please indicate which:

a Oxygen therapy ☐

b Artificial airway (please specify which) ☐ 35A

☐

c Ventilatory support (including CPAP, IMV, IPPV etc)

36 Were non-depolarising relaxants used to aid controlled ventilation before operation?

Yes = 1 No = 2 ☐ 36

If yes, please specify:

37 Were any other invasive treatments in progress?

Yes = 1 No = 2 ☐ 37

If yes, please indicate which:

a Renal dialysis (peritoneal or haemodialysis) ☐ 37A

b Other (please specify)

OPERATION

38 Classification of operation

a Emergency
b Urgent
c Scheduled
d Elective

☐ 38

Definitions

a Emergency
Immediate operation, resuscitation simultaneous with surgical treatment (eg trauma). Operation usually within one hour.

b Urgent
Delayed operation as soon as possible after resuscitation (eg irreducible hernia, intussusception, oesophageal atresia, intestinal obstruction, major fractures). Operation usually within 24 hours.

c Scheduled
An early operation, but not immediately life saving (eg malignancy, cardiac surgery). Operation usually within 3 weeks.

d Elective
Operation at a time to suit both patient/parents and surgeon (eg circumcision, orchidopexy).

39 Time of start of anaesthetic

☐☐☐☐ 39
(use 24 hour clock)

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 Type of anaesthetic used

a General alone
b Local infiltration alone
c Regional alone
d General and regional
e General and local infiltration
f Sedation alone
g Sedation and local infiltration
h Sedation and regional

☐ 42

GENERAL ANAESTHESIA

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

Yes = 1 No = 2 ☐ 43

If yes, please indicate which

Precaution(s)

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)

☐ 43A

44 Was the trachea intubated at induction?

Yes = 1 No = 2 ☐ 44

If yes, which route was used?

a Orotracheal ☐ 44A

b Nasotracheal

c Other (tracheostomy etc)

45 Were muscle relaxants used for intubation at induction?

Yes = 1 No = 2 ☐ 45

46 Is there an anaesthetic record for this operation in the notes?

Yes = 1 No = 2 ☐ 46

If **YES** please send a complete copy of it with this questionnaire to the NCEPOD office. (We will delete/remove identification marks.)

Go now to question 47.

IF NO please give as full account as possible of the anaesthetic below. Kindly include details of anaesthetic agents, drugs, routes of administration, breathing system, and tube size. Then go to question 47.

47 Did the child receive intravenous fluids during the operation?

Yes = 1 No = 2 ☐ 47

If yes, please indicate which

47A **Crystalloid**

		Fluid (indicate type by inserting appropriate letter)	*Total volume during operation (mls)*
a	Dextrose 5%	☐	☐☐☐☐ 47A
b	Dextrose 4% saline 0.18%	☐	☐☐☐☐
c	Dextrose 10%	☐	☐☐☐☐
d	Saline 0.9%		
e	Hartmann's		
f	Half strength Hartmann's (or saline) and 5% glucose		
g	Other (please specify)		

47B **Colloid**

		Fluid	*Total volume during operation (mls)*
a	Modified gelatin (Gelofusin, Haemaccel)	☐	☐☐☐☐ 47B
b	Albumen 4%	☐	☐☐☐☐
c	Starch (HES)	☐	☐☐☐☐
d	Dextran		
e	Plasma Protein Fraction		
f	Other (please specify)		

47C **Blood**

		Fluid	Total volume during operation (mls)
a	Whole blood	☐	☐☐☐☐ 47C
b	Red cell component	☐	☐☐☐☐
c	Other component (please specify)		

MONITORING

48 Which of the following methods or devices were used during the management of this child?

We want to know which monitor(s) was (were) used and in which location(s). Please insert a number in every box as follows:

Yes = 1 No = 2

		ROOM		
		Anaesthetic	*Operating*	*Recovery*
a	None	a ☐	☐	☐
b	Pulse: manual	b ☐	☐	☐
c	Pulse: meter	c ☐	☐	☐
d	Indirect BP (non-invasive)	d ☐	☐	☐ 48
e	Direct arterial BP	e ☐	☐	☐
f	CVP	f ☐	☐	☐
g	Left atrial pressure	g ☐	☐	☐
h	Pulmonary arterial pressure	h ☐	☐	☐
i	ECG	i ☐	☐	☐
j	Pulse oximetry	j ☐	☐	☐
k	Oesophageal or precordial (chest wall) stethoscope	k ☐	☐	☐
m	Temperature (state site)	m ☐	☐	☐
n	Ventilation volume	n ☐	☐	☐
p	Airway pressure	p ☐	☐	☐

(question 48 continued on next page)

48
continued

q	Expired CO_2 partial pressure (concentration)	q		
r	0_2 analyser-fresh gas	r		
s	0_2 analyser-inspired gas	s		48
t	Inspired anaesthetic vapour	t		
w	Peripheral nerve stimulator	w		
x	Ventilator alarm-disconnect	x		
y	Urine output	y		
z	Other (please specify)	z		

49 Was there any defect of monitoring equipment?

Yes = 1 No = 2 49

If yes, please specify

50 Did you have non-medical help?

Yes = 1 No = 2 50

If yes, please specify (insert letter for each) 50A

a Trained anaesthetic nurse

b Trained operating department assistant (ODA)

c Trainee anaesthetic nurse

d Trainee ODA

e Operating department orderly (ODO)

f Other (please specify)

TEMPERATURE

51 What measures were taken to maintain body temperature in the OPERATING ROOM? 51

a None

b Ambient room temperature adjustment

c Water/air/electric underblanket

d Overhead heater

e Specific lagging of patient

f Warmed intravenous fluids

g Inspired gas humidification

h Other (please specify)

VENTILATION OF LUNGS DURING ANAESTHETIC

52 What was the mode of ventilation?

a Spontaneous
b Controlled

☐ 52

53 If controlled, what method was used?

a Manual
b Machine (please specify)

☐ 53

54 Were muscle relaxants used during the anaesthetic?

Yes = 1 No = 2

☐ 54

BLOOD LOSS

55 Did you assess blood loss?

Yes = 1 No = 2

☐ 55

If yes, how?

a Visually only
b Swab weighing
c Sucker volume
d Colorimetric
e Other (please specify)

☐ 55A

EVENTS

56 Did any of the following untoward incidents occur during operation?

Yes = 1 No = 2

☐ 56

If yes, please specify nature by insertion of the appropriate letter(s) in a box

Incidents

a air embolus
b airway obstruction
c bradycardia
d bronchospasm
e cardiac arrest (unintended)
f convulsions
g cyanosis
h arrhythmia
k hyperpyrexia (greater than 40 degrees C or very rapid increase in temperature)
m hypotension
n hypoxia
p pulmonary aspiration
q pneumothorax
r other (please specify)

☐ 56A

(question 56 continued on next page)

56 continued

Please specify location of patient, treatment and outcome.

57 Was there any mechanical failure of equipment (excluding that for monitoring)?

Yes = 1 No = 2 ☐ 57

If yes, please specify

a Failure of equipment for IPPV ☐

b Failure of equipment for cardiopulmonary bypass ☐ 57A

c Other (please specify) ☐

DEFINITIONS

(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).

RECOVERY

58 Was there a specific recovery area (see definition 1 above) available?

Yes = 1 No = 2 ☐ 58

If no, please explain

59 Was this suitable for this patient?

Yes = 1 No = 2 ☐ 59

60 Who decided that the patient should be discharged from the recovery room?

- a Yourself
- b Another anaesthetist
- c Surgeon
- d Nurse
- e Other (please specify)

60

61 Indicate which of the following are available in the hospital in which the operation was performed.

- a special care baby unit
- b neonatal intensive care unit
- c high dependency unit solely for children
- d high dependency unit for children and adults
- e intensive care unit solely for children
- f intensive care unit for children and adults
- g children's ward
- h children's bed in an adult ward

61

62 To which location did **this** patient go on leaving the recovery area?

- a special care baby unit
- b neonatal intensive therapy unit
- c high dependency unit solely for children
- d high dependency unit for children and adults
- e intensive care unit solely for children
- f intensive care unit for children and adults
- g children's ward
- h children's bed in an adult ward
- k another hospital for intensive or high dependency care

62

63 Did you consider this location appropriate?

Yes = 1 No = 2

63

If no, please explain:

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

Yes = 1 No = 2

64

65 Were there complications within 24 hours after operation?

Yes = 1 No = 2

65

If yes, indicate which:

- a Airway problems
- b Bleeding sufficient to require postop transfusion or reoperation
- c The need for mechanical ventilation of the lungs (specify reason)

65A

- d Septicaemia
- e Renal failure sufficient to require dialysis
- f Central nervous system failure (persistent coma), failure to recover consciousness, convulsions
- g Other conditions (please specify)

MANAGEMENT OF POSTOPERATIVE PAIN RELIEF

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

Yes = 1 No = 2 ☐ 66

If yes, please specify drug, dose, times and route:

67 Were other sedative/hypnotic drugs given?

Yes = 1 No = 2 ☐ 67

If yes, please specify drug, dose, times and route:

68 Were there any complications associated with postoperative analgesic drugs?

Yes = 1 No = 2 ☐ 68

If yes, please explain:

TRAINEES

69 Has a consultant seen and agreed this form?

Yes = 1 No = 2 ☐ 69

70 Have you enclosed a copy of the anaesthetic record and fluid balance chart?

Yes = 1 No = 2 ☐ 70

DEATH

71 Date of death — day month year [ ][ ][ ][ ][ ][ ] 71

72 Time of death [ ][ ][ ][ ] 72
(use 24 hour clock)

73 Place of death: [ ] 73

a Theatre

b Recovery

c Special care baby unit

d Intensive care unit

e High dependency unit

f Ward

g Other (please specify)

74 Did organisational factors contribute to the death? [ ] 74

Yes = 1 No = 2

If yes, please explain:

75 Do you have morbidity/mortality review meetings in your department? [ ] 75

Yes = 1 No = 2

If yes, will this case be, or has it been, discussed at your departmental meeting? [ ] 75A

Yes = 1 No = 2

PLEASE RETURN THIS FORM IN THE REPLY PAID ENVELOPE PROVIDED TO:

Ms E. A. CAMPLING
ADMINISTRATOR,
NCEPOD
33–43 Lincoln's Inn Fields
LONDON
WC2A 3PN

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE

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

SURGICAL QUESTIONNAIRE (DEATHS)

QUESTIONNAIRE No. S | | | | | |

DO NOT PHOTOCOPY ANY PART OF A COMPLETED 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 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 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).

eg question 8 | b | indicates African

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 the patient's notes).

In case of difficulty, please contact the NCEPOD office on 01-831-6430 (direct line).

1 Specialty of operating surgeon

- a General
- b General with special interest in Paediatric surgery
- c General with special interest in Urology
- d General with special interest in Vascular surgery
- e General with special interest in _____
- f Paediatric
- g Accident & Emergency
- h Cardiothoracic – Paediatric
- k Cardiothoracic – Adult
- m Cardiothoracic – Mixed practice
- n Dental/Oral/Maxillofacial
- p Gynaecology
- q Neurosurgery
- r Ophthalmology
- s Orthopaedic
- t Otorhinolaryngology
- w Plastic
- x Transplantation
- y Urology
- z Other (please specify) _____

	1

PATIENT DETAILS

2 Date of birth | | | | | | | | 2

D D M M Y Y

3 Age at operation _____ yrs _____ months

4 Gestational age at birth (neonates only) _____ weeks

5 Sex
- a Male
- b Female
- c Indeterminate

	5

6 Weight _____ kg or _____ st _____ lb

7 Height _____ cm or _____ ft _____ ins

8 To which ethnic group did the patient belong?
- a Europid
- b African
- c Oriental

	8

ADMISSION DETAILS

9 Admission:

a Elective – at a time agreed between patient/parents and surgical service.

b Urgent – within 48 hours of consultation

c Emergency – immediately following consultation

9

10 Admission date

						10
D	D	M	M	Y	Y	

time

				10A

(use 24 hour clock)

11 Was the child transferred from another hospital?

Yes = 1 No = 2 ☐ 11

If yes, a from Non-NHS Authority
b from same District
c from same Region
d from outside Region
e from overseas

☐ 11A

12 Date and time of transfer to surgical team if different from above

date

						12
D	D	M	M	Y	Y	

time

				12A

(use 24 hour clock)

13 Did the child's condition deteriorate during transfer?

Yes = 1 No = 2 ☐ 13

14 Did you consider transferring the child to another hospital?

Yes = 1 No = 2 ☐ 14

15 If transfer was considered desirable, why was it not undertaken?

DEFINITIONS

A **high dependency unit** (HDU) 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.

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).

16 To what type of ward was the child first admitted?

a Paediatric Medical
b Paediatric Surgical
c Paediatric Mixed Medical & Surgical
d Paediatric ICU/HDU
e Neonatal ICU/SCBU
f Adult surgical
g Adult ICU/HDU
h Other (please specify)

☐ 16

17 Was the child transferred to another type of ward within the same hospital before or after operation?

Yes = 1 No = 2 ☐ 17

If yes, please specify

18 Was the child first admitted under the care of:

a Consultant Paediatric Physician
b Consultant Paediatric Cardiologist
c Consultant Surgeon
d Other (please specify)

☐ 18

19 Was the care undertaken on a formal shared basis?

Yes = 1 No = 2

☐ 19

20 Who made the working diagnosis?

Medical

a Paediatric Medical House Physician
b Paediatric Medical Senior House Officer
c Paediatric Medical Registrar
d Paediatric Medical Senior Registrar
e Paediatric Medical Consultant
f Associate Specialist
g Other (please specify)

☐ 20

Surgical

a HO
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

☐ 20A

20B Pre = 1 or Post = 2 FRCS?

☐ 20B

21 Which grade of surgeon made the final decision to operate?

a HO
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

☐ 21

GENERAL PREOPERATIVE DETAILS

22 Decision to operate – Date ☐☐☐☐☐☐ 22
D D M M Y Y

23 Operation

Date ☐☐☐☐☐☐☐☐ Time ☐☐☐☐ 23
D D M M Y Y use 24 hour clock

Day M T W TH F S S (please circle)

24 Grade of most senior operating surgeon

a HO
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

☐ 24

24A Pre = 1 or Post = 2 FRCS? ☐ 24A

25 How long had this surgeon spent in this grade?

_____YRS_____MTHS

26 Was this surgeon a locum? Yes = 1 No = 2 ☐ 26

27 Grade of most senior surgeon consulted before operation.

a HO
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

☐ 27

27A Pre = 1 or Post = 2 FRCS? ☐ 27A

28 Was there pressure to operate?

Yes = 1 No = 2 ☐ 28

If yes from whom? Please insert the appropriate letter(s) in a box (this can be a multiple entry)

a Consultant Paediatrician
b Consultant Cardiologist
c Consultant Cardiothoracic Surgeon
d Consultant Surgeon
e Consultant – other (please specify)

f Relatives
g Organisational considerations
h Others (please specify)

☐ 28A

29 Please record all **paediatric medical staff** who took history before operation. (This can be multiple entry.)

a HP
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

h None

☐ 29

30 Please record all **surgical staff** who took history before operation. (This can be multiple entry.) Please indicate in the right hand column whether Pre-(=1) or Post-(=2) FRCS.

a HO
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

h None

☐ 30

31 Please record all **paediatric medical staff** who **examined** the child before operation. (This can be multiple entry.)

a HP
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

h None

☐ 31

32 Please record all **surgical staff** who **examined** the child before operation. (This can be multiple entry.) Please indicate in the right hand column whether Pre (=1) or Post (=2) FRCS.

a HO
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

h None

32

33 Working diagnosis by most senior member of surgical team.

NCEPOD office use only

34 Identified medical diagnoses at time of surgery (specify disorder)

a Respiratory

b Cardiac

c Neurological

d Endocrine

e Alimentary

f Renal

g Musculoskeletal

h Haematological

k Prematurity

m Other

34

NCEPOD office use only

35 Please note any coexisting congenital abnormalities.

NCEPOD office use only

36 ASA Grade (see definitions below). Enter grade **number**.

Grade 1
Grade 2
Grade 3
Grade 4
Grade 5

☐ 36

American Society of Anaesthesiology 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 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.

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

Yes = 1 No = 2 ☐ 37

If yes, please explain

38 Was there a fever greater than 37.5°C recorded preoperatively?

Yes = 1 No = 2 ☐ 38

39 Who supervised the **preoperative preparation** on the ward?

Paediatric medical

a HP
b SHO
c Registrar
d Senior Registrar ☐ 39
e Consultant
f Associate Specialist
g Other (please specify)

h None

(question 39 continued on next page)

39 continued

39A **Surgical**

a HO
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

h None

☐ 39A

39B Pre = 1 or Post = 2 FRCS? ☐ 39B

39C **Anaesthetic**

a SHO
b Registrar
c Senior Registrar
d Consultant
e Associate Specialist
f Other (please specify)

g None

☐ 39C

40 What precautions or therapeutic manoeuvres were undertaken immediately preoperatively to ensure adequate physiological function? Enter 1 for Yes or 2 for No in **each** box.

a	Pulse rate recording	a	
b	Blood pressure recording	b	
c	Central venous pressure measurement	c	
d	Gastric aspiration	d	
e	Intravenous fluids	e	
f	Correction of hypovolaemia	f	
g	Blood transfusion	g	
h	Antibiotics	h	
k	Oxygen therapy	k	40
m	Airway protection ie head injuries	m	
n	Tracheal intubation	n	
p	Mechanical ventilation	p	
q	Stabilisation of fractures	q	
r	Nutritional support	r	
s	Vitamin K	s	
t	Others (please specify)	t	

41 Who supervised the measures detailed in Q40?

Paediatric medical

a HP
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

h None

☐ 41

41A **Surgical**

a HO
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

h None

☐ 41A

41B Pre = 1 or Post = 2 FRCS?

☐ 41B

41C **Anaesthetic**

a SHO
b Registrar
c Senior Registrar
d Consultant
e Associate Specialist
f Other (please specify)

g None

☐ 41C

OPERATION

PLEASE INCLUDE A PHOTOCOPY OF ALL OPERATION NOTES. Identification will be removed at the NCEPOD office.

42 Proposed operation

☐☐☐☐☐

NCEPOD office use only

43 Operation undertaken

☐☐☐☐☐

NCEPOD office use only

44 Multiple operations

If this operation was the most recent in a sequence, please list the other procedures.

	Operation	Date	Objective eg palliative "curative"
a	_____	_____	_____
b	_____	_____	_____
c	_____	_____	_____

☐☐☐☐☐
☐☐☐☐☐
☐☐☐☐☐

NCEPOD office use only

45 If the operation performed was different to that proposed, please explain.

46 If cardiac, was it

a Closed

b Open

☐ 46

47 Was cardiopulmonary bypass used?

Yes = 1 No = 2

☐ 47

48 How did you classify the operation? (See definitions on next page)

a Emergency
b Urgent
c Scheduled
d Elective

☐ 48

DEFINITIONS

a Emergency:

Immediate operation, resuscitation simultaneous with surgical treatment (eg trauma). Operation usually within one hour.

b Urgent:

Delayed operation as soon as possible after resuscitation (eg irreducible hernia, intussusception, oesophageal atresia, intestinal obstruction, major fractures). Operation usually within 24 hours.

c Scheduled:

An early operation, but not immediately life saving (eg malignancy, cardiac surgery). Operation usually within 3 weeks.

d Elective:

Operation at a time to suit both patient/parents and surgeon (eg circumcision, orchidopexy).

49 In view of your answer to Q48, was there any delay due to factors other than clinical?

Yes = 1 No = 2

☐ 49

If yes, please specify

50 Time of start of operation*

☐☐☐☐ 50

(use 24 hour clock)

51 Duration of operation* _____ hrs _____ mins

52 Was this longer than usual?

Yes = 1 No = 2 ☐ 52

If yes, please specify why

53 Was there an unanticipated intra-operative problem?

Yes = 1 No = 2 ☐ 53

If yes, please specify

* not including anaesthetic time

POSTOPERATIVE PROGRESS

54 Does your hospital have (enter letter for each) ☐ 54

a Theatre recovery room

b Paediatric ICU

c Adult ICU

d Paediatric HDU

e Neonatal ICU

f Special Care Baby Unit

55 Was the patient admitted to one of the above?

Yes = 1 No = 2 ☐ 55

If yes, please specify which, using identifying letter. ☐ 55A

56 Were you at any time unable to transfer the child into an ICU, HDU etc?

Yes = 1 No = 2 ☐ 56

If yes, why?

57 What were the indications for the admission to ICU/HDU? (This can be multiple entry.)

a Specialist nursing

b Monitoring

c Ventilation

d Surgical complications

e Anaesthetic complications

f Transfer from hospital without facilities

g Other (please specify)

57

58 Were ICU/HDU facilities adequate?

Yes = 1 No = 2

58

If no, what in your opinion, was inadequate?

59 Discharge from ICU/HDU due to

a Elective transfer to ward

b Pressure on beds

c Death

d Other (please specify)

59

60 Was the child subsequently readmitted to ICU/HDU etc?

Yes = 1 No = 2

60

If yes, please give details

POSTOPERATIVE CARE

61 Was the postoperative period complicated by (enter letter for each):

a Significant bleeding

b Upper respiratory obstruction

c Respiratory distress

d Sepsis

e Anastomotic failure

f Low cardiac output

g Hepatic failure

h Renal failure

k Endocrine system failure

m Persistent coma

n Other organ failure (please specify)

p Problems with analgesia

q Complications of prematurity

r Other problems (please specify)

61

62 Was mechanical ventilation employed?

Yes = 1 No = 2 62

If yes, were there any complications with mechanical ventilation?

Yes = 1 No = 2 62A

If yes, please explain.

63 Was any non oral feeding used for this patient? (eg jejunostomy)

Yes = 1 No = 2 63

If yes, please specify

64 Was parenteral feeding (either by peripheral or central veins) used for this patient?

Yes = 1 No = 2 64

65 Were there complications with the feeding techniques specified in Q's 63 and 64?

Yes = 1 No = 2 ☐ 65

If yes, please specify

DEATH

66 Date of death ☐☐☐☐☐☐ 66

D D M M Y Y

Time of death ☐☐☐☐ 66A

please use 24 hour clock

67 What do you think was the immediate **CLINICAL** cause of death? (This need not be a duplication of the death certificate.)

☐☐☐☐☐☐ 67

NCEPOD office use only

68 Other relevant clinical contributory causes of death.

☐☐☐☐☐☐ 68

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69 Was the death reported to the coroner?

Yes = 1 No = 2 ☐ 69

If yes, was a postmortem ordered by him/her?

Yes = 1 No = 2 ☐ 69A

70 Was a hospital postmortem requested?

Yes = 1 No = 2 ☐ 70

If yes, who requested the postmortem?

a Consultant Surgeon
b Senior Registrar
c Registrar
d SHO
e Other (please specify) ☐ 70A

If no, why not?

71 Was a postmortem refused?

Yes = 1 No = 2 ☐ 71

If yes, by whom?

a Relatives
b Pathologist
c Other (please specify) ☐ 71A

72 Were you informed of the date and time of the postmortem?

Yes = 1 No = 2 Not applicable = 3 ☐ 72

If yes, who attended the postmortem?

a Consultant Surgeon
b Senior Registrar
c Registrar
d SHO
e Other (please specify) ☐ 72A

73 Were you sent a copy of the postmortem report?

Yes = 1 No = 2 Not applicable = 3 ☐ 73

74 What was the date of the first written information you received about any postmortem?

☐☐☐☐☐☐ 74
D D M M Y Y

75 If a postmortem was performed, please list the relevant findings

PLEASE SEND A COPY OF ALL POSTMORTEM REPORTS AND POSTMORTEM REQUEST FORM IF AVAILABLE

76 Do you have regular local mortality/morbidity meetings?

Yes = 1 No = 2 ☐ 76

77 Was/will this death be considered at a local mortality meeting?

Yes = 1 No = 2 ☐ 77

OTHER INFORMATION

78 Was there any shortage of trained personnel in theatre/recovery?

Yes = 1 No = 2 ☐ 78

If yes, was there a shortage of:

a	Surgeons	☐
b	Anaesthetists	☐
c	Skilled Assistants	☐
d	Nurses	☐ 78A
e	Paediatricians	☐
f	ODAs	☐
g	Porters	☐
h	Other (please specify)	☐

79 **Out of hours operations only:**

Should this operation have been done during the routine list time if operating theatre space had been available?

Yes = 1 No = 2 ☐ 79

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

Yes = 1 No = 2 ☐ 80

If yes, please specify:

81 Who completed this form?

a HO
b SHO
c Registrar
d Senior Registrar
e Consultant
f Associate Specialist
g Other (please specify)

☐ 81

82 Did you have trouble in obtaining the patient's notes?

Yes = 1 No = 2

☐ 82

If yes, how long did they take to reach you?

83 Were all the notes available?

Yes = 1 No = 2

☐ 83

If no, which part was unavailable?

a Preoperative notes
b Operative notes
c Postoperative notes
d Other notes (please specify)

☐ 83A

84 Were the nursing notes available?

Yes = 1 No = 2

☐ 84

85 Were you in any way concerned about the conduct of the anaesthetic in this case?

Yes = 1 No = 2

☐ 85

If yes, do you think the surgical assessors should see the anaesthetic questionnaire on this patient?

Yes = 1 No = 2

☐ 85A

86 Has the consultant seen and agreed this form?

Yes = 1 No = 2

☐ 86

87 Have you enclosed a copy of the surgical operation notes?

Yes = 1 No = 2

☐ 87

If no, why not?

88 Have you enclosed a copy of the postmortem report?

Yes = 1 No = 2

☐ 88

89 How long did it take you to complete this questionnaire?

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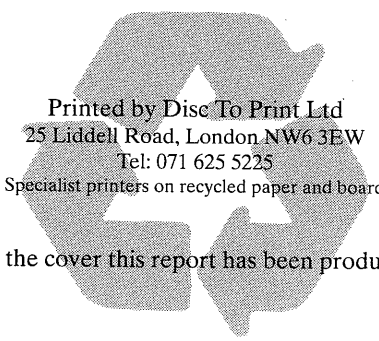

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