The National Sentinel Caesarean Section Audit Report

RCOG Clinical Effectiveness Support Unit October 2001

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All correspondence with regard to the content of this Audit should be addressed to:

Clinical Effectiveness Support Unit
Tel: +44 (0)20 7772 6342
Email: NSCSA@rcog.org.uk

Copies of this publication can be obtained from:

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Tel: +44 (0)20 7772 6275
Fax: +44 (0)20 7724 5991
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Website: www.rcog.org.uk

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Abbreviations used in the survey

CS	Caesarean section
CSR	Caesarean section rate(s)
CTG	Cardiotocograph(y)
ECG	Electrocardiogram
EFM	Electronic fetal monitoring
ECV	External cephalic version
FBS	Fetal blood sampling
FHR	Fetal heart rate
HDU	High-dependency unit
HELLP	Haemolysis, elevated liver enzymes and low platelet count
HES	Hospital episode statistics
ITU	Intensive care unit
LREC	Local research and ethics committee
MREC	Multicentre research and ethics committee
NCEPOD	National Confidential Enquiry into Perioperative Deaths
NICU	Neonatal intensive care unit
NSCSA	National Sentinel Caesarean Section Audit
ODP	Operating department practitioner
OR	Odds ratio
SCBU	Special care baby unit
SROM	Spontaneous rupture of membranes
RCT	Randomised controlled trial
VBAC	Vaginal birth after caesarean section
WHO	World Health Organization

Glossary of terms

Auditable standard	An agreed standard against which practice can be assessed.
Case–control study	The study reviews exposures or risk factors, comparing the exposure in people who have the outcome of interest, for example the disease or condition (i.e. the cases) with patients from the same population who do not have the outcome (i.e. controls).
Cohort study	The study involves identification of two groups (cohorts) of patients, one of which has received the exposure of interest and one of which has not. These groups are followed forward to see if they develop the outcome (i.e. the disease or condition) of interest.
Confounder	A factor that may offer an alternative explanation for the observed association between an exposure and the outcome in which we are interested.
Cross-sectional study	The observation of a defined population at a single point in time or time interval. Exposure and outcome are determined simultaneously.
Denominator data	The denominator data forms refer to the data completed for every birth that occurred within a unit during the audited period, irrespective of the type of delivery that was undertaken.
Median	If the data is arranged in an increasing order, the middle value is the median. The range is the difference between the largest and smallest values. The interquartile range (IQR) is the difference between the bottom quarter and top quarter of the data. This is the summary statistic used when the data is not normally distributed.
Mean	This is the summary statistic used when the data follows a normal distribution. It is the sum of all the values divided by the number of values. The standard deviation gives a measure of the spread of individual values about the mean.
Meta-analysis	This is an overview of a group of studies that uses quantitative methods to produce a summary of the results.
Number needed to treat	This is the number of patients who need to be treated to prevent one outcome.
Odds ratio	Describes the odds that a case (a person with the condition) has been exposed to a risk factor relative to the

	odds that a control (a person without the condition) has been exposed to the risk. The crude odds ratio describes the association without taking into consideration the possible effect of any confounders. Adjusted odds ratios describe the association having adjusted for the effect of confounders.
Positive predictive value	This is the percentage of people who have a positive test who really have the condition. The predictive value is dependent upon the prevalence of the disease in the population being tested, i.e. if the disease is rare, the predictive value is low, due to the greater influence of false positive tests.
Randomised controlled trial	A group of patients is randomised into an experimental group and a control group. These groups are followed up for the variables and outcomes of interest. This study is similar to a cohort study but the exposure is randomly assigned. Randomisation should ensure that both groups are equivalent in all aspects except for the exposure of interest.
Risk ratio	Risk is a proportion or percentage. The risk ratio is the ratio of risk of developing the outcome of interest in an exposed group compared with the risk of developing the same outcome in the control group. It is used in randomised controlled trials and cohort studies.
Risk difference	This is the difference in risk of developing the outcome of interest between the exposed and control groups.
Systematic review	This is a literature review using a systematic approach to minimise bias and random errors, which is documented in a materials and methods section, may or may not include meta-analysis.
Sensitivity	The ability of the test to detect those who have the disease, i.e. the proportion (%) of people with the condition who are detected as having it by the test.
Specificity	The ability of the test to identify those without the disease, i.e. the proportion of people without the condition who are correctly reassured by a negative test.

Contributors and acknowledgements

RCOG Clinical Effectiveness Support Unit

J Thomas, Director
S Paranjothy, Clinical Research Fellow
AB Jones, Research Fellow
J Kavanagh, Research Fellow
A Callwood, Research Fellow
J Havilland, Statistician
S Gwilliam, Statistician
D Gray, Research Assistant
C Clark, Administrative support
E Fairclough, Administrative support

Audit Working Group: October 1999 – October 2001

J Walker, Chairman, Royal College of Obstetricians and Gynaecologists
P Brocklehurst, National Perinatal Epidemiology Unit
G Cooper, Royal College of Anaesthetists
G Lewis, Department of Health
M Maresh, Chairman of the Pilot Steering Group
M Newburn, National Childbirth Trust
L Silverton, Royal College of Midwives

Pilot Steering Group: April 1998 – October 1999

M Maresh, Chairman, Manchester Audit Unit
A Benbow, Research Fellow, RCOG Clinical Audit Unit, Manchester
J Chapple, Consultant in Perinatal Epidemiology, Public Health Directorate, London
R Cleary, Health Services Researcher, CASPE
G Cooper, Senior Lecturer in Anaesthesia, Royal College of Anaesthetists
R Kyffin, Research Fellow, RCOG Clinical Audit Unit, Manchester
L Lancucki, Statistician, Department of Health
G Lewis, Principal Medical Officer, Department of Health
A Macfarlane, Statistician, National Perinatal Epidemiology Unit
G McIlwaine, Public Health Consultant, Glasgow
S Petrou, Health Economist, National Perinatal Epidemiology Unit
M Robson, Consultant Obstetrician and Gynaecologist, Wycombe General Hospital
W Savage, Senior Lecturer in Obstetrics and Gynaecology, London
R Settatree, Chair RCOG Audit Committee
L Silverton, Deputy General Secretary, Royal College of Midwives

Additional research advice provided to RCOG CESU

C Frost, Senior Lecturer, London School of Hygiene and Tropical Medicine
J Garcia, Social Scientist, National Perinatal Epidemiology Unit
B Jetten, Plus Four, Market Research Limited
S Kenyon, Oracle Project, Leicester
R McCandlish, Research Fellow, National Perinatal Epidemiology Unit
A Thomas, Freelance Psychologist
J Weaver, Centre for Family Research, Cambridge

Local facilitators

S Legg, Airedale General Hospital, Keighley
K Perkes, Alexandra Hospital, Redditch
K McDaid, Altnagelvin Hospital, Londonderry
S Rawlinson, Andover War Memorial Hospital
A Fitzsimons, Antrim Area Hospital
L Russell, Arrowe Park Hospital, Birkenhead
L McQueen, Ashington Hospital, Berwick Infirmary and Hillcrest GP Maternity Unit, Northumberland
L Haines, Barnet Hospital, London
L Robinson, Barnsley District General Hospital
J Blanchard, L Cotter, Basildon Hospital
Z Paling, Bassetlaw Hospital, Worksop
H Packman, Bedford Hospital
V Gardner, Billinge Hospital, Wigan
L Linning, S Ray, Birch Hill Hospital, Rochdale
A Mason, M Griffin, Birmingham City Hospital
C Barley, Birmingham Heartlands & Solihull Hospitals
J Davis, Birmingham Heartlands Hospital
C Downes, Birmingham Women's Hospital
V Kitching, Bishop Auckland General & Darlington Memorial Hospitals
S Wilkinson, D Jankowicz, Bradford Royal Infirmary
C Tennant, H O'Donnell, Brecon War Memorial Hospital
J Best, Bridlington & District General Hospital
A Ovens, M Sciacca, Bronglais General Hospital, Aberystwyth
P Jedrzejewski, Buckland Hospital, Dover
M Rose, Burnley General Hospital
C Jordan, Caerphilly District Miners' Hospital
C Atkinson, Castle Hill Hospital, Cottingham
C Mannian, Y Sam, L Phillip, S Kiely, Central Middlesex Hospital, London
R Lawson, Chase Farm Hospital, London
Y Choo, Chelsea and Westminster Hospital, London
S Williams, D Owen, Cheltenham General Hospital
S Petty, A Davies, Chesterfield and North Derbyshire Hospital
L Edwards, Christiana Hartley Maternity Hospital, Southport
L Saunders, Colchester General Hospital
S Janes, H Fryer, Conquest Hospital, St Leonards-on-Sea
J McMahon, Countess of Chester Hospital
A Davison, D Lowry, Craigavon Hospital
M Royds-Jones, Crawley Hospital
M Waitt, Cumberland Infirmary
D Chambers, D Fearnside, Darlington Memorial Hospital
J Gilby, T Seed, Derby City Hospital

F Porter, Derriford Hospital, Plymouth
K Gillings, G Hayes, Dewsbury District Hospital
C Hansen, Diana Princess of Wales Hospital, Grimsby
A Donnelly, Daisy Hill Hospital, Newry
S Noblet, Dilke Hospital, Gloucestershire
S Nurse, Dolgellau & Barmouth Community Hospital, Gwynedd
A Wilson, Doncaster Royal Infirmary
J Allmond, Dorset County Hospital, Dorchester
E Cowan, Downe Hospital, Downpatrick
A Gilchrist, Dryburn Hospital, Durham
M O'Shea, Ealing Hospital, London
S Cowley, T Weller, East Surrey Hospital, Redhill
A Holdsworth, L Meech, Eastbourne District General Hospital
S Gibson, Edgware Birth Centre
A Johnston, Epsom General Hospital
N Cadden, Erne Hospital, Fermanagh
S Sweeney, Fairfield General Hospital, Bury
H Robinson, Farnborough Hospital, Orpington
C Umbers, D Parkinson, Fazakerley Hospital, Liverpool
E Jamieson, Friarage Hospital, Northallerton
J Driver, A Price, H Whapshott, S Adams, Frimley Park Hospital, Camberley
S McDowell, Furness General Hospital, Barrow-in-Furness
C Roost, George Eliot Hospital, Nuneaton
A Downey, E Godwin, Gloucestershire Royal Hospital
L Brown, Good Hope Hospital, Sutton Coldfield
C Ho, Gravesend & North Kent Hospital
H Knower, R Oyeniyi, Greenwich District Hospital, London
K Morris, G Joyce, M Sheridan, Guy's & St Thomas' Hospitals, London
C Whitworth, S Monroe, Halifax General Hospital
S Ojelade, Hammersmith Hospital, London
B Tremain, Harold Wood Hospital, Romford
P Ross, Harrogate General Hospital
S Walsh, Hartlepool General Hospital
G Brace, E Trevelyan, Heavitree Hospital, Exeter
M Turner, Helme Chase Maternity Unit, Kendal
J Fallon, Hemel Hempstead General Hospital
S Pratt, Hereford County Hospital
V Wood, Hexham General Hospital
L Lim, Hillingdon Hospital, Uxbridge
S Sibanda, Hinchingbrooke Hospital, Huntingdon
T Manea, Homerton Hospital, London
J Moffat, Hope Hospital, Salford
L Jewson, Horton Maternity Unit, Banbury
L Womersley, Huddersfield Royal Infirmary
L Garry, Hull Maternity Hospital
L Wright, C Colbourne, Ipswich Hospital
L Hynes, James Paget Hospital, Great Yarmouth
P Smith, D Wilson, Jersey General Hospital
D Hughes, Jessop Hospital for Women, Sheffield
J Daddy, Kent & Canterbury Hospital
R Whittle, Kettering General Hospital
S Hayes, Kidderminster General Hospital
N Mullinder, King George Hospital, Goodmayes
P Dobson, Angela Munden, King's College Hospital, London
W James, Kings Mill Hospital, Sutton-in-Ashfield

A Eng Ng, Kingston Hospital
M Gillespie, Lagan Valley Hospital, Lisburn
J Wills, Leeds General Infirmary
S Mansoori , Leicester General Hospital
B McGorty, Leicester Royal Infirmary Maternity Hospital
S Taylor, Leighton Hospital, Crewe
S Gordon, Lewisham Hospital, London
Y Daniels, S Gregory, Lincoln County Hospital
C Gaffney, Lindo Wing, St Mary's Hospital London
V Ryan, L Farrow, Lister Hospital, Stevenage
J Ratcliffe, Liverpool Women's Hospital
F Gillespie, Llandough Hospital
P Davies, Luton & Dunstable Hospital
L Hobbs, Hythe, Lymington & Romsey Hospitals
L Eccleston, Macclesfield District General Hospital
A Brindle, Maidstone Hospital
D Hever, M Hateley, Manor Hospital, Walsall
G O'Boyle, Mater Infirmorum Hospital, Belfast
D Minden, Mayday University Hospital, Thornton Heath
S Heaton, Medway Maritime Hospital, Gillingham
H O'Neill, Mid Ulster Hospital, Magherafelt
J Harrison, Milton Keynes General Hospital
M Farey, Musgrove Park Hospital, Taunton
C Williams, Neath General Hospital
H Davies, E Barnor, Nevill Hall Hospital, Abergavenny
C Hever, M Rooney, New Cross Hospital, Wolverhampton
M Steptoe, N Iqbal, Newham General Hospital, London
M Orchard, S Nath Ray, Noble's Hospital, Isle of Man
J Fraser, Norfolk & Norwich Hospital
N Mitchell, S Bennett, North Devon District Hospital, Barnstaple
M Hull, North Hampshire Hospital, Basingstoke
E Smith, L Cummins, North Manchester General Hospital
M Oldfield, North Middlesex Hospital, London
J D'Silva, M Moss, North Staffordshire Maternity Hospital, Stoke-on-Trent
J Lambert, North Tees General Hospital, Stockton
A Beldon, North Tyneside General Hospital, Whitley Bay
J Woodward, Northampton General Hospital
C Owen, Northern General Hospital, Sheffield
N Katira, Northwick Park Hospital, Harrow
L Hargreaves, R Buckley, Nottingham City Hospital
Y Till, Ormskirk & District General Hospital
S Crook, Pembury Hospital, Tunbridge Wells
T Phillips, Penrice Hospital, St Austell
N Griffin, Peterborough Hospital
S Sinha, Pilgrim Hospital, Boston
B Hartshorne, Pinderfield Hospital Wakefield & Pontefract General Hospital
M Algate, Poole General Hospital
A Shenkorov, M Allinson, Prince Charles Hospital, Merthyr Tydfil
B Harvey, Princess Alexandra Hospital, Harlow
E Kitson-Reynolds, Princess Anne Hospital, Southampton
J Ellyatt, R Nelson, Princess Elizabeth Hospital, Guernsey
W Morris, P Strong, Princess Margaret Hospital, Swindon
J Woolley, Princess of Wales Hospital, Bridgend
D Marriott, Princess Royal Hospital, Haywards Heath
A Aras-Payne, Queen Charlotte's & Chelsea Hospital, London

K Griffin, Queen Elizabeth Hospital, Gateshead
S Hart, Queen Elizabeth Hospital, King's Lynn
C Brittain, A Wakeford, Queen Elizabeth II Hospital, Welwyn Garden City
A Lucas, C Reed, Queen Elizabeth the Queen Mother Hospital, Margate
K Sealey, Queen Mary's Hospital, Sidcup
J Radford, Queen's Hospital, Burton-on-Trent
V Hickman, J Brown, Queen's Medical Centre, Nottingham
A Pedder, Queen's Park Hospital, Blackburn
N Orosz, R Hamilton, Rotherham District General Hospital
G Tracey, P Mulholland, Route Hospital, Ballymoney
K MacKinnon, W Smith, Royal Berkshire Hospital, Reading
S Purnell, Royal Bolton General Hospital
A Wareham, Royal Bournemouth General Hospital
S Budgen, Royal Cornwall Hospital, Truro
G Roberts, Royal Glamorgan Hospital, Llantrisant
D Harding, Royal Gwent Hospital
P Dana, Royal Hampshire County Hospital, Winchester
S Goss, Royal Lancaster Infirmary
D Dale, Royal Oldham Hospital
J Latham, Royal Shrewsbury Hospital
L Wren, Royal Surrey County Hospital, Guildford
K Creed, Royal Sussex Hospital, Brighton
H Saint F Jones, Royal United Hospital, Bath
E Blair, Royal Victoria Infirmary, Newcastle-upon-Tyne
J Smith, P Curran L Hide, St George's Hospital, London
S Wright, St Helier Hospital, Carshalton
V Watson, R Kendall, St James University Hospital, Leeds
C Jenkins, St John & St Elizabeth Hospital, London
A Smith, St John's Hospital, Chelmsford
S Daly, J Hempstock, St Mary's Hospital Manchester
F W Han, St Mary's Hospital London
J Brooks, C Abrook, St Mary's Hospital Isle of Wight
A Blatch, S Hackett, St Mary's Hospital Portsmouth
J Butler, St Michael's Hospital, Bristol
P Frost, St Peter's Hospital, Chertsey
A Anderson, E Norvall, St Richard's Hospital, Chichester
S Fenwick, M Neville, Salisbury District Hospital
J Whitaker, Sandwell District General Hospital, West Bromwich
P Chico, D Robinson, Scarborough & Malton, Norton & District General Hospitals
J Rands, Scunthorpe General Hospital
A McKenna-Griffiths, Sharoe Green Hospital Preston & Chorley District Hospital
A Warren, Singleton Hospital, Swansea
N Edwards, Solihull Hospital
C Marshall, South Cleveland Hospital, Middlesborough
J Hall, South Tyneside District Hospital, South Shields
P Hurworth, J Pattern, Southend Hospital
S Price, J Webster, Southmead Hospital, Bristol
G Carrasco, Stafford District General Hospital
J Grindey, Stepping Hill Hospital, Stockport
E Ridgway, Stoke Mandeville Hospital, Aylesbury
B Cullimore, Stroud Maternity Hospital
C Carter, E Moscrop, Sunderland City Hospital
G McNeil, D Hunt, Tameside General Hospital, Ashton-under-Lyne
H Kirlow, L O'Connor, The John Radcliffe Hospital, Oxford
S Khan, The Portland Hospital, London

J Hughes, The Princess Margaret Hospital Windsor
J Gwynn, The Rosie Maternity Hospital, Cambridge
S Crook, A Canning, E Scott, The Royal Free Hospital, London
S Wilson, D Thornley, The Royal London Hospital
H Kyle, C Duff, The Royal Maternity Hospital, Belfast
H Gobrial, Torbay Hospital
R Morton, Trafford General Hospital, Manchester
E Madden, Ulster Hospital, Belfast
J Baxter, University College Hospital, London
A Wouters, University Hospital of Wales, Cardiff
R Hartley, Victoria Hospital, Blackpool
K Camm, Walsgrave Hospital, Coventry
A Anderson, J Thompson, E Kozman, Warrington District General Hospital
R Harris, Warwick Hospital
T Toman, Watford Hospital
J Guy, Wessex Maternity Centre, Southampton
J Bragg, West Cumberland Hospital, Whitehaven
K Beck, West Middlesex University Hospital, Isleworth
S Rush-Hall, West Suffolk Hospital, Bury St Edmunds
A Rees, J Davies, M Wingham, West Wales General Hospital, Carmarthen
K Roberts, Weston General Hospital, Weston-Super-Mare
J Uhlhorn, Wexham Park Hospital, Slough
A Meade, S Guildford, Whipps Cross Hospital, London
M Brown, Whiston Hospital, Merseyside
C Maher, Whittington Hospital, London
M Jackson, William Harvey Hospital, Ashford (Kent)
J Regan, U Walapu, Withybush Hospital, Haverfordwest
T Price, Worcester Royal Infirmary
L Delaney, B Smith, Wordsley Hospital, Stourbridge
E Cregan, Worthing Hospital
A Fraser, Wycombe General Hospital, High Wycombe
A Bell, J Anderson, Wythenshawe Hospital, Manchester
C Limrick, Yeovil Maternity Unit
S Fairclough, York District Hospital
J Leadbetter, Ysbyty Glan Clwyd
J Pugh, Ysbyty Gwynedd, Bangor
D Edwards, Ysbyty Wrexham Maelor

Contributors

The audit was developed by the multidisciplinary Pilot Steering Group and Audit Working Group. The RCOG Manchester Audit Unit ran the pilot project. The RCOG CESU provided methodological expertise, co-ordinated data collection and undertook statistical analysis of the data for the main study. The report was written by J Thomas and S Paranjothy.

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Foreword

Concerns about the rise in the number of caesarean sections and possible variation in rates between maternity units have quite properly been a matter of public debate. The Department of Health commissioned the National Sentinel Caesarean Section Audit to accurately determine the current caesarean section rate, factors associated with variation in the rate and quality of care.

This project has been an important initiative successfully undertaken by the Royal College of Obstetricians and Gynaecologists Clinical Effectiveness Support Unit in collaboration with the Royal College of Midwives, the Royal College of Anaesthetists and the National Childbirth Trust, funded by the National Institute for Clinical Excellence. All maternity units in England, Wales and Northern Ireland have participated and great credit is due to the 350 local facilitators, professional staff (midwives, obstetricians and hospital administrators) and expectant mothers who contributed to the exemplary response rates.

This audit will provide important information for the development of the guideline on caesarean section by the National Institute for Clinical Excellence. The audit will also inform the development of the National Service Framework for Children and Maternity Services. It is also anticipated that this national audit will be used as the basis for development of continued local audit. The audit findings have been disseminated to individual NHS trusts to inform discussion and possible strategies for further improvements in quality of care and service provision for maternity care.

JACQUI SMITH MP
Minister of State
Department of Health

24 October 2001

Introduction

This report presents the findings of the national audit of caesarean section rate (CSR) in England, Wales and Northern Ireland.

As the first national survey of its kind, this report provides information about the range and determinants of CSR with comparative data by countries, regions and maternity units, about demographic, clinical and organisational factors that may be influential and about the views of women and obstetricians. This report provides an overview of the main results and a detailed description of the methodology.

The data presented in this report represent the most comprehensive set of data collected to date and represent 99% of all births in England and Wales that took place during a three-month period. The data presented here will help to inform the development of clinical guidelines on CS. In addition, it is anticipated that this national audit will be used as the basis for the development of continued local audit. The outputs from this study have been made available to local stakeholders such as commissioners of health care, general practitioners, midwives, obstetricians and service users.

Following the pilot study, the main audit was carried out in two phases:

The aims of phase one of the audit were:

- to determine the frequency of CS in all maternity units in England, Wales and Northern Ireland
- to evaluate demographic, clinical and organisational factors associated with variations in the CSR
- to assess the quality of clinical care against agreed standards, derived from published literature.

The aims of phase two of the audit were:

- to survey maternal views and attitudes to CS and the sources of information that women use and value when they are forming their views about how they wish to have their babies
- to explore clinicians' attitudes towards, and threshold for, CS.

The role of the local facilitators was critical to the success of such an extensive survey. Local facilitators were responsible for coordinating and validating local data collection. This achievement was due to the excellent collaboration of the participating hospitals.

The Audit was funded by the Department of Health, the National Institute for Clinical Excellence and the Department of Health, Social Services and Public Safety, Northern Ireland. It was developed by multiprofessional and lay working groups (the Pilot Steering Group and the Audit Working Group). It was conducted by the Clinical Effectiveness Support Unit at the RCOG. The National Institute for Clinical Excellence is associated with the National Sentinel Audit on Caesarean Section through a funding contract. The Institute considers the work of RCOG CESU to be of value to the NHS in England and Wales and recommends that it be used to inform decisions on service organisation and delivery.

In this report, in each chapter and for each topic, there is an initial review of the literature and research studies. The results are then presented and discussed in the context of auditable standards, either formulated by the participating Colleges or based on research evidence.

The subject matters described and discussed in the chapters is as follows:

1. International trends in the CSR, the reasons for and the possible responses to its persistent growth
2. Audit methodology and the rigorous quality standards
3. Coverage and response rates to the Audit, including the surveys of organisations and women's and clinicians' views
4. Results pertaining to the mode of delivery
5. Influence of population and clinical characteristics on the CSR, e.g. maternal age, ethnicity, gestational age, multiple births
6. Management decisions relating the principal indications for CS: previous CS, failure to progress and fetal distress
7. Approaches to denoting the urgency of CS
8. Decision-to-delivery interval for emergency CS
9. Morbidity from CS: reducing infection and thromboembolic disease
10. Organisational factors that may effect the CSR: characteristics of the maternity unit, midwifery and obstetric staffing levels and facilities in the labour ward
11. Anaesthetic care: its availability and practice compared with standards developed by the Obstetric Anaesthetists Association.
12. Survey of women's views about the CS
13. Survey of obstetricians' views about CS.

1. Background

1.1 Summary

- Increasing concern about the rising trend in developed countries prompted the World Health Organization (WHO) in 1985 to organise a consensus conference, which concluded that there were no additional health benefits associated with a CSR above 10–15%.
- The Nordic countries (Norway, Finland, Sweden and Denmark), which had experienced comparable rates of growth to the UK in the 1960s, 1970s and 1980s, were able to maintain the CSR in the 1990s within the range indicated by the WHO.
- The CSR continued to rise in the 1990s and by the year 2000 was close to or exceeding 20%.
- Deriving a complete picture of current rates is hampered by the lack of comprehensive data.
- Demographic changes may have contributed to the rising trend, although they appear not to have had an impact in the Nordic countries.
- Differences in clinical practice may also be influential. Initiatives in the USA and Canada focused on the principal indications for CS, dystocia, fetal distress and repeat CS, may have contributed to the recent stabilisation of the CSR in those countries. A similar initiative has been launched in Scotland. The principal indications for CS are considered in Chapter 6.
- Other factors that could be associated with the CSR are the organisation and availability of resources, the provision of one-to-one support in labour, women's choices about childbirth and the characteristics and views of obstetricians. These factors are considered in Chapters 10 to 13.

1.2 Introduction

This chapter reviews the international trends in CSR, the World Health Organization (WHO)'s 1985 view of its appropriate level and its subsequent development internationally. Demographic and variations in clinical practices are considered as possible explanations for the trend. Initiatives taken in the USA and Canada to reduce the increase are reported.

1.3 Background

There has been public health concern for over 30 years about the increasing CSR. Although a global phenomenon, the timing and rate of increase has differed between countries and marked differences in rates persist.

In 1985, WHO issued a consensus statement suggesting there were no additional health benefits associated with a CSR above 10–15%. This was based on an examination of estimates of national CSR and maternal and perinatal mortality rates from various countries.

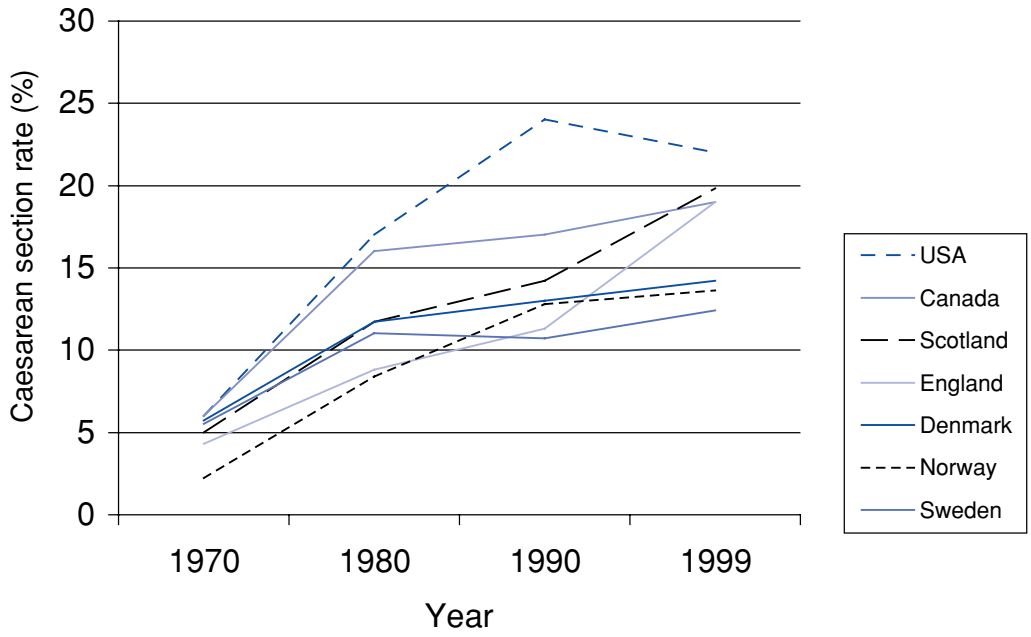

Figure 1 International caesarean section rate

The greatest increase in CSR in England was seen in the 1970s when rates doubled from 4% in 1970 to 9% in 1980. However, during the 1980s the increase was less marked. Rates appeared to almost double again during the 1990s, with estimated rates of 16%[1] in 1995, and 19%[2] by 1999, for the first time indicating that CSR in England had surpassed those recommended by the WHO. Deriving a complete picture of current rates is hampered by the lack of comprehensive data: the latest national estimates were based on only 67% of maternities. Such deficiencies in the completeness and quality of national maternity data in England and Wales have been documented.[3] However, it has not been possible to comment on recent trends in Wales and Northern Ireland due to inconsistency in the collection of national data.

In Scotland, where data have been routinely collected about all births since 1970, a similar pattern of increase has been observed, with the rates rising from 5% in 1970,[4] to 12% in 1980[5] to nearly 20% in 1999.[6]

Nordic countries (Norway, Finland, Sweden and Denmark) have had good national maternity data for many years. In these countries, CSR and the pattern of increase have been similar to those observed in the England up to 1990. CSR were between 2% and 6% in 1970, rising to 8–12% in 1980,[5] and 12–13% in 1990.[7] However, the period of rapid increase observed in England and Scotland during the 1990s did not occur, with national rates in Nordic countries remaining at 12–14%.[8]

Other European countries do not have published national maternity data and, therefore, the pattern of change in these countries is more difficult to ascertain. The estimates for France suggest rates comparable to England and Scotland up to 1995.[9] In Italy, CSR were comparable in 1980 at 11%[10] but rose dramatically to 22% in 1995.[11]

In the USA, rates nearly tripled during the 1970s and continued to rise steeply throughout the 1980s.[12] Rates increased from 6% in 1970 to 17% in 1980[5] and to 24% in 1990.[7] Through the 1990s, rates stabilised and even fell marginally[13] to 22% in 1999.[14] This pattern was mirrored in Canada, where rates increased from 6% in 1970 to 16% in 1980,[5] to 19% in 1998.[15]

1.3.1 Why have caesarean section rates increased?

Many studies have attempted to examine and evaluate the changes in population characteristics that may have contributed to the observed increases in CSR. For example, women are delaying childbirth and have fewer children.[12,16,17] CSR have been observed to increase with age. However, shifts in the age structure of the population have been shown to account for only a small part of the increase in CSR.[18] For example, the Nordic countries have had similar demographic transitions but have not reported parallel increase in CSR.[8]

An alternative approach to explaining the observed increase has been to evaluate the effect of differences in clinical practice by examining CSR within specific clinical groups. In order to facilitate valid comparisons between different clinical populations, several published methods have been developed that aim to take into consideration differences in population or pregnancy characteristics that may account for the observed differences in overall CSR. The more commonly use methods are described below.

Robson Groups[39] subdivide the population into ten groups based on the following six clinical characteristics:

- parity
- previous caesarean section
- multiple pregnancy
- presentation
- gestation
- labour onset

Caesarean section rates are then examined within these groups.

Standard Primipara[33] compares caesarean section rates among women who are white, aged 20–34 years old, more than 155 cm tall, delivering a singleton, cephalic baby at term and who have had no medical complications during pregnancy. Using this method requires the collection of eight data items on all women. The quality and completeness of some of these items (e.g. maternal height) in routine maternity data may be poor. In a society with diverse demographic characteristics the proportion of women included in this group will be less, thus reducing the generalisability of the result.

An early and consistent observation has been that over 70% of CS can be attributed to the following four indications: dystocia (failure to progress during labour); fetal distress; breech; repeat CS. These have been cited as the major determinants of the overall CSR.[18]

This observation resulted in recommendations for practice that aimed to reduce the number of CS performed for these indications, in particular, reducing primary CS (i.e., the CSR for women who have not had a previous section, regardless of parity[12]) for dystocia and fetal distress and increasing the rates of vaginal birth after CS (VBAC) to curtail the self-perpetuating effect of the procedure.[4,8]

Initiatives to implement these recommendations may have contributed to stabilisation of the CSR seen in the USA and Canada. A comparable initiative in Scotland has not yet achieved a similar effect.

Other factors that have been considered to be associated with CSR include: organisational factors (such as hospital size, availability of a neonatal intensive care unit (NICU); provision of one-to-one support in labour; women's choices about childbirth;[19] obstetrician characteristics (such as age, experience, gender and recent medico-legal claims).

These factors are discussed further in Chapters 10, 11, 12 and 13.

The Department of Health was aware of possible wide variations in CSR between maternity units in England and Wales and sought evaluation of the role of population, clinical and organisational factors. In addition, the frequency of maternal request and clinician preference for CS were to be explored. This National Sentinel Caesarean Section Audit (NSCSA) was thus designed to determine factors associated with variation in the CSR.

2. Audit methodology

2.1 Summary

- The Audit was developed by multiprofessional and lay groups drawn principally from the Royal Colleges of Obstetricians and Gynaecologists, Midwives and Anaesthetists and the National Childbirth Trust.
- The output has been made available to stakeholders. Each maternity unit has received feedback on its own data to facilitate the development of continuing local audit.
- The auditable standards were derived from evidence in systematic reviews and from published standards. An extensive search was conducted to identify and synthesise relevant evidence within the published literature to answer specific clinical questions. Thus, where possible, clinical audit standards are evidence based. There was no systematic attempt to search the 'grey' literature.
- The highest levels of evidence were used and all papers were reviewed using the established guidelines of the US Agency for Health Care Policy and Research.
- The draft data collection tools were all modified after pilot studies and feedback from the 320 local facilitators and prospective respondents.
- Data collection was in two phases.
- In phase one, the aims were to determine the frequency of CS in all maternity units in England, Wales and Northern Ireland, to evaluate demographic, clinical and organisational factors and to assess the quality of clinical care.
- All maternity units were asked to nominate a local facilitator to distribute audit materials locally, to validate and return data and to act as a link with CESU at the RCOG.
- Denominator data forms were used to collect data on all births and clinical data forms for more detailed information about every caesarean delivery. In addition, there were supplementary surveys covering midwifery, obstetric and anaesthetic issues and each 'delivery suite' was asked to keep a two-week diary.
- In phase two, the aims were to extend the phase one audit to Northern Ireland, the Channel Islands and the Isle of Man, to re-collect data of caesarean births in a randomly selected and stratified sample of maternity units, to evaluate the influence of women's views about childbirth, and to explore clinicians' attitudes about CS.
- Data were validated by local facilitators and by CESU at the RCOG. Checks were made to identify data inconsistencies and duplication.
- In this report, estimates given in the text relate to the data from maternity units in England and Wales that took part in phase one between 1 May to 31 July 2000 and for Northern Ireland and the Channel Islands between 1 December 2000 and 28 February 2001.
- The data on all births, including CS, that were re-collected as part of phase two for a limited number of hospitals, are included to allow for comparison with the phase one data.

2.2 Introduction

This chapter deals with the development of the Audit, who was involved; its intended audience and how the results will be disseminated. The basis of the auditable standards are described, with details of the literature search and the appraisal of the of the research evidence. The aims and extent of two phases of the Audit including the surveys of organisational, maternal and clinicians' views are described. The arrangements for collection, validation, entry, management and analyses of the data are outlined.

2.3 Who developed the Audit?

The Audit was developed by a multiprofessional and lay working group (Pilot Steering Group and Audit Working Groups) convened by the Royal College of Obstetricians and Gynaecologists (RCOG) and funded by the Department of Health and NICE/Department of Health, Social Services and Public Safety Northern Ireland. Members included representatives from:

- Royal College of Obstetricians and Gynaecologists
- Royal College of Midwives
- Royal College of Anaesthetists
- The National Childbirth Trust
- Faculty of Public Health
- Department of Health
- The RCOG Audit Unit (pilot project)
- The RCOG Clinical Effectiveness Support Unit (main project, phases one and two).

2.4 For whom is the Audit intended?

The audit is of relevance to:

- pregnant women and their families
- healthcare professionals who share in caring for women during pregnancy and childbirth
- those with responsibilities for planning maternity services such as directors of public health and NHS trust managers
- those involved in the planning and funding of maternity services.

To complete the audit cycle, a re-audit to monitor change should be undertaken. It is anticipated that this national audit will be used as the basis for the development of continued local audit, the outputs of which should be made available to local stakeholders such as commissioners of health care, general practitioners, midwives, obstetricians and service users.

2.5 How are the Audit results being disseminated?

- Each maternity unit has received feedback on its own patient data. This was sent to the facilitator, the clinical director, the midwifery manager and the director of public health.
- For ease of comparison, the corresponding regional and national statistics are included in the report.
- Full copies of the printed report can be purchased from the RCOG Bookshop and Online Bookshop (www.rcog.org.uk).
- Full copies of the Audit report are available to view on the RCOG website (www.rcog.org.uk).

2.6 Methods used in the development of audit standards

2.6.1 Topic areas

An audit must seek to define 'auditable standards' – those against which practice and outcomes can be assessed. The auditable standards to be evaluated in this audit were derived from the evidence of systematic reviews and from published standards[4,20,21] and were agreed by the pilot steering and audit working groups. The approach taken to reviewing the literature is described in more detail below. In addition, this literature review was updated prior to the writing of this report to ensure that any new significant publications were incorporated.

2.6.2 Literature search strategy

The aim of the literature review was to identify and synthesise all relevant evidence within the published literature to answer the specific clinical questions. Thus, where possible, clinical audit standards would be based on research evidence.

Searches were carried out for each topic of interest:

- The Cochrane Library was searched to identify systematic reviews (with or without meta-analyses) of randomised controlled clinical trials and randomised controlled trials.
- Guidelines were searched for on the National Guidelines Clearinghouse database and the TRIP and OMNI services on the Internet. The reference lists in these guidelines were checked against the Group's searches to identify any missing evidence.
- Searches of MIDIRS were obtained to cover nursing and midwifery literature.
- The electronic database, MEDLINE (CD Ovid version), was searched for the period January 1966 to September 2001.
- The electronic database EMBASE was searched between 1988 to September 2001 to identify publications, usually European, not indexed on MEDLINE.
- Reference lists of non-systematic review articles and studies obtained from the initial search were reviewed and journals in the RCOG library were hand-searched to identify articles not yet indexed.
- Full details of these searches are available on request from the RCOG CESU.
- There was no systematic attempt to search the 'grey' literature (conferences, abstracts, theses and unpublished trials).

2.6.3 Sifting and reviewing the literature

A preliminary scrutiny of titles and abstracts was undertaken and full papers were obtained if the research addressed the audit topic. Following a critical review of the full version of the study, articles not relevant to the subject in question were excluded. All retrieved articles were appraised methodologically using established guides.[22]

For all the subject areas, evidence from the study designs least subject to sources of bias was included. Where possible, the highest levels of evidence were used. All papers were reviewed using established guides (Table 2.1). For example, evidence based on a meta-analyses of randomised controlled trials were classified as level Ia, compared with evidence from a well-designed controlled study without randomisation (level IIb). The definitions of the types of evidence used in this audit originate from the US Agency for Health Care Policy and Research.[23]

Published systematic reviews or meta-analyses were incorporated where available. For subject areas where neither of these sources was available, other appropriate experimental or observational studies were sought and weighted according to the hierarchy of levels of evidence.

Table 2.1 Levels of evidence

Level	Definition
Ia	Evidence obtained from meta-analysis of randomised controlled trials
Ib	Evidence obtained from at least one randomised controlled trial
IIa	Evidence obtained from at least one well-designed controlled study without randomisation
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study
III	Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies
IV	Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities

2.6.4 Synthesising the evidence

Once identified articles had been assessed methodologically using Table 2.1, the retrieved evidence was graded accordingly. The clinical question dictates that the highest level of evidence should be sought. For issues of therapy or treatment, the highest level of evidence is meta-analyses of randomised controlled trials or individual randomised controlled trials. This would equate to a Grade A recommendation in clinical practice guidelines.[24]

Where appropriate, if a systematic review, meta-analysis or randomised controlled trial existed in relation to a topic, studies of a weaker design were ignored. The evidence was synthesised using qualitative methods.

2.7 Data collection tools

Appendices C and D include copies of all data collection tools. The remit and draft data collection tools for all births and all CS were agreed by the Pilot Steering and the Audit Working Groups. The data collection tools were modified following the pilot study in ten hospitals and following feedback from the 320 local facilitators on the audit training days (see section on phase one data collection for a full description of role of local facilitators).

Due to logistical complexities, the decision was taken that it was not feasible within the timescale to carry out a survey of women's views in every hospital in England and Wales. Hence, it was agreed to survey women in a random sample of hospitals. The survey questionnaire was revised in light of the pilot study and an additional series of pilots undertaken with pregnant women who responded to notices in newspapers and magazines.

The survey of clinicians' views on CS was developed and piloted on a number of clinicians at hospitals not included in the sample frame for the phase two study for these surveys.

2.8 Phase one

The aims of phase one of the audit were:

- to determine the frequency of CS in all maternity units in England, Wales and Northern Ireland
- to evaluate demographic, clinical and organisational factors associated with variations in CSR
- to assess the quality of clinical care against agreed standards, derived from published literature.

All maternity units in England and Wales (NHS and private sector) were invited to participate and all units accepted this invitation. Data collection took place between 1 May and 31 of July 2000. Northern Ireland, the Channel Islands and the Isle of Man also wished to participate. For logistical reasons, the data collection from these centres took place between 1 December 2000 and 28 February 2001.

2.8.1 Local facilitators

All maternity units were asked to nominate a local facilitator to provide a link between the researchers at RCOG CESU and their Unit. The facilitators were either clinical members of the maternity department involved in intrapartum care or were from the audit department. NHS trusts were asked to provide dedicated staff time for this role in recognition that this work, for an average size unit, would take a half day per week for three months. In preparation for their role, facilitators attended a training day that had approval from the relevant professional bodies. They were provided with information about generic audit methodology, the background and proposed methods of this audit.

These facilitator-training days provided an invaluable opportunity for a wider consultation on the study design and the consideration of potential problems that could arise at a local level during data collection. Consideration and discussion of these issues facilitated the development of strategies to overcome them and led in some cases to modification of the study design before data collection started.

A number of resources were made available to facilitators to publicise the audit locally including teaching materials, posters and pens. Facilitators distributed the audit materials locally. They undertook local validation of data prior to its return to RCOG CESU for data entry and analyses. During the period of data collection, regular contact was maintained between facilitators and RCOG CESU so that potential problems with data collection/coding could be addressed promptly.

2.8.2 Data validation

To ensure data quality, facilitators validated the data content, completeness and the number of deliveries against alternate sources such as the delivery suite register, theatre register or maternity case notes. Forms were returned to RCOG CESU on a weekly basis. In order to monitor data completeness locally and centrally, facilitators completed a check sheet (Appendix Cvii) recording both the numbers of completed forms being returned and the dates of delivery to which they pertained. To ensure against data loss, facilitators also kept copies of these verification checklists and the 'denominator' data forms. The denominator data forms refer to the data completed for every birth that occurred within a unit during the audited period, irrespective of the type of delivery that was undertaken.

On receiving these forms, RCOG CESU staff checked the verification checklists, the denominator forms and the additional clinical data forms completed for each CS, for inconsistencies in the numbers of forms returned or for incomplete data. Resultant queries were referred back to the local facilitators so that any inconsistencies were resolved before data entry.

This process helped to identify quickly and promptly units experiencing difficulties with data collection, who were then contacted by the RCOG CESU within two-three weeks.

2.8.3 Data collected on all births (denominator data)

England and Wales do not have a national maternity database. Collection of reliable and consistent information on all women giving birth during the audit was needed for reliable computation of a CSR. The variety of hospital information systems in use, the inconsistencies in definitions between maternity systems and poor population coverage of such systems meant that routine data collection systems were not deemed fit for this purpose.

Participation in the audit involved the collection of specific data that were additional to the routine hospital data collection. Therefore, it was recognised that information required specifically by the audit needed to be known, or accessible, to the person filling in the form and the form needed to be simple and quick to complete.

The data items collected on the denominator data forms for all births during the study period were are shown in the box below (Appendix Ci).

Data items collected on all births

- Date of delivery
- Mother's date of birth
- Mother's ethnicity
- Total number of previous pregnancies of at least 24 weeks of gestation
- Number of previous caesarean sections
- Gestation
- Mode of onset of labour
- Number of babies born
- Presentation
- Mode of delivery
- Outcome of pregnancy (live/stillbirth)
- Birthweight of baby(ies)

Most, but not all, of these data items (e.g. number of previous CS) would be available from alternate sources, such as delivery suite registers. Therefore, to ensure data completeness for these items, facilitators were encouraged to ensure that data collection forms were completed at the time of delivery by someone who had cared for the mother during the delivery. It was agreed that, in order to get good quality and complete data, it would be necessary to collect only essential data items that were easily accessible and collectable. As data pertaining to maternal height and weight are not always recorded on case notes nor easily obtained, the decision was made not to collect these items.

2.8.4 Data collected on all caesarean births

Detailed information was collected for every caesarean delivery that took place during the three-month study period using clinical data forms (Appendix Ciii). There were 55 questions on each clinical data form covering demographic characteristics, details of the index pregnancy, previous obstetric history, the decision making process leading to the CS and assessment of the quality of care against pre-defined standards.

Again, facilitators were encouraged to ensure that these forms were completed at the time of delivery by the most appropriate person/s at the delivery.

2.8.5 Organisational surveys

A number of organisational and staffing factors are known to impact on both the CSR and the quality of care women receive. In order to assess these organisational factors two supplementary survey questionnaires were developed. One, covering midwifery and obstetric issues, was sent to the midwifery manager (Appendix Civ); the other, on anaesthetic issues, was sent to the lead obstetric anaesthetic consultant (Appendix Cv). In addition, each 'delivery suite' was asked to keep a two-week diary documenting its activity (Appendix Cviii). This diary was used to evaluate the current staffing provision for intrapartum care within maternity units.

2.8.6 Confidentiality

Ethics committee approval was sought from a multi-regional ethics committee (MREC) for this phase of the study, although they confirmed that, for an audit of this nature, this was not required. To ensure confidentiality of individual and hospital data, all data collection forms were identifiable only by an alphanumeric code. All audit materials were prepared centrally. Only the central research staff knew the key to all the codes. The unique identifiers used were study hospital code, date of delivery and maternal date of birth.

2.9 Data collection: phase two

The aims of phase two of the audit were:

- to survey maternal views and attitudes to CS and the sources of information women use and value when they are forming their views about how they wish to have their baby
- to explore clinicians' attitudes towards, and threshold for, CS.

2.9.1 Survey of maternal views

The aim of this survey was to document the frequency of maternal request for CS and explore women's views about childbirth. It included an exploration of the sources of information women use when they are forming their views about how they wish to have their baby, as well as determining women's perception of the risks and benefits of different modes of delivery (Appendix Di).

Study population

Forty-two units were invited to take part in phase two of the audit. The sampling process for selection of hospitals in phase two involved creating a matrix, which categorised hospitals in England, Wales and Northern Ireland by region, size; CSR (based on preliminary data from phase one) and type of hospital (district general hospital, teaching hospital). One hospital was then randomly selected from each category.

One unit declined to take part and another did not get local permission from its research development committee. This phase of the study did require ethics committee approval for the survey of maternal views. This was sought and granted by the MREC and all local research ethics committees (LREC). The final sample consisted of 40 units.

The population to be surveyed in phase two included women booked in to these units (both to receive community or primary care) with an estimated date of delivery in January 2001.

Local hospital facilitators compiled lists of eligible women. Variation in patient information systems meant that not all centres could easily identify such women directly. Therefore, in some centres, indirect methods were used; for example, identifying women from appointment diaries of the ultrasound department or antenatal clinic. The list of women included in the sample was kept by the local facilitators and was not available to the RCOG CESU researchers. To enable the RCOG CESU to estimate the response rate, the total numbers of women invited by each centre was reported back to RCOG CESU.

To try to ensure that women who had experienced an adverse event (e.g. preterm birth, neonatal death) were not included in the survey, local facilitators crosschecked this information against an appropriate local source. In the event that a woman was inadvertently sent a questionnaire, the local facilitator contacted the woman's GP and the person responsible for her maternity care to inform them of this. Where appropriate they were also sent a letter of apology from RCOG CESU.

RCOG CESU prepared and dispatched the survey materials to the facilitators for distribution. Local facilitators sent the eligible women an information leaflet, an invitation to participate in the survey, patient address labels (if available) and a prepaid response envelope. The enclosures also included an endorsement from the maternity unit but it was made clear that all responses to the survey were confidential and would not be available to their health care professionals.

Women who wished to take part in the study sent were required to send their address label in the prepaid response envelope to the RCOG CESU. The questionnaire, a pen and a further prepaid return envelope were then dispatched by return. Women were required to return completed questionnaires to RCOG CESU.

The time interval between the initial invitation and dispatching the questionnaire was kept as short as possible to reduce the risk of an interim adverse event.

2.9.2 Survey of clinicians' views

A survey exploring clinicians' attitudes towards, and threshold for, CS was also undertaken (Appendix Dii).

Study population

The finalised questionnaire was sent to all consultant obstetricians in the 40 units participating in phase two. They were identified using the RCOG College database and crosschecked with local facilitators to ensure complete coverage.

During phase two, data on all births including CS were re-collected, ensuring contemporaneous, high-quality maternity data, which were comparable to phase one. Simultaneously, all maternity units in Northern Ireland, the Channel Islands and the Isle of Man ran phase one of the audit for the first time, and phase two, including completion of the supplementary surveys mentioned.

2.10 Statistical methods

2.10.1 Data entry

Data collection involved completion of paper forms by healthcare professionals on the labour ward. Information was collected for all births and all CS using closed questions. All questions were pre-coded. Data were validated by local facilitators and then by RCOG CESU. Data were entered manually into QPS market research software[25] and then exported to Microsoft Excel software. Prespecified edit checks were run so that data inconsistencies could be identified and addressed in a timely manner. A check for duplicate entries was also performed. Approximately 50% of all phase one denominator data were double entered, ensuring at least 98% accuracy; 20% of phase two denominator data were double entered.

2.10.2 Data management and analysis

Data were transferred into the statistical software package using Stat Transfer software.[26] Data were checked for inconsistencies both in coding and between variables. Data pertaining to infants who were stillborn and were less than 24 weeks of gestation were excluded from the analysis.

The number of observations per hospital on the verification checklists, the data entered, the data transferred, before and after data cleaning, were checked for consistency. In addition, summary statistics were prepared and fed back to each participating unit for further validation.

To produce statistics across clinical groups (e.g. all nulliparous women or all breech births) the information collected on all caesarean births was linked to the corresponding denominator data using a combination of four variables: hospital alpha-numeric code, date of delivery, maternal date of birth and birthweight. This was done using Microsoft Access 2000 software.

Thirteen consultant-led units had midwifery-led units referring to them. The local facilitators responsible for these units decided whether they wished their midwifery-led units to be separately identified or aggregated with the main unit data. Where midwifery-led units were kept separate, the relationship with the main unit was identified using the alphanumeric coding system. Place of birth (e.g. at home) was not the focus of the audit and therefore specific data items about this were not collected.

Summary statistics in the form of denominator data feedback were given to the consultant-led units in two ways: first excluding deliveries in the respective midwifery-led units and then including these deliveries. Estimates in this report for all units use as the denominator data the total population from which a woman having a CS in that unit could have come (i.e. including home births and midwifery-led units).

All analysis was carried out using STATA 7.0 software.[26] National, regional and unit-level summary descriptive statistics were produced examining CSR and quality-of-care issues, in accordance with the project's prespecified aims and objectives. Summary variables (for example, a unit-specific CSR) have been used to examine the associations with other unit level factors. To calculate the contribution of specific indications to the overall CSR, the information on clinical data forms that were linked to corresponding denominator data entries were used. Univariate and multivariate logistic regression models were used to evaluate associations between CS as mode of delivery and various demographic and pregnancy characteristics. Robust standard errors were obtained to adjust for clustering within units. Probability of less than 0.05 was considered to be statistically significant.

2.11 Presentation of data for this report

In this report, estimates given in the text relate to the data from maternity units in England and Wales that took part in phase one between 1 May and 31 July 2000 and for Northern Ireland and the Channel Islands between 1 December 2000 and 28 February 2001.

The data on all births, including CS that were re-collected as part of phase two for a limited number of hospitals, are included to allow for comparison with the phase one data.

3. Data coverage and response rates

3.1 Summary

- Data collection was successfully completed by 213 NHS consultant-led units, 20 NHS midwifery-led units and three private maternity hospitals in England and Wales.
- 99% of all births were covered.
- The response rates to the organisation surveys ranged from 92% to 100%.
- 2942 women (37% of those invited to participate in the survey of women's views of childbirth) responded; 84% of this group completed and returned the questionnaire.
- 224 consultant obstetricians were invited to respond to the survey of their views about CS. The response rate was 77%, with at least one consultant responding from each of the 40 participating units.

3.2 Introduction

This chapter reports on the coverage and response rates to both phases of the Audit, including the surveys of organisation and women and clinicians' views.

3.3 Phase one

3.3.1 Denominator and caesarean section data

All maternity units in England and Wales agreed to participate in phase one. One hospital was subsequently excluded because it failed to collect and return data contemporaneously; it then undertook the audit in phase two between December and February 2001. Its data are included where appropriate with the forty units participating in phase two.

Data collection was successfully completed by 213 NHS consultant-led units, 20 NHS midwifery-led units and three private maternity hospitals.

Coverage of the data set was assessed by comparing it with the most complete source of birth statistics derived from birth registrations. The Office for National Statistics birth registration data documented 154,265 births occurring between 1 May and 31 July 2000 in England and Wales. The phase one data set includes information on 152,413 births: this is equivalent to 99% of all births that occurred in England and Wales during the time frame of the study. The missing data can be accounted for as follows: the database does not include:

- births from the one NHS unit that was unable to collect data contemporaneously
- one RAF unit
- home births that were undertaken by Independent midwives.

The information on the 152,413 births for which forms were returned is referred to as the denominator data.

The number of caesarean births recorded on the denominator data of all births was 32,222 out of the 150,139 maternities. The total number of additional clinical data forms received relating the details of these CS was 32,082, equivalent to 99.6% of all CS that took place during the audited period.

To enable statistics to be collated across clinical groups (e.g. all nulliparous women or all breech births), the information collected on all caesarean births was linked to the corresponding entry in the denominator data using a combination of four variables (hospital alpha-numeric code, date of delivery, maternal date of birth and birthweight). Using this process, it was possible to accurately link 92% (n = 29,488) of the data on caesarean births.

The phase one dataset for Northern Ireland, the Isle of Man and the Channel Islands includes information on 5886 births. The number of caesarean births recorded on the denominator data on all births was 1410. The total number of clinical data forms received relating to these CS was 1410 (100%); 1272 (90%) of these clinical data forms accurately linked to entries on denominator data forms.

3.3.2 Organisational surveys

The two supplementary surveys relating to organisational issues were sent to all participating units in phase one of the Audit. In addition, each 'delivery suite' was asked to keep a two-week diary documenting its activity.

The response rates to these surveys from England and Wales were:
- 95% (n = 224) labour ward staffing and facilities
- 94% (n = 218) anaesthetic questionnaires
- 92% (n = 217) staffing diaries.

The response rate for phase one organisational surveys in Northern Ireland, the Isle of Man and the Channel Isles was 100%.

3.4 Phase two

3.4.1 Denominator and caesarean sections

The phase two data set on births occurring in the forty randomly selected units in England, Wales and Northern Ireland includes information on 27 615 births. The number of caesarean births recorded on the denominator data for all births occurring in these units during the phase two data collection was 6131. The total number of clinical data forms received relating to these CS that linked to the corresponding entry on denominator data was 5512 (90%).

3.4.2 Maternal survey

Invitations to participate in the survey were sent out to 7873 women by the participating units; 2942 women (37%) responded to the initial invitation and were subsequently sent a questionnaire by RCOG CESU. Completed questionnaires were returned by 2475 women. This represents 84% of women who received the questionnaire from RCOG CESU and 31% of those who had received the initial invitation from the participating unit.

Response rates to the maternal survey sent out by RCOG CESU varied between units from 58% to 94%. Details of response rates and demographics of responders and non-responders are given in Chapter 10.

3.4.3 Clinician survey

Overall, the survey was sent to 224 consultant obstetricians directly by RCOG CESU. The response rate was 77%. Eight questionnaires were returned by consultants who did not practice obstetrics and were thus excluded from the analysis. There was at least one questionnaire returned from each of the 40 participating units. Response rates to the questionnaire between units varied from 53% to 90%.

4. Methods of delivery

4.1 Summary

- The National CSR in England was 21.3%; in Wales it was 24.2% and Northern Ireland it was 23.9%. These rates are comparable to those in USA.
- Operative vaginal rates have remained constant at 11% in England, 10% in Wales and 12% in Northern Ireland.
- The spontaneous vaginal delivery rate has decreased in England: it was 67%; in Wales it was 65% and in Northern Ireland it was 64%.
- Primary CSR was 17% in England, 19% in Wales and 17% in Northern Ireland.
- Repeat CSR was 67% in England, 66% in Wales and 76% in Northern Ireland.
- Classification using Robson clinical groups indicates that the group contributing most to the overall CSR is that composed of women at term with a singleton cephalic pregnancy and a previous CS.
- The objective measurement of clinical characteristics to determine their prevalence in a population is important and may shed light on variations in clinical management.
- The most frequently cited primary indications reported by clinicians for performing CS were presumed fetal compromise, failure to progress (dystocia), previous CS and breech presentation. This agrees with studies in other countries.[4,12,18]
- Maternal request, as reported by the clinician, was the primary indication for performing 7% of CS.

4.2 Introduction

This chapter considers international data on CSR and mode of delivery. CSR in different clinical groups is considered. The primary indications reported for CS are presented.

4.3 Background

The heterogeneity in the CSR between developed countries was outlined in Chapter 1. A number of explanations have been postulated, including the possibility that CS has replaced some types of operative vaginal delivery.[18]

While CSR have increased, there has not been a corresponding reduction in operative vaginal delivery rates, although the rates of overall spontaneous vaginal deliveries have reduced.[1,6] In England, operative vaginal deliveries have remained constant at 10–11% of births.[1] Comparative international statistics for operative vaginal delivery rates are limited but rates in England are lower than those reported in Scotland (13% in 1999)[6] and Canada (17% in 1998).[15] However, the type of operative vaginal delivery used has changed. In accordance with evidence suggesting that use of the ventouse reduces maternal perineal trauma,[26] there has been a reduction in the use of forceps and an increase in the use of the ventouse, from 2% in 1980 to 8% in 1999.[2]

In defining the determinants of the overall CSR, it is helpful to distinguish between the contribution of the increasing prevalence of a clinical characteristic in the population (e.g. percentage of women with a previous CS) and the subsequent use of CS within that group (e.g. VBAC rates).

To do this, it is essential to use an objective measure of clinical characteristics to determine their prevalence in the population (e.g. percentage of women previous CS in the population). The CSR within a group can them be estimated.

Clinical reports of the indications for a CS within such groups may shed light on variations in clinical management. There is no consensus in the reporting of indications and they are used inconsistently. Hence, they are generally not reliable measures from which to establish the determinants of the overall CSR.

4.4 The Audit results

Table 4.1 shows the recent estimates of CSR from countries with published national data alongside the estimated rates from this audit. There has been an increase in CSR in England. The 2000 rates for England and Wales and the 2001 rate for Northern Ireland are comparable to those in USA and Italy.

Table 4.1 International caesarean section rates (CSR)

Country	Year	CSR (%)
England[a]	2000	21.3
Wales[a]	2000	24.2
Northern Ireland[b]	2000/01	23.9
Scotland[c]	1999	19.3
USA[d]	1999	22.0
Denmark	1999	13.7
Norway	1999	12.6
Sweden	1999	12.2
Finland	1999	15.1
France	1999	17.5
Italy	1999	22.5

Sources: [a]NSCSA data collected May – July 2000; [b]NSCSA data collected December 2000 – February 2001; [c]Scottish Health Executive report[6]; [d]Final report CDC[14]

Table 4.2 shows the trends for method of delivery in England and Wales for the last 40 years, including the audit results.

Table 4.2 Trends in method of delivery

Source of data	Maternities (n)	Spontaneous			Instrumental			Caesarean section (%)
		All (%)	Vertex (%)	Breech (%)	All (%)	Ventouse (%)	Forceps (%)	
England/Wales (annual rates)								
1960[a]	–	–	–	–	4.5	–	–	2.8
1970[a]	–	–	–	–	8.8	–	–	4.3
1975[a]	–	68.3	–	–	12.6	0.7	11.9	5.8
1980[a]	–	75.7	–	–	11.7	0.6	11.2	8.8
1985[b]	–	75.6	–	–	10.6	0.7	9.0	10.4
1989/90[c]	–	78.1	–	–	9.7	1.6	7.8	11.3
1994/5[c]	–	73.8	–	–	10.8	4.8	5.8	15.5
1999[d]	348408*	–	70	1	10.0	7.0	4.0	18.0
NSCSA data 2000/01 (estimates from 3-month period)								
England and Wales[e]	150139	67.3	66.9	0.5	10.9	7.4	3.5	21.5
England[e]	142463	67.4	67.0	0.5	10.9	7.4	3.5	21.3
Wales[e]	7535	65.1	64.7	0.5	9.9	7.4	2.6	24.2
Northern Ireland[g]	5341	64.0	63.5	0.6	12.1	6.4	5.7	23.9
Channel Islands and Isel of Man[f]	545	61.3	61.3	0.0	13.4	9.7	3.9	24.8

Sources: [a]estimated percentage of deliveries England and Wales[1]; [b]estimated percentage of deliveries England[1]; [c]estimated percentage of deliveries in NHS hospitals in England[1]; [d]estimated percentage of deliveries In England based on 67% coverage of all maternities[2]; [e]NSCSA data collected May–July 2000; [f]NSCSA data collected December 2000–Feb 2001, all units in region

Operative vaginal delivery rates have remained reasonably constant since the mid 1970s. There has been a move away from the use of forceps to using ventouse for operative vaginal delivery. Spontaneous vaginal delivery rates vaginal are lower that those in the 1980s and 1990s but comparable to those in the 1970s.

Table 4.3 shows the regional rates for method of delivery. The CSR now ranges from 19% in the North East to 24% in London, Wales, Northern Ireland and the Channel Isles and the Isle of Man.

Table 4.3 Method of delivery

Source of data	Maternities (*n*)	Spontaneous			Instrumental			Caesarean section (%)
		All (%)	Vertex (%)	Breech (%)	All (%)	Ventouse (%)	Forceps (%)	
England and Wales								
1980[b]	–	75.7			11.7	0.6	11.2	8.8
1985[b]	–	75.6			10.6	0.7	9.0	10.4
1989/90[c]	–	78.1			9.7	1.6	7.8	11.3
1994/5[c]	–	72.8			10.8	4.8	5.8	15.5
1999[d]	348408		70.0	1.0	10.0	7.0	4.0	18.0
1999 Scotland[h]	55604	68.3			12.5	–	–	19.3
NSCSA Data 2000/1								
England[e]	142463	67.4	67.0	0.5	10.9	7.4	3.6	21.3
North East[e]	16295	70.8	70.3	0.5	9.6	5.7	3.9	19.3
North West[e]	18940	71.0	70.7	0.5	9.2	6.4	2.9	19.6
East Midlands[e]	11997	67.1	66.5	0.7	12.3	8.0	4.3	20.4
West Midlands[e]	16498	68.8	68.4	0.6	9.2	6.3	2.9	21.8
Eastern[e]	17768	66.8	66.5	0.4	11.4	8.1	3.3	21.4
London[e]	19389	63.9	63.4	0.5	11.5	8.1	3.4	24.2
South East[e]	28589	64.6	64.2	0.5	12.4	8.4	4.0	22.6
South West[e]	12987	69.1	68.4	0.8	11.5	7.6	3.9	19.4
Wales[e]	7535	65.1	64.7	0.5	9.9	7.4	2.6	24.2
Northern Ireland[g]	5341	64.0	63.5	0.6	12.1	6.4	5.7	23.9
Channel Islands and Isle of Man[g]	545	61.3	61.3	0.0	13.4	9.7	3.9	24.8

Source: [a]estimated percentage of deliveries England[1]; [b]estimated percentage of deliveries in NHS hospitals in England[1]; [c]percentage of deliveries in England[2]; [d]Scottish health statistics 1999[6]; [e]NSCSA data collected May – July 2000 all units in region; [f]NSCSA data collected December 2000–February 2001, all units in region:

Table 4.4a shows the national and regional CSR, primary and repeat CSR. Spontaneous vaginal delivery rates vary between regions from 61% to 71% and between units they vary from 20% to 92%. Instrumental vaginal delivery rates vary between regions from 9% to 13%. Between units they vary from 0% to 22%. The use of forceps has declined and constitutes less than one-third of operative vaginal deliveries in all regions, with the exception of Northern Ireland.

The primary CSR shown in Table 4.4a is the rate of CS for women who have not had a previous CS, regardless of parity. This varied between regions from 15% to 19%; between units, the IQR was 15% to 19% (range 6–56%). The repeat CSR varied between 61% and 72%; between units the IQR was 61–74%, (range 0–100%). Higher rates of repeat CS are associated with higher overall CSR. Rates of vaginal birth after CS (VBAC) are discussed in Chapter 5.

Table 4.4b shows the national and regional emergency and elective CSR. Of all CS, 37% were classified as elective, this ranged between regions from 35% to 47%; 63% were emergency procedures. The proportion of emergency procedures between regions ranged from 62% to 65%. Among maternity units the median emergency CSR was 63%, IQR 58–67% (range 7–77%).

Tables 4.5a and 4.5b show the percentage of women in each Robson Group, the CSR within that group and the percentage contribution of each group to the overall CSR.

Table 4.4a Overall, primary and repeat caesarean section rates (CSR) by region

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands & Isle of Man
CSR (%)												
Overall	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2	23.9	24.8
Primary*	16.7	15.2	15.5	15.7	17.0	16.4	19.1	17.6	14.7	18.8	17.0	18.8
Repeat	67.2	61.8	66.3	65.5	66.1	67.9	70.1	68.7	65.8	72.6	76.3	78.2

* CSR for women who have not had a previous caesarean section, regardless of parity

Table 4.4b Elective and emergency caesarean section rates (CSR)

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands & Isle of Man
CSR (%)												
Overall	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2	23.9	24.8
Elective	37.0	37.7	37.3	38.5	35.3	38.2	34.6	37.6	38.1	37.4	47.0	45.4
Emergency	62.9	62.2	62.6	61.5	64.6	61.7	65.4	62.3	61.8	62.4	53.0	53.9
Missing	0.1	0.2	0.1	0.0	0.2	0.2	0.0	0.1	0.1	0.2	0.0	0.7

Robson Groups 1 and 3 contain the largest percentage of the population. The biggest contribution to the overall CSR is repeat CS (Robson group 5). This proportion varied between regions from 23% to 31% and between units it ranged from 0% to 41%. As before, higher rates of repeat CS are associated with higher overall CSR.

About 3–4% of women presented with a breech (Robson Groups 6 and 7). The caesarean rate for breech presentation is nearly 90% for nulliparous women in all regions and above 80% for multiparous women in all regions. The contribution of breech to the overall CSR varied between regions from 13% to 19%; between units this ranged from 1.5% to 40%.

About 6% of women had singleton babies born preterm (Robson Group 10). CSR in this group varied between regions but contributed between 8% and 11% to the overall CSR. Between units this ranged from 2% to 22%.

Table 4.6 shows the primary indication given by obstetricians for performing all CS. These data need to be treated with caution because:

- there may be more than one indication contributing to the decision to perform CS (e.g. a woman may have both a breech presentation and placenta praevia)
- there may not be consistency in deciding the primary indication.

The most frequently cited indication for CS is presumed fetal compromise, including suspected intrauterine growth restriction or an abnormal CTG. The percentage of CS reported to be performed for this indication varied between regions from 20% to 24%. Between units this ranged from 4% to 43%. Failure to progress (dystocia) is the second most commonly cited reason for performing a CS. In three regions this was the most commonly cited indication for CS. Between regions this ranged from 18% to 23% and between units it ranged from 6% to 36%. Repeat CS was the third most commonly cited indication, contributing 14% overall. This varied between regions from 13% to 15% and between units from 0% to 27% of all CS. CS performed for breech presentation was the fourth most commonly reported indication. Overall, 11% (range between regions 8–12% and between units 2–42%) of CS were performed for this indication.

CS reported by clinicians to be primarily performed for maternal request contributed 7% the overall CSR. This ranged between regions from 6% to 8% and between units from 2% to 27%.

The determinants of the overall CSR will be discussed in the next chapter, in the context of the relevant clinical groups.

Table 4.5a Caesarean section rate (CSR) for clinical groups: phase one

	North Eastern			North Western			East Midlands			West Midlands			Wales		
Overall CSR (%)	19.3			19.6			20.4			21.8			24.2		
Robson Group[a]	**(%)**[b]	**CSR**[c]	**Cont**[d]	**(%)**[b]	**CSR**[c]	**Cont**[d]	**(%)**[b]	**CSR**[c]	**Cont**[d]	**(%)**[b]	**CSR**[c]	**Cont**[d]	**(%)**[b]	**CSR**[c]	**Cont**[d]
1	24.8	9.9	12.6	25.1	10.3	13.2	24.8	10.5	12.8	24.1	12.6	14.0	23.4	14.3	13.8
2	10.9	31.7	17.9	11.0	30.3	17.0	11.0	30.3	16.3	10.7	34.9	17.2	12.7	34.2	17.9
– IOL	10.0	25.1	12.9	10.0	23.0	11.7	10.2	24.9	12.5	9.5	26.4	11.5	11.2	26.3	12.2
– CSBL	0.96	100.0	5.0	1.0	100.0	5.3	0.78	100.0	3.8	1.2	100.0	5.7	1.4	100.0	5.7
3	32.9	2.8	4.8	32.6	2.9	4.8	31.9	2.6	4.1	33.4	3.0	4.6	31.0	4.4	5.7
4	11.1	15.4	8.9	11.1	17.0	9.6	11.3	15.6	8.6	10.5	19.0	9.1	11.6	19.2	9.2
– IOL	10.0	5.8	3.1	9.9	6.6	3.3	10.3	7.1	3.6	9.4	9.3	4.0	10.3	8.9	3.8
– CSBL	11.1	100.0	5.8	11.1	100.0	6.3	11.3	100.0	5.0	10.5	100.0	5.1	11.6	100.0	5.4
5	7.6	59.5	23.4	7.0	63.4	22.6	7.9	61.7	23.9	8.1	63.4	23.5	8.4	70.3	24.4
6	1.9	91.7	9.1	2.0	91.7	9.5	2.1	91.1	9.3	2.0	91.4	8.3	1.9	92.5	7.4
7	1.6	85.3	7.0	1.6	86.8	7.1	1.9	81.7	7.5	1.7	82.0	6.4	1.7	86.4	5.9
8	1.5	57.4	4.6	1.5	54.4	4.1	1.5	58.3	4.3	1.3	56.4	3.5	1.6	58.1	3.7
9	0.3	98.0	1.6	0.3	100.0	1.8	0.4	100.0	2.3	0.3	100.0	1.4	0.2	100.0	1.0
10	6.2	29.7	9.6	6.2	30.5	9.6	5.9	33.8	9.8	6.7	35.1	10.9	5.9	39.5	9.7

	Eastern			London			South East			South West			England & Wales 2000		
Overall CSR (%)	21.4			24.2			22.6			19.4			21.5		
Robson Group[a]	**(%)**[b]	**CSR**[c]	**Cont**[d]	**(%)**[b]	**CSR**[c]	**Cont**[d]	**(%)**[b]	**CSR**[c]	**Cont**[d]	**(%)**[b]	**CSR**[c]	**Cont**[d]	**(%)**[b]	**CSR**[c]	**Cont**[d]
1	24.5	12.5	14.3	26.2	14.3	15.4	24.7	13.7	15.0	24.7	11.1	14.1	24.8	12.2	14.1
2	11.5	33.8	18.2	10.7	42.1	18.6	10.7	37.8	17.9	9.5	31.7	15.6	10.8	34.6	17.5
– IOL	10.4	26.5	12.9	9.2	32.8	12.5	9.5	29.9	12.6	8.7	24.8	11.1	9.7	27.0	12.3
– CSBL	1.1	100.0	5.3	1.5	100.0	6.1	1.2	100.0	5.3	0.87	100.0	4.5	1.1	100.0	5.3
3	33.1	2.8	4.4	32.1	4.5	5.9	33.5	2.9	4.3	35.1	2.2	4.0	33.0	3.1	4.7
4	11.0	16.0	8.2	8.8	23.0	8.4	10.7	20.1	9.4	11.2	16.4	9.4	10.7	18.1	9.0
– IOL	9.8	6.2	2.8	7.6	10.7	3.3	9.3	8.8	3.6	10.0	7.0	3.6	9.5	7.8	3.5
– CSBL	11.1	100.0	5.4	8.8	100.0	5.1	10.7	100.0	5.8	11.2	100.0	5.8	1.2	100	5.5
5	8.1	64.7	24.6	8.4	67.3	23.2	8.4	66.4	24.7	7.7	61.1	24.2	8.0	64.4	23.9
6	1.8	92.6	7.9	1.6	90.4	6.0	1.9	93.2	7.8	2.0	89.5	9.2	1.9	91.7	8.1
7	1.7	88.0	7.0	1.7	80.9	5.6	1.7	85.0	6.5	1.9	77.8	7.5	1.7	83.9	6.6
8	1.5	62.0	4.5	1.6	66.9	4.4	1.4	62.2	3.8	1.5	62.2	4.2	1.5	59.5	4.1
9	0.4	100.0	2.0	0.45	98.9	1.9	0.3	100.0	1.7	0.50	100.0	2.6	0.4	99.7	1.8
10	5.2	32.8	8.0	6.1	34.1	8.6	5.3	33.4	7.9	5.1	31.7	8.4	5.8	33.0	9.0

Key to Robson Group classification (see page 22)

Table 4.5b Caesarean section rate (CSR) for clinical groups: phase two

	England & Wales 2001			Northern Ireland			Channel Islands & Isle of Man		
Overall CSR (%)	22.1			23.9			24.8		
Robson Group[a]	**(%)**[b]	**CSR**[c]	**Cont**[d]	**(%)**[b]	**CSR**[c]	**Cont**[d]	**(%)**[b]	**CSR**[c]	**Cont**[d]
1	25.0	11.8	13.4	18.0	12.9	9.7	26.2	8.4	8.9
2	11.1	35.4	17.8	16.6	31.5	21.9	16.7	37.4	25.2
–IOL	9.9	27.9	12.5	15.0	24.1	15.1	15.4	32.1	20.0
–CSBL	1.2	100.0	5.3	1.6	100.0	6.7	1.3	100.0	5.2
3	31.7	3.4	4.9	24.3	2.4	2.4	25.1	1.5	1.5
4	11.1	20.3	10.2	19.3	11.6	9.3	13.2	19.4	10.4
–IOL	9.6	8.5	3.7	18.0	5.3	4.0	12.1	12.1	5.9
–CSBL	1.4	100.0	6.5	1.3	100.0	5.3	1.1	100.0	4.4
5	8.0	63.5	23.1	9.7	75.3	30.7	8.6	76.6	26.7
6	1.7	91.9	7.2	1.7	90.1	6.4	2.4	100.0	9.6
7	1.7	89.2	7.0	1.8	85.3	6.4	2.2	100.0	8.9
8	1.7	58.7	4.5	1.7	42.4	3.1	0.9	80.0	3.0
9	0.30	98.8	1.4	0.39	100.0	1.6	0.4	100.0	1.5
10	6.3	32.7	9.3	5.2	34.2	7.5	3.1	35.3	4.4

[a] **Key to Robson Group classification:**

1 = Nulliparous, single cephalic, ≥ 37 weeks gestation, spontaneous labour
2 = Nulliparous, single cephalic, ≥ 37 weeks gestation: IOL – induced labour; CSBL – caesarean section before labour
3 = Multiparous, single cephalic, ≥ 37 weeks gestation, no uterine scar, spontaneous labour
4 = Multiparous, single cephalic, ≥ 37 weeks gestation, no uterine scar: IOL – induced labour; CSBL – caesarean section before labour
5 = Multiparous, single cephalic, ≥ 37 weeks gestation, with uterine scar
6 = Nulliparous singleton breeches
7 = Multiparous singleton breeches, including previous scar
8 = Multiple pregnancies (includes previous uterine scar)
9 = Singleton transverse, oblique or unstable lies, including previous uterine scar
10 = Singleton cephalic, less than 37 weeks of gestation, including previous uterine scar

[b] Percentage of all women in the region included in the group
[c] CSR in the group
d Percentage contribution of CS within that group to overall CSR

N.B. Column totals will approximate 100% but may not add up to exactly 100% because of rounding up and missing data

Table 4.6 Primary indications for caesarean section (CS) as reported by clinicians

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands and Isle of Man
Overall CS rate (%)	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2	23.9	24.8
Primary indication to perform CS												
Breech presentation (%)	10.8	12.4	12.1	11.7	10.5	11.8	7.9	10.5	12.4	9.6	9.6	13.9
Malpresentation/unstable lie (%)	3.4	3.9	3.6	3.8	3.1	3.6	3.7	2.8	3.7	2.8	3.1	3.1
Multiple pregnancy (%)	1.2	1.4	0.9	1.0	1.3	0.9	1.4	1.4	1.2	1.0	0.8	0.0
Presumed fetal compromise/IUGR/abnormal CTG (%)	22.0	23.4	22.8	21.8	24.2	20.5	22.2	21.7	19.8	20.7	14.3	18.5
Cord prolapse (%)	0.5	0.7	0.5	0.8	0.4	0.7	0.5	0.4	0.6	0.4	0.7	0.0
Chorioamnionitis (%)	0.2	0.3	0.2	0.4	0.1	0.2	0.4	0.2	0.3	0.2	0.3	0.8
Other (fetal)[a] (%)	2.3	2.4	2.4	2.6	2.8	2.2	2.3	2.1	1.8	2.4	2.7	0.0
Placenta praevia, actively bleeding (%)	0.9	1.1	1.1	0.9	1.2	0.8	0.8	0.9	1.1	0.6	0.6	1.5
Placenta praevia, not actively bleeding (%)	2.2	1.6	2.4	2.4	2.5	2.2	2.2	2.3	1.9	2.0	1.3	3.9
Antepartum/intrapartum/Intrapartum haemorrhage (%)	0.9	0.8	1.5	0.6	0.8	0.9	1.0	0.9	0.6	1.1	0.7	1.5
Placental abruption (%)	0.9	1.1	1.1	1.2	1.2	0.8	0.8	0.7	0.9	0.9	1.1	1.5
Pre-eclampsia/eclampsia/HELLP (%)	2.3	1.8	2.4	1.7	2.6	2.3	2.7	2.2	2.4	2.4	2.3	1.5
Maternal medical disease[a] (%)	1.9	1.8	2.1	1.7	1.8	1.9	2.8	1.5	1.7	1.7	1.8	0.8
Failure to progress (induction/in labour) (%)	20.4	18.6	17.9	19.3	18.8	20.4	22.4	21.3	22.1	22.8	22.0	18.5
Previous caesarean section (%)	13.8	12.5	14.1	14.7	13.8	13.6	13.7	13.8	14.6	13.8	23.9	16.2
Uterine rupture (%)	0.2	0.0	0.1	0.3	0.3	0.1	0.3	0.1	0.1	0.1	0.2	0.8
Maternal request[b] (%)	7.3	8.1	6.1	7.2	5.7	8.3	6.3	8.4	6.9	7.9	6.3	6.9
Previous poor obstetric outcome (%)	0.9	1.0	1.2	0.7	0.7	0.7	0.8	0.9	1.0	1.2	0.6	0.0
Previous physically or emotionally traumatic vaginal delivery (%)	1.7	1.3	1.8	1.8	1.3	1.6	1.6	2.0	2.3	1.5	1.9	2.3
Previous infertility (%)	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.3	0.0
Other (maternal)[a] (%)	2.4	2.5	2.4	2.6	2.6	2.5	2.2	2.5	2.4	2.1	3.6	0.8

[a] See key in Appendix Civ

[b] Maternal request as reported by clinicians on question 24 of the clinical data form; this is not necessarily maternal request in the absence of any maternal or fetal medical complications (see Appendix Ciii)

5. Influence of population and clinical characteristics on caesarean section rate

5.1 Summary

The influence of specific population and clinical characteristics in determining the overall CSR are examined. The findings were:

- CSR increased with maternal age
- CSR was higher for women reported to be black African or black Caribbean compared with women reported to be white race. Indications of maternal medical disease and fetal distress were higher among the black African and black Caribbean women. Adjustment for age, parity, previous CS, gestation, presentation and birthweight did not remove the observed increased risk of CS in these two groups.
- For primigravid women CSR was 24%, with the most common indications being failure to progress, presumed fetal compromise, breech presentation and maternal request (as reported by clinicians).
- For multiparous women with a previous CS, the rate was 67%. The most common primary indication reported in this group was previous CS.
- The rate for preterm births is higher than that for term births and varies with gestational age, from 20% at term to 38% at 33–36 weeks; the majority were primary CS.
- The rate among women who had induction of labour was 19%, marginally below the rate for all women.
- The majority of women have one baby, born head first at term. CSR in this group was 17% but, as the largest clinical group in the population, it contributed 70% to the overall CSR. The primary CSR in this group was 12% and the repeat CSR was 64%, contributing 46% and 24%, respectively, to the overall rate.
- For breech presentations, the overall CSR was 88%, representing 16% of the overall CSR; 56% were elective and 44% emergency operations. For 85% of women, this was their first CS. External cephalic version (ECV) was reported to have been offered to 33% of women who were delivered by CS.
- The twinning rate was 14.4 per 1000 pregnancies. CSR was higher for multiple pregnancies: 59% of twin pregnancies were delivered by CS, representing 14% of the overall CS rate. Multiple pregnancy is more likely to result in preterm birth; 14% of twins and 36% of triplets were born before 33 weeks, compared with less than 2% of singleton pregnancies. Therefore, 21% of all babies born at less than 33 weeks of gestation were from multiple pregnancies.

5.2 Introduction

Some of the factors that may affect CSR have been outlined in Chapter 1. In this chapter, the influence of specific populations and clinical characteristics in determining the overall CSR are evaluated. For each factor, the research evidence and its associated risk of CS, as estimated from the data, is summarised.

5.3 Maternal age

5.3.1 Background

Overall fertility rates have declined and this decline is most marked in women under 30 years as women choose to both delay childbirth and have fewer children.[16] Therefore, although the absolute numbers of older mothers have not increased, they form a larger proportion of all maternities. In 1975, 6% of mothers were over 35 years old; in 1995 11% were in this age category.[17]

CSR has been observed to increase with maternal age, in a variety of populations with different overall CSR.[8,14,15,17]

Complications of pregnancy increase with maternal age. However, these alone may not account for all the increases in CSR observed. It has been suggested that other physical factors, such as age-related physiological changes[27] or changes in maternal or clinician preference, may also contribute.[28]

It has been suggested that shifts in the age structure of the population only account for a small part of the increase in CSR.[18] Nordic countries have had similar demographic transitions but have not had the rapid increases in CSR.[8]

5.3.2 The Audit results

Tables 5.1a and 5.1b show the distribution of demographic characteristics by region. The average age of mothers giving birth in England and Wales during the study period was 29 years. The average age at birth of the first baby was 27 years. There was geographical variation in this. Mothers in southern regions were slightly older (average age of 28 years) compared with an average age of 26 years for mothers in northern regions and Wales. Average age at second pregnancy was 30 years and 31 years at third pregnancy.

Overall, 7% of mothers were under 20 years old. This proportion was higher in northern England and Wales. The proportion of mothers over 35 years old was 17% overall; this proportion was higher in southern England. In the South East and South West, about 3% of mothers were over 40 years old; in London, 4% of mothers were over 40 years and in all other regions about 2% were over 40 years.

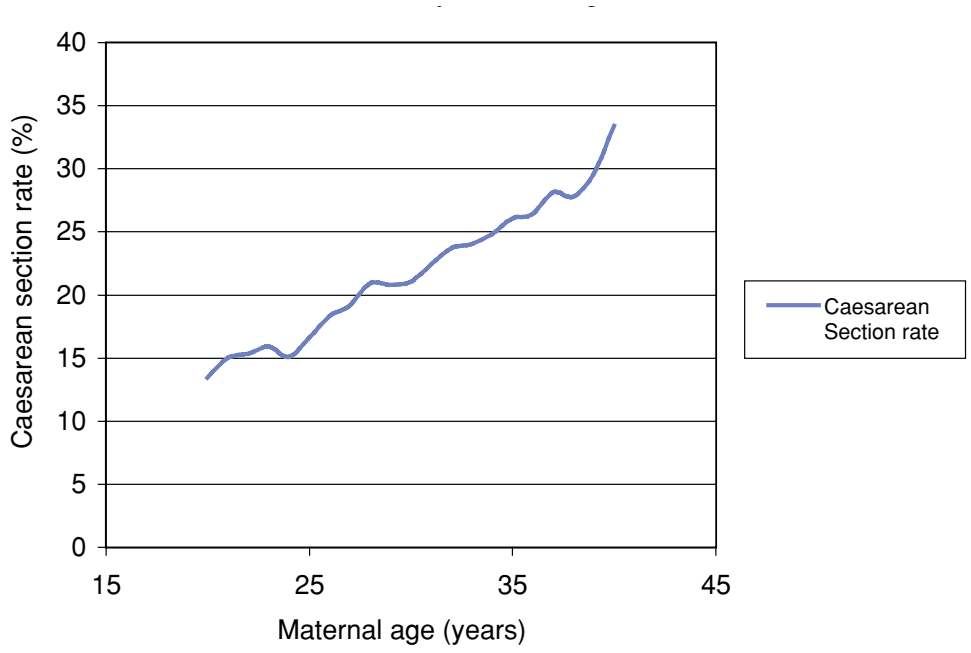

Figure 2 Caesarean section rate by maternal age

Tables 5.2a and 5.2b show the CSR by demographic characteristics.

As Figure 2 illustrates, CSR increased with maternal age. The rates were lowest for mothers under 20 years old (13.4%); they were 28% for mothers aged between 35 years and 39 years and 33% for those between 40 years and 50 years. This pattern was consistent across all regions.

To explore whether this association could be explained by differences in other characteristics between age groups, analyses that included adjustment for other factors were performed (mother's ethnicity, previous vaginal delivery, previous CS, gestation, presentation and birthweight). This adjustment did not remove the observed increased risk of CS with age (Table 5.3).

5.4 Maternal weight, height or body mass index

5.4.1 Background

Several population studies report that CSR increases with increasing maternal weight, short stature or body mass index.[29–33] Higher prevalence of obesity may contribute to the observed increases in CSR. Population levels of obesity (defined as body mass index, BMI, greater than 30) have increased. In the UK, 16% of women aged 25–34 years old and 21% of women aged 35–44 years are obese. These are among the highest rates of obesity in Europe.[34] In the USA, the rates are higher, 19% of women aged 20–34 years and 26% of women aged 35–44 years are obese.[35] However, information on height and weight is not part of routine maternity data. Although height, weight or BMI may be recorded as part of routine antenatal care, the timing and method of measuring them are not standardised. This could result in inconsistencies in the data that could effect interpretation.

5.4.2 The Audit results

Maternal height and weight were collected only on women having a CS. Therefore, it was not possible to look at the effect of maternal weight on CS in this data.

Median weight of women who were delivered by CS was 73 kg (IQR 63, 85 kg). Thirty-four percent of women who had a CS had a BMI greater than 30 and 13% of women had a BMI greater than 35. Among these women, it was found that BMI was highly correlated with increasing maternal age.

5.5 Ethnicity

5.5.1 Background

Several population studies report the observation that CSR vary between some ethnic groups. Higher rates of CS have been reported in black women.[14,33,36] Some complications of pregnancy are more prevalent in black mothers (e.g. diabetes, hypertensive disorders) or in specific ethnic groups (e.g. HIV is more prevalent amongst black African women[37]) and may contribute to the observed association.[14]

5.5.2 The Audit results

Tables 5.1 a and 5.1b show the distribution of demographic characteristics by region.

Standard ethnicity groups were used.[38] Overall, the majority of mothers in England and Wales were reported to be white. This proportion varied with region and, for example, greater ethnic diversity was observed in London.

Table 5.1a Distribution of demographic characteristics: numbers by region (phase one data, all women)

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales
Total maternities (*n*)	150,139[a]	16,295	18,940	11,997	16,498	17,768	19,389	28,589	12,987	7535
Demographic characteristics (n)										
Age group (years)										
< 20	10,987	1584	1734	1109	1353	1042	1025	1605	791	733
20-24	25,978	3409	3627	2447	3239	2770	2972	3977	2005	1502
25-29	42,039	4690	5390	3437	4793	5187	4911	7720	3693	2183
30-34	45,014	4402	5243	3280	4656	5678	6135	9483	4150	1944
35-39	21,164	1816	2390	1397	1989	2532	3445	4776	1898	902
>40	3,680	289	373	249	318	416	721	789	365	158
Ethnicity										
White	126,613	14,417	16,820	10,980	13,151	15,714	9828	25,859	12,507	7221
Black African	2963	42	66	60	81	225	2154	272	31	31
Black										
Caribbean/other	3357	169	164	117	458	270	1689	351	86	51
Bangladeshi/Indian/										
Pakistani	9487	1323	1235	527	2116	867	2301	873	112	117
Chinese	1139	29	89	62	64	102	510	217	44	20
Asian other	2098	108	230	74	274	116	838	327	78	51
Parity										
Primiparous	61,984	6789	7938	4989	6726	7326	8215	11,621	5148	3172
Multiparous with no previous CS	72,933	8023	9232	5807	8093	8643	8917	13,977	6608	3568
Multiparous with previous CS	14,104	1430	1568	1116	1599	1709	1936	2796	1189	745
Gestation (weeks)										
< 28	830	100	123	60	101	74	151	129	60	31
28–32	1953	252	256	152	247	201	301	318	137	86
33–36	8419	955	1108	717	1053	919	1041	1498	677	447
≥37	138,517	14,958	17,400	11,027	15,048	16,524	17,828	26,561	12,078	6960
Birth weight (g)										
<1500	2305	255	313	172	279	257	413	356	174	83
1500–2499	8325	956	1085	685	1055	935	1189	1381	625	405
2500–4000	122,316	13,226	15,361	9794	13,469	14,393	15,975	23,251	10,548	6181
>4000	16,766	1804	2136	1310	1648	2131	1740	3515	1619	852

[a] Region unknown for 141 maternities

Table 5.1b Distribution of demographic characteristics: numbers by region (phase two data)

	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Total maternities (*n*)	27,168	5341	545
Demographic characteristics (n)			
Age group (years)			
< 20	2162	398	27
20–24	5162	896	67
25–29	7461	1475	138
30–34	7647	1614	193
35-39	3810	746	95
>40	768	157	23
Ethnicity			
White	22,512	5258	520
Black African	391	4	0
Black Caribbean/other	560	7	0
Bangladeshi/Indian/Pakistani	2382	18	3
Chinese	193	17	0
Asian other	479	8	4
Parity			
Primiparous	11,358	2098	261
Multiparous with no previous CS	13,007	2598	229
Multiparous with previous CS	2640	619	55
Gestation (weeks)			
< 28	146	34	0
28–32	404	53	5
33–36	1637	261	17
≥37	24,905	4986	522
Birth weight (g)			
<1500	353	53	1
1500–2499	1694	224	21
2500–4000	22,230	4309	467
>4000	2830	743	55

Mother's ethnicity and risk of CSR (Tables 5.2a and 5.2b) showed that, in England, Wales and Northern Ireland, CSR was higher for women reported to be black African (31%) or black Caribbean (24%) compared with women reported to be white (21%). CSR among women from other ethnic groups was about 20%.

To explore if this association could be explained by differences in other population characteristics, analysis that included adjustment for other factors was carried out (e.g. age, parity, previous CS, gestation, presentation and birthweight). Adjusting for these factors did not remove the observed increased risk of CS in black African or black Caribbean women (Table 5.3).

To explore whether a higher rate of maternal medical conditions influenced the decision to perform CS on these women, the primary indication for CS was reviewed. Maternal medical disease was reported to be the most influential factor in deciding to perform the CS for 5% of black African women, 3% of black Caribbean women and 2% of all other women. CS performed for maternal medical disease accounted for 4% of the overall CSR among black African women, 2% of the rate among black Caribbean women and 1.6% of the rate among all other women. The proportion of CS carried out for other common indications, such as failure to progress and previous CS, were similar among the three groups. However, there was a higher proportion of CSR for fetal distress according to ethnicity; 29% among black African women, 32% among black Caribbean women and 22% among all other women.

5.6 Parity and previous caesarean section

5.6.1 Background

There has been a decline in the fertility rate over the last 40 years in England, Wales[16] and a number of other countries.[8,14]

National birth registration data on parity are incomplete because they are only collected on births within marriage. Numbers of previous pregnancies resulting in a birth that could be registered are included in the maternity tail of hospital episode statistics (HES) but the quality and completeness of HES data is poor. The HES data set does not include information on previous CS. Therefore population trends in the percentage of women who have had a previous CS are not available for England and Wales.

The risk of a CS in a first pregnancy is different for subsequent pregnancies.[12,17] CSR is lowest in women who have only ever had vaginal births previously.[39] CSR is increased in women who have had a previous CS. An increase in the percentage of women who have had a previous CS in a population will result in a disproportionate increase in the overall CSR.[12,14,15] Several studies report that the risk of a repeat CS is reduced in women who have had a previous vaginal delivery in addition to their previous CS.[40–44]

5.6.2 The Audit results

In England and Wales, 42% of women were in their first pregnancy. Of women who had had at least one previous pregnancy, 16% had undergone at least one previous CS. These proportions were consistent across all regions (Tables 5.1a and 5.1b).

As Table 5.2a shows, the CSR in England and Wales was 24% for primigravid women, 10% for multiparous women who had not had a previous CS and 67% for multiparous women who had had at least one previous CS. In Wales, the rates were higher: 26% for primigravid and 73% for multiparous women who had had at least one previous CS. Findings regarding the management of women who had had a previous CS are discussed in Chapter 6. The most common primary indications reported for women having a primary CS were failure to progress (25%), presumed fetal compromise (28%), breech presentation (14%) and

Table 5.2a Caesarean section rates (CSR) by demographic characteristics (phase one)

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales
Overall CSR (%)	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2
Demographic characteristics (%)										
Age group (years)										
< 20	13.4	12.7	12.7	14.9	14.7	12.4	12.8	14.1	10.5	16.1
20–24	15.6	14.4	14.4	15.1	16.7	15.6	15.3	16.6	15.2	18.5
25–29	20.2	18.9	19.0	19.1	21.4	20.0	22.0	20.6	18.0	23.3
30–34	24.0	21.9	22.5	23.1	24.2	24.2	26.6	24.7	21.4	28.0
35-39	27.9	27.2	26.1	27.9	28.6	25.9	31.6	27.7	24.9	31.9
>40	33.4	32.2	30.3	33.7	31.5	33.9	37.5	34.1	27.4	36.1
Ethnicity										
White	21.3	19.5	19.9	20.0	21.9	21.3	24.3	22.6	19.4	24.0
Black African	31.3	26.2	22.7	26.7	29.6	29.8	32.9	26.8	12.9	32.3
Black Caribbean/other	24.0	18.9	17.1	26.5	26.2	24.8	24.0	23.1	20.9	39.2
Bangladeshi/Indian/Pakistani	20.0	17.9	17.0	25.1	20.1	18.0	20.6	22.9	22.3	28.2
Chinese	18.8	27.6	14.6	14.5	21.9	21.6	18.6	20.7	6.8	25.0
Asian other	23.7	13.9	17.4	25.7	23.0	21.6	26.7	24.2	24.4	27.5
Parity										
Primiparous	24.2	22.0	21.9	22.6	24.9	24.2	26.7	25.9	22.1	26.3
Multiparous with no previous CS	10.3	9.5	9.9	9.8	10.4	9.7	12.1	10.6	9.0	12.2
Multiparous with previous CS	67.2	61.8	66.3	65.5	66.1	67.9	70.1	68.7	65.8	72.6
Gestation (weeks)										
<28	30.1	24.0	24.4	36.7	20.8	29.7	34.4	35.7	35.0	38.7
28–32	54.8	49.2	49.6	54.6	56.3	54.7	56.2	61.0	57.7	53.5
33–36	38.5	34.9	37.2	40.3	39.2	39.3	38.9	38.5	37.2	43.4
≥37	19.9	17.8	18.1	18.5	19.9	19.9	22.7	21.2	17.9	22.5
Birth weight (g)										
<1500	44.5	44.3	38.3	45.9	45.2	40.5	45.3	48.0	46.0	53.0
1500–2499	37.7	34.1	33.6	39.9	37.6	39.7	37.3	40.0	37.6	43.5
2500–4000	19.6	17.3	18.1	18.1	19.7	19.5	22.0	20.8	17.7	22.4
>4000	23.9	22.6	20.6	23.5	23.9	23.7	30.3	25.1	20.9	24.8

Source: Denominator data

Table 5.2b Caesarean section rates (CSR) by demographic characteristics (phase two)

	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Overall CSR (%)	22.1	23.9	24.8
Demographic characteristics (%)			
Age group (years)			
< 20	13.1	13.3	14.8
20–24	16.1	17.6	10.5
25–29	21.4	23.9	20.3
30–34	24.7	27.1	30.1
35–39	28.9	28.6	27.4
>40	34.6	29.9	47.8
Ethnicity			
White	22.0	23.9	24.4
Black African	29.4	50.0	–
Black Caribbean/other	24.1	14.3	–
Bangladeshi/Indian/Pakistani	22.3	27.8	33.3
Chinese	21.8	17.7	–
Asian other	19.0	12.5	0.0
Parity			
Primiparous	24.1	25.9	24.5
Multiparous with no previous CS	11.5	9.7	12.2
Multiparous with previous CS	65.8	76.3	78.2
Gestation (weeks)			
< 28	24.7	41.2	–
28–32	59.4	49.1	80.0
33–36	37.8	37.9	41.2
≥37	20.4	22.7	23.8
Birth weight (g)			
<1500	51.0	45.3	100
1500–2499	41.3	37.5	47.6
2500–4000	19.6	22.3	22.3
>4000	26.2	27.6	36.4

Table 5.3 Crude and adjusted odds ratios (OR) for age and ethnicity

	Crude OR (95% CI)	Adjusted OR[a] (95% CI)
Demographic characteristics:		
Age group (years)		
<20	0.62 (0.59, 0.66)	0.73 (0.61, 0.88)
20–24	0.74 (0.71, 0.77)	0.78 (0.72, 0.83)
25–29[b]	1.00	1.00
30–34	1.24 (1.21, 1.28)	1.21 (1.15, 1.28)
35–39	1.52 (1.45, 1.58)	1.41 (1.31, 1.52)
>40	1.97 (1.82, 2.14)	1.88 (1.63, 2.15)
Missing/unknown	1.02 (0.87, 1.20)	1.33 (1.04, 1.72)
Ethnicity		
White[b]	1.00	1.00
Black African	1.70 (1.54, 1.87)	1.58 (1.40, 1.78)
Black Caribbean/other	1.16 (1.06, 1.26)	1.19 (1.03, 1.38)
Bangladeshi/Indian/Pakistani	0.92 (0.86, 0.99)	0.84 (0.78, 0.92)
Chinese	0.85 (0.73, 0.99)	0.93 (0.73, 1.19)
Asian other	1.15 (1.02, 1.29)	1.07 (0.87, 1.30)
Other/missing/unknown	0.92 (0.84, 1.01)	0.96 (0.86, 1.08)

[a]Adjusted for maternal age, ethnicity, previous vaginal delivery, previous caesarean section, gestation, presentation and birth weight; [b]chosen as reference groups as they constitute the largest group in population

maternal request as reported by clinicians (5%). This group includes both nulliparous and multiparous women but the majority (67%) having a primary CS were nulliparous.

The most common indications for women having a repeat CS were previous CS (44%), maternal request as reported by clinicians (12%), failure to progress (10%), presumed fetal compromise (9%) and breech presentation (3%).

5.7 Gestation and birthweight

5.7.1 Background

ICD-10 classification defines low birthweight as less than 2500 g, very low birthweight as less than 1500 g and extremely low birthweight as less than 1000 g. Gestational age is defined as the duration of gestation measured from the first day of the last normal menstrual period expressed as completed days or completed weeks. Preterm birth is defined as less than 37 completed weeks, term as 37 completed weeks to less than 42 completed weeks, post term as 42 completed weeks or more.[1]

Birthweight is included in birth notification data. Gestational age is not routinely collected on livebirth notification data in England and Wales. It is, however, part of the HES maternity data set. Birthweight and gestational age are highly correlated but, in order to be able to distinguish preterm babies from those that are small for gestational age, both items should be collected.

The incidence of low birthweight was about 6% in Scotland in 1998,[1] 6% in USA 1999[14] and 8% in England in 1998. The proportions of low-birthweight babies and preterm babies have increased. This may reflect the increases in multiple pregnancies, the increases in obstetric intervention, greater registration of births at extremely early gestation and increased use of ultrasound estimates of gestational age. Prematurity is the most common cause of neonatal mortality.[45]

CSR in all preterm singleton cephalic infants is higher than for term infants.[39] Prematurity and fetal growth compromise are risk factors for poor neonatal outcome.[46] However, the

Table 5.4a Caesarean section rates (CSR) (%) by gestational age and birthweight (phase one)

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales
Overall CSR (%)	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2
Gestation <28 weeks										
Birthweight (g)										
<1500	30.2	23.4	26.5	34.7	22.2	30.4	32.8	34.5	36.8	40.0
1500–2499	27.3	–	0.0	33.3	–	–	33.3	100.0	–	0.0
2500–4000	20.0	–	20.0	100.0	20.0	33.3	0.0	0.0	0.0	–
Gestation 28–32 weeks										
Birthweight (g)										
<1500	63.6	59.7	57.9	62.7	68.8	58.6	63.1	72.3	64.9	62.5
1500–2499	47.2	38.1	38.7	46.9	45.6	52.3	46.5	56.7	52.8	46.8
2500–4000	41.2	43.8	58.3	100.0	36.4	25.0	50.0	22.7	33.3	60.0
Gestation 33–36 weeks										
Birthweight (g)										
<1500	67.8	63.2	61.1	76.5	84.2	59.1	78.3	48.3	76.5	77.8
1500–2499	43.1	38.6	39.7	47.1	43.9	45.8	43.7	43.2	39.6	50.8
2500–4000	37.2	30.6	33.3	31.6	32.5	32.5	31.8	34.4	32.8	35.8
>4000	59.2	40.0	85.7	80.0	81.8	81.8	100.0	38.5	62.5	100.0
Gestation 33–36 weeks										
Birthweight (g)										
<1500	23.0	34.8	16.7	17.9	22.4	24.1	26.8	22.2	19.1	36.4
1500–2499	29.3	28.5	25.5	28.9	28.5	29.7	29.4	31.5	30.7	34.2
2500–4000	19.1	16.8	17.5	17.5	19.2	19.1	21.7	20.4	17.2	21.9
>4000	23.8	22.4	20.4	23.3	23.5	23.7	29.9	25.0	20.6	24.6

Table 5.4b Caesarean section rates (CSR) (%) by gestational age and birthweight (phase two)

	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Overall CSR (%)	22.1	23.9	24.8
Gestation <28 weeks			
Birthweight (g)			
<1500	24.8	39.3	–
1500–2499	20.0	0.0	–
2500–4000	–	50.0	–
Gestation 28–32 weeks			
Birthweight (g)			
<1500	68.7	54.6	100.0
1500–2499	53.8	39.3	75.0
2500–4000	21.1	100.0	–
Gestation 33–36 weeks			
Birthweight (g)			
<1500	62.5	50.0	–
1500–2499	45.3	44.0	57.1
2500–4000	29.2	34.3	30.0
>4000	60.0	20.0	–
Gestation > 37 weeks			
Birthweight (g)			
<1500	28.6	0.0	–
1500–2499	33.7	29.1	30.0
2500–4000	19.3	21.8	22.2
>4000	26.2	27.4	36.4

optimal mode of delivery for the small or immature baby is not clear.[47] The evidence that CS improves the outcome is not conclusive.[48] If a high proportion of these operations are primary sections they may contribute a disproportionate amount to the overall CSR. Survival rates for babies born between 27 and 28 weeks gestation have improved, with 88% surviving for 28 days after delivery. This is double the rate of 15 years ago.[45]

Population studies indicate that the risk of stillbirth increases from one per 3000 continuing pregnancies at 37 weeks to three per 3000 continuing pregnancies at 42 weeks and six per 3000 continuing pregnancies at 43 weeks.[49]

Large babies are less likely to die than smaller babies but are more likely to die from intrapartum-related factors than small babies.[50] It has been postulated that CS could improve the outcome for suspected fetal macrosomia. However, in order for a policy to be effective, fetal size needs to be estimated accurately and all methods currently used to estimate fetal size, especially for large fetuses, are poorly predictive.[51]

5.7.2 The Audit results

Tables 5.1a and 5.1b show the distribution of demographic characteristics by region in England, Wales and Northern Ireland. Percentages given below are derived from the numbers in these tables.

Overall, 92% of mothers had their babies at term and 0.05% delivered post term. Six percent of mothers delivered at 33–36 weeks and about 2% delivered at less than 33 weeks of gestation.

Overall, 7% of babies were low birthweight (less than 2500 g), 1.5% were very low birthweight (less than 1500 g) and 0.9% were extremely low birthweight (less than a 1000 g); 11% of babies weighed more than 4000 g at birth.

For those babies born at term, 3% were low birthweight, 0.38% were less than 1500 g. The average birthweight at term was 3337 g (SD 625 g); 12% of babies weighed more than 4000 g.

Tables 5.4a and 5.4b a show CSR by gestational age and birthweight in England and Wales. CSR for preterm births is higher than that for term births but varies with gestational age. CSR at term was 20%. For pregnancies of less than 28 weeks of gestation CSR was 30%; between 28 and 32 weeks it was 55% and between 33 and 36 weeks it was 38%. These contribute 0.8%, 3% and 10%, respectively, to the overall CSR. The majority were primary CS.

CSR for low birthweight babies was 39%, for very low birthweight babies it was 44% and for extremely low birthweight babies it was 32%. CSR for babies that weighed between 2501 g and 4000 g was 20%.

CSR for babies weighing more than 4000 g was 24%; 69% of these were emergency CS, compared with the 63% overall CSR. The two most frequent primary indications in deciding to perform CS in these cases was failure to progress (57% compared with 34% in babies of normal birthweight) and presumed fetal compromise (21% compared with 34% of normal birthweight babies). For those women, with babies weighing more than 4000 g who had an elective CS, the most influential indication was previous CS (34%) maternal request (15%) and other fetal problems (11%).

5.8 Induction of labour

5.8.1 Background

Induction of labour is defined as an intervention designed to artificially initiate uterine contractions leading to progressive dilatation and effacement of the cervix and birth of the

Table 5.5a Distribution of onset of labour: numbers by region

	Phase I										Phase II		
	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Total maternities (*n*)	150,139	16,295	18,940	11,997	16,498	17,768	19,389	28,589	12,987	7,535	27,168	5341	545
Onset:													
spontaneous (*n*)	100,501	10,954	12,599	7861	11,106	11,777	13,398	19,106	8896	4704	17,963	2669	311
induction no SROM (*n*)	27,597	3123	3489	2401	3006	3469	3106	5109	2298	1578	5213	1694	130
induction with SROM (*n*)	5621	609	889	478	547	629	633	1102	479	253	880	248	35
not in labour (*n*)	15,538	1514	1876	1198	1736	1820	2091	3105	1259	918	2926	686	64

Table 5.5b Onset of labour and caesarean section rate (CSR)

	Phase I										Phase II		
	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Overall CSR (%)	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2	22.1	23.9	24.8
Onset:													
spontaneous (%)	10.0	8.8	8.8	9.0	10.1	10.2	12.2	10.4	9.0	11.3	10.2	10.9	10.0
induction no SROM (%)	19.2	17.5	17.0	17.8	19.3	18.0	23.8	21.5	16.8	19.6	19.8	14.3	22.3
induction with SROM (%)	20.7	18.8	14.4	21.1	22.5	22.7	29.5	21.8	16.3	19.8	20.6	19.8	28.6
not in labour (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 5.6 Term singleton cephalic pregnancies: caesarean section rate (CSR)

	Phase I										Phase II		
	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Overall CSR, all maternities (%)	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2	22.1	23.9	24.8
Term singleton cephalic pregnancies													
Maternities (*n*)	132,632	14,364	16,668	10,530	14,451	15,803	17,082	25,427	11,571	6664	23,835	4749	493
CSR (%)	17.0	14.9	15.1	15.3	17.1	16.8	20.0	18.3	14.8	19.7	17.8	20.0	19.9
Primary CSR (%)	12.3	10.7	11.0	10.8	12.5	12.0	15.0	13.2	10.4	14.3	13.0	13.2	13.9
Repeat CSR (%)	64.4	59.5	63.4	61.7	63.4	64.7	67.3	66.4	61.1	70.3	63.5	75.3	76.6

baby. This includes women with intact membranes and women with spontaneous rupture of the membranes but who are not in labour (6–19% of women at term).[49,52,53] Induction of labour is indicated when it is concluded that the fetus or the mother will benefit from a higher probability of a healthy outcome than if birth is delayed. The process of induction of labour should only be considered when vaginal delivery is felt to be the appropriate route of delivery.[49]

Induction of labour is a common procedure within obstetric practice. National data for England and Wales possibly overestimate the rate, due to the misclassification of women who receive oxytocin augmentation after spontaneous labour onset as induction of labour. Overall, in England and Wales for the period 1980–95, the induction of labour rate varied between 17% and 21%. In Scotland, there was a marked decrease in the induction rate between 1980 and 1992, following which there was a return to the level seen in 1987.[54] The Canadian induction rate was 19% in 1998.[15] The induction rate (for term pregnancies only) in the USA was 20% in 1998.[14]

For women who are healthy and who have had an uncomplicated pregnancy, a policy of active induction of labour after 41 weeks compared with expectant management reduces perinatal mortality and results in a reduction in CSR.[55]

5.8.2 The Audit results

Tables 5.5a and 5.5b show the distribution of the onset of labour and CSR by region. The overall rate of induction of labour was 18%. In Wales it was 21% while in London it was 16%. Forty-seven percent of inductions were in women who were primigravid, 48% in women who were multiparous with no previous CS and 4% were in women who were multiparous with a previous CS. Overall, 55% of inductions were carried out before 41 weeks and 91% before 42 weeks of gestation.

The overall CSR among women who had induction of labour was 19%. This rate was higher in the South East (22%) and in London (24%). Among primigravid women, the CSR was 28%, among multiparous women with no previous CS it was 9% and among women who have had a previous CS it was 40%.

The most influential factor in deciding to perform these CS was failure to progress (44% cases) and presumed fetal compromise (38% cases).

5.9 Term singleton cephalic pregnancies

5.9.1 Background

The majority of women have one baby, which is born head first at term. National statistics in England and elsewhere do not collect information on presentation at birth for all babies.

Most fetal risk factors for poor outcome are not present in this group (e.g. immaturity, multiple pregnancy, breech presentation); therefore, it could be anticipated that the perinatal mortality rate in this group will be lower than average. However, the group includes infants who are at risk of adverse outcome who may or may not have been identified as such (e.g. growth-restricted infants).

The women in this group will be heterogeneous with respect to risk factors for CS (e.g. parity, previous CS, age, ethnicity). These factors have been discussed in earlier sections.

This is the largest clinical group in the population and as such even though the CSR within the group may be lower than average it contributes most to the overall CSR. The majority of these CS will be performed for failure to progress, fetal distress and previous CS. Hence, initiatives aimed at reducing CSR have centred on this group (e.g. increasing VBAC rates, reducing CS for failure to progress and fetal distress).[4,6,12,56]

Table 5.7a Distribution (*n*) of birthweight by gestational age: numbers by region (phase one)

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales
Total maternities (*n*)	150,139[a]	16,295	18,940	11,997	16,498	17,768	19,389	28,589	12,987	7,535
Gestation < 28 weeks (total)	830	100	123	60	101	74	151	129	60	31
Birthweight (g)										
<1500	736	94	102	49	90	69	128	116	57	30
1500–2499	11	0	3	3	0	0	3	1	0	1
2500–4000	20	0	5	1	5	3	2	2	2	0
Gestation 28–32 weeks (total)	1953	252	256	152	247	201	301	318	137	86
Birthweight (g)										
<1500	890	119	121	67	1112	87	157	137	57	32
1500–2499	941	113	119	81	114	107	129	157	72	32
2500–4000	85	16	12	3	11	4	6	22	6	5
Gestation 33–36 weeks (total)	8419	955	1108	717	1053	919	1041	1498	677	447
Birthweight (g)										
<1500	174	19	18	17	19	22	23	29	17	9
1500–2499	3861	427	516	329	490	430	499	664	308	195
2500–4000	4268	491	561	361	527	452	509	785	342	240
>4000	71	10	7	5	11	11	5	13	8	1
Gestation ≥ 37 weeks (total)	138,517	14,958	17,400	11,047	15,048	16,524	17,828	26,561	12,078	6960
Birthweight (g)										
<1500	501	23	72	39	58	79	105	72	42	11
1500–2499	3490	414	444	270	449	398	551	555	244	161
2500–4000	117,598	12,697	14,738	9392	12,886	13,900	15,401	22,372	10,166	5928
>4000	16,626	1787	2119	1300	1627	2104	1727	3493	1609	849

[a]Region unknown for 141 maternities

Table 5.7b Distribution (*n*) of birthweight by gestational age (phase two)

	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Total maternities (*n*)	27,168	5341	545
Gestation <28 weeks (total)	146	34	–
Birthweight (g)			
<1500	133	28	–
1500–2499	5	1	–
2500–4000	0	2	–
Gestation 28–32 weeks (total)	404	53	5
Birthweight (g)			
<1500	179	22	1
1500–2499	199	28	4
2500–4000	19	2	0
Gestation 33–36 weeks (total)	1637	261	17
Birthweight (g)			
<1500	32	2	0
1500–2499	780	109	7
2500–4000	812	143	10
>4000	10	5	0
Gestation ≥ 37 weeks (total)	24,886	4986	522
Birthweight (g)			
<1500	7	1	0
1500–2499	701	86	10
2500–4000	21,333	4157	456
>4000	2802	734	55

5.9.2 The Audit results

Table 5.6 shows the distribution of term singleton cephalic pregnancies numbers by region. Percentages given below are derived from the numbers in these tables.

Eighty-eight percent of women were in this group; 41% of these mothers were nulliparous, 50% were multiparous with no previous CS and 9% were multiparous with at least one previous CS.

Of these babies, 12% were greater than 4000 g at birth, 3% were low birthweight and 0.4% were less than 1500 g (Tables 5.7a and 5.7b).

The overall CSR in this group was 17%. The rates in the regions varied from 15% in North East, North West and South West England to 20% in London, Wales and Northern Ireland. This group contributed 70% to the overall CS. The primary CSR for the group was 12%, which contributed 46% to overall caesarean rate. The repeat CSR was 64% and this contributed 24% to the overall CSR.

Of the primary CS undertaken, 82% were emergency procedures. The main indications reported for these were: failure to progress (43%, which contributed 16% to the overall CSR) and fetal distress (40%, which contributed 15% to the overall CSR).

Of the repeat CS undertaken, the majority (70%) were elective procedures. The main indications reported for these were: previous CS (63%, contributing 10% to overall CSR) and maternal request (18%, contributing 3% to overall CSR).

There were audit standards for the management of women with previous CS, failure to progress and fetal distress. The findings of the audit relating to these standards are presented in Chapter 6.

5.10 Breech

5.10.1 Background

Breech presentation is associated with an increase risk of both cerebral palsy and death.[57,58] This is independent of mode of delivery and gestation. The prevalence of breech reduces with increasing gestational age with most foetuses turning to cephalic presentation spontaneously. About 3–4% of all pregnancies reach term with a fetus in the breech presentation.[59]

A systematic review of studies on the effects of ECV at term and measures of pregnancy outcome found that ECV at term was associated with a significant reduction in non-cephalic births and CS.[60] There was no significant effect on perinatal mortality. ECV before term was not effective at reducing these outcomes.[61]

A recent randomised control trial (RCT)[62] and systematic review,[60] provide information on the risks and benefits of planned CS compared with planned vaginal breech delivery. The perinatal mortality was lower for planned CS compared with planned vaginal breech delivery (the number of CS needed to prevent one perinatal death was 29). However, maternal morbidity was increased in such women who had a CS. The RCT[62] was published after the period data for the phase one of the Audit in England and Wales. Recruitment for the trial was stopped earlier than planned (April 2000); the implications of this probably did impact on the management of breech during the Audit.

CS for breech has been identified as one of the major reasons for performing a primary CS.[12] An increase in primary CS will increase the percentage of women with a uterine scar who will be at increased risk of a CS in future pregnancies.

Table 5.8a Distribution of breech babies by gestational age, (*n*) by region

	Phase I										Phase II		
	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Pregnancies (*n*)	5866	628	732	516	642	690	701	133	557	289	1034	198	25
Gestation (weeks):													
< 28	247	35	26	21	31	23	45	36	23	7	37	9	0
28–32	359	49	50	32	48	39	42	60	26	13	65	12	0
33–36	738	79	92	71	87	88	76	123	78	34	149	17	3
≥ 37	4510	465	561	390	475	539	535	876	429	234	781	159	22

Table 5.8b Caesarean section rates (CSR) (%) for breech babies by gestational age

	Phase I										Phase II		
	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Overall CSR (all maternities)	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2	22.1	23.9	24.8
Overall CSR (breech presentation)	88.4	89.2	89.8	86.4	87.4	90.7	85.9	89.7	85.1	90.3	90.3	86.4	100.0
Gestation (weeks):													
< 28	38.9	31.4	42.3	52.4	25.8	34.8	40.0	50.0	34.8	42.9	37.8	44.4	–
28–32	81.3	73.5	80.0	93.8	79.2	71.8	33.8	91.7	92.3	76.9	89.2	66.7	–
33–36	87.1	89.9	90.2	84.5	88.5	89.8	90.8	82.7	84.6	82.4	87.3	88.2	100.0
≥ 37	91.8	95.1	92.7	88.0	92.0	94.6	89.9	92.2	87.4	93.6	93.5	89.9	100.0

Table 5.9a Distribution of twin pregnancies by gestational age, (*n*) by region

	Phase I										Phase II		
	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Pregnancies (*n*)	2158	247	275	175	214	263	297	386	186	112	437	88	5
Gestation (weeks):													
< 28	75	2	4	2	1	3	4	3	1	2	20	5	–
28–32	224	17	11	10	15	15	28	25	13	4	54	6	1
33–36	828	55	59	42	42	59	62	95	37	30	164	22	1
≥ 37	1024	66	72	46	60	84	100	114	48	27	198	55	3

Table 5.9b Caesarean section rates (CSR) (%) for twin pregnancies by gestational age

	Phase I										Phase II		
	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	England & Wales 2000/01	Northern Ireland	Channel Islands & Isle of Man
Overall CSR (all maternities)	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2	22.1	23.9	24.8
Overall CSR (twin pregnancies)	58.5	56.7	53.5	57.1	55.1	61.6	66.0	61.7	53.2	56.3	58.1	40.9	80.0
Gestation (weeks):													
< 28	29.3	15.4	28.6	28.6	14.3	42.9	44.4	37.5	20.0	40.0	35.0	60.0	–
28–32	61.6	53.1	39.3	55.6	53.6	60.0	73.7	89.3	72.2	57.1	72.2	33.3	100.0
33–36	58.1	56.7	55.7	58.3	48.3	64.8	66.0	59.8	53.6	57.7	60.4	50.0	100.0
≥ 37	60.3	62.9	57.1	59.0	65.9	60.4	64.9	60.3	51.1	56.3	55.1	36.4	66.7

5.10.2 The Audit results

Table 5.8a shows the distribution of breech pregnancies by region. Percentages given below are derived from the numbers in these tables.

Overall, about 4% of singleton pregnancies were breech presentation: 3% of term infants were breech; in babies born preterm, the percentage was higher – 9% for those born at 33–36 weeks, 18% at 28–32 weeks and 30% at less than 28 weeks.

Table 5.8b shows the CSR of breech babies according to gestational age.

The overall CSR was 88%. Fifty-six percent of these operations were elective while 44% were emergency sections. For 85% of women, this was their first CS. The most common primary indications given by clinicians for performing CS were breech presentation (62%), presumed fetal compromise (7%), maternal request (6%), previous CS (4%) and failure to progress (2%). CS in pregnancies with breech presentation contributes 16% to the overall CSR.

Nearly all women (96%) who had a previous CS and who had a breech presentation in this index pregnancy were delivered by CS, which contributed 2% to the overall CSR.

Of the women who had a CS for breech presentation, ECV was reported to have been offered to 33% of women, which was the same for both nulliparous and multiparous women. The procedure was reported to have been attempted in 41% of nulliparous women and 46% of multiparous women.

5.11 Multiple pregnancies

5.11.1 Background

Rates of multiple pregnancy have increased. The twinning rate in Scotland was 14.3 per 1000 pregnancies in 1998.[63,64] In Canada, twinning rates are markedly higher and have increased from 21 per 1000 in 1990 to 25 per 1000 in 1997.[15] The USA has similarly high rates of 19 per 1000 in 1980, which increased to 29 per 1000 in 1999.[14]

The risk of death from any cause is higher among multiple births than among singletons. The stillbirth rate was 21 per 1000 multiple total births and the neonatal death rate was 25.5 per 1000 multiple live births, compared with a stillbirth rate of 4.9 per 1000 total singleton births and a neonatal death rate of 3.3 per 1000 singleton livebirths.[45] The effects of prematurity account for a disproportionate number of deaths among multiple births.[64]

5.11.2 The Audit results

The multiple birth rate was approximately 15 per 1000 pregnancies. The twinning rate was 14.4 per 1000 pregnancies. Higher order births occurred at a rate of 4 per 10,000.

Tables 5.9a and 5.9b show the distribution of twin pregnancies according to gestational age by region. Percentages given below are derived from the numbers in these tables.

Preterm birth was more common with multiple pregnancy. Fifty-two percent of twin pregnancies delivered before 37 weeks gestation (compared with 7% of singletons). Fourteen percent of twin and 36% of triplet pregnancies compared with less than 2% of singleton pregnancies were delivered before 33 weeks of gestation. Babies born at less than 33 weeks are likely to require neonatal intensive care; 21% of all babies born at less than 33 weeks were from multiple pregnancies.

Tables 5.9a and 5.9b show rates for twin pregnancies according to gestational age. Fifty-nine percent of twin pregnancies were delivered by CS. Fifty-one percent of these CS were carried out before 37 weeks gestation. This contributes 4% to the overall CSR.

For all CS in this group, multiple pregnancy was reported to be the primary indication for 26%. Sixty-three percent of these CS were emergency sections and 37% were elective. For elective CS, breech presentation of the first twin was the most commonly reported indication (14%), together with previous CS (7%) and maternal request (9%). Of the emergency sections, fetal distress was the most influential factor in 29% and failure to progress in 12%.

CS for delivery of the second twin following vaginal delivery of the first baby was carried out in 3.5% of twins (n = 75). Information on the grade of obstetrician present in theatre was available: for 84% of these cases: a consultant was present in 22% cases, year 4/5 SPR in 33% and year 1/2/3 SPR in 32% of cases.

Ninety-two percent of triplets were delivered by CS. All babies in three sets of triplets were delivered vaginally.

6. Decision making before caesarean section

6.1 Summary

- A large proportion of CS are undertaken for the following indications: previous CS, failure to progress and fetal distress. Management decisions about these indications are key to determining the overall CSR.
- As part of its strategy to reduce CSR, the USA has set targets to increase VBAC rates to 40%.
- In the Audit, the VBAC rate was 33% but the range between units was wide: from 6% to 64%. Of women who had a repeat CS in the index pregnancy, 44% were reported to have been offered a trial of labour but, again, the range between units was wide: from 8% to 90%.
- The auditable standard states 'In general, pelvimetry should not be used after a CS to decide the mode of delivery'. In the Audit, the use of pelvimetry in women having CS was low, at 6%.
- In line with the auditable standard that 'oxytocin should be used in the management of primigravidae with suspected failure to progress prior to delivery by CS', 81% of women in their first pregnancy had oxytocin prior to their CS. The group in which the standard was not met contributed 2.6% to the overall CSR.
- The auditable standard states that 'Where a CS is contemplated because of an abnormal fetal heart rate (FHR) pattern, in cases of suspected fetal acidosis, fetal blood sampling (FBS) should be undertaken when it is technically possible to do so'. In the Audit, FBS was attempted in 44% of the relevant cases. Those not meeting the standard contributed 4.6% to the overall CSR.
- In accordance with the auditable standard, umbilical acid base was measured following a CS for fetal distress in 82% of the relevant cases.

6.2 Introduction

A large proportion of CS are undertaken following a previous CS, failure to progress and fetal distress.[4,18] *Therefore, management decisions prior to CS for these indications are key in determining the overall CSR. The chapter examines the levels of application of the relevant auditable standards for offering a trial of labour, the use of pelvimetry, the use of oxytocin and FBS and measuring the umbilical artery acid base status.*

6.3 Management of previous caesarean section

6.3.1 Background

CSR is higher in women who have had a previous CS. An increase in the number of women who have had a previous CS in a population will result in a disproportionate increase in the

overall CSR.[12,14,15] Low VBAC rates are associated with higher overall CSR. As part of the strategy to reduce CSR, the USA has set targets to increase VBAC rates to 40%.

6.3.2 Auditable standard

A trial of labour should be considered in women who have had a previous CS.

The Audit results

Table 6.1 shows the numbers and proportions relating to decision making before CS. Percentages given in the text are derived from these numbers.

Data from the audit shows that repeat CS contributed 29% to the overall CSR. The overall rate of vaginal birth after a previous CS was 33%. Between regions this ranged from 27% to 38% and between units from 6% to 64%.

The repeat CSR is shown in Table 4.4a. The offer of a trial of labour was only reported for those women who delivered by CS. Of women who had a repeat CS in the index pregnancy, 44% were reported to have been offered a trial of labour. Between regions, this ranged from 39% to 49% and between units from 8% to 90%.

Research evidence shows that pelvimetry has a poor predictive value for future obstetric outcome. Therefore, in general, pelvimetry should not be used after a CS to decide on the mode of delivery in the next pregnancy[65] or antenatally in the index pregnancy,[66] except in rare situations such as a previous fractured pelvis.[67]

6.3.3 Auditable standard

In general, pelvimetry should not be used after a CS to decide on the mode of delivery.

The Audit results

Table 6.1 shows that 6% of women who had had a previous CS and who had a CS in this index pregnancy were reported to have had pelvimetry. Between regions this ranged from 3% to 12%. Pelvimetry was said to have influenced the decision to perform CS for 40% of these women. Between regions, this proportion ranged from 27% to 50%. Therefore, the results of pelvimetry have influenced the decision to perform 0.7% of all CS.

6.4 Failure to progress

6.4.1 Background

CS because of a failure to progress is a known determinant of the overall CSR. These data show that, as the primary indication, it contributed 20% to the overall CSR. Sixty-nine percent of these women were in their first pregnancy.

6.4.2 Auditable standard

Oxytocin should be used in the management of primigravidae with suspected failure to progress in labour prior to a CS.[4]

The Audit results

The use of oxytocin was only reported for those women who delivered by CS. Eighty-one percent of women in their first pregnancy having a CS for failure to progress had oxytocin prior to the CS (Table 6.1). Between regions, this ranged from 74% to 84% and between units from 47% to 100%. The group in which this standard was not met contributed 2.6% to the overall CS rate.

Table 6.1 Decision making before caesarean section (CS)

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands and Isle of Man
Overall CS rate	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2	23.9	24.8
Management of women with previous CS												
VBAC rate (%)	32.6	38.2	33.7	34.3	33.7	32.0	29.6	31.1	34.0	26.9	23.8	21.8
Women with previous CS who delivered by CS in this index pregnancy and were offered a trial of vaginal delivery (%)	44.0	49.3	39.0	43.3	41.8	44.8	42.3	45.6	47.0	43.2	24.5	54.3
Women with a previous CS who had pelvimetry (%)	6.0	8.9	11.9	7.2	3.1	5.4	3.3	5.5	5.0	4.1	1.2	0.0
Women for whom pelvimetry influenced decision to perform CS (%)	40.4	41.9	36.5	36.7	26.7	41.4	47.5	45.0	38.9	50.0	40.0	–
Failure to progress												
Primigravidae who delivered by CS with failure to progress as the primary indication (*n*)	4150	360	430	298	431	488	627	909	349	258	195	14
Deliveries in which oxytocin used prior to CS (%)	80.7	83.6	81.4	82.2	74.0	82.4	83.9	79.4	82.8	76.0	84.6	78.6
Fetal distress												
CS performed where abnormal CTG was noted (*n*)	4099	417	494	287	487	455	613	869	261	216	110	11
FBS possible (%)	49.6	48.9	50.8	46.3	49.3	54.1	41.8	52.5	56.3	46.8	63.6	63.6
FBS performed (%)	43.6	66.2	49.4	51.9	37.9	34.7	32.8	41.9	50.3	33.7	25.7	14.3
Fetal umbilical cord pH status determined (%)	82.1	78.9	76.9	83.6	86.2	74.9	86.9	85.8	82.4	76.5	75.0	50.0

6.5 Presumed fetal compromise

6.5.1 Background

The data from this audit show that CS for presumed fetal compromise contributed 22% to the overall CSR (Table 4.5). The use of continuous electronic fetal monitoring (EFM), without FBS, increases the CSR but has not been shown to improve perinatal mortality.[68]

6.5.2 Auditable standard

Where CS is contemplated because of an abnormal fetal heart-rate pattern, in cases of suspected fetal acidosis, FBS should be undertaken when it is technically possible to do so and where there are no contraindications.[68] For the purposes of this audit, 'technically possible' was defined as cervical dilation of 4 cm or more.

The Audit results

Table 6.1 shows that an abnormal CTG was noted in 4099 (69%) singleton cephalic pregnancies delivered by CS for fetal distress. Cases where the CTG was noted to be severely abnormal were not included. In 50% of these cases, cervical dilatation was at least 4 cm. While information on all relevant maternal contraindications was not reported, it has been assumed these were a small percentage and reasonably constant proportion of all cases. FBS was attempted in 44% of these cases. This varied between regions from 33% to 66% and between units from 11% to 100%. The group in which this standard was not met contributed 4.6% to the overall CS rate.

6.6 Umbilical artery acidaemia

6.6.1 Background

Umbilical artery acidaemia at birth correlates with neonatal complications. However, in isolation, it has not been shown to be a predictor of long-term neurological sequelae. It has been recommended that umbilical artery acid base status should be ascertained after delivery in cases where delivery was expedited for concern about fetal wellbeing, e.g. after an emergency CS.[68]

6.6.2 Auditable standard

It is recommended that umbilical artery acid base status should be performed as a minimum if emergency CS is performed for fetal distress.

The Audit results

Table 6.1 shows that umbilical cord pH was taken following CS for fetal distress in 82% of cases. Between regions this varied between 75% and 87% and between units from 11% to 100%.

7. Classification of urgency of caesarean section

7.1 Summary

- CS have traditionally been divided into either elective or emergency. The latter term can be broad and may not connote the degree of urgency. This has led to ad hoc local adaptations and data inconsistencies between hospitals.
- A clear classification would facilitate communication between professionals and the comparison of process and outcomes.
- NCEPOD recommended categorisation of operations into four grades of urgency; adaptation of this recommendation has been endorsed by the RCOG and the RCA.
- An evaluation of the two approaches was undertaken but piloting revealed that the use of category names increased confusion and greater misclassification. Thus, in the Audit, the category names were removed.
- There was consistent use of the new scheme compared to the traditional binary categories. Misclassification occurred in only 5% of cases.
- As assigned to the four categories of urgency, the proportion of CS procedures were:

1 an immediate threat to the life of the mother or fetus (16%)
2 maternal or fetal compromise that was not immediately life threatening (32%)
3 the mother needed early delivery but there was no maternal or fetal compromise (18%)
4 delivery was timed to suit the mother and the staff (31%).

- The use of the four categories of urgency was compared with the primary indication reported for the procedure.
- The clinical features thought to be consistent with category 1 above were placental abruption, cord prolapse, uterine rupture, actively bleeding, placenta praevia, intrapartum haemorrhage or presumed fetal compromise; 51% of the cases included in this category fitted these criteria.
- Using the clinical features consistent with category 1 would mean that 8% of CS would be included in this category, representing about 2% of all births.
- 89% of cases reported in category 4 filled the criteria appropriate for this category.

7.2 Introduction

Urgency can be a critical dimension motivating a CS. In this chapter, the merits of the traditional binary description of urgency and the alternative four categories adapted from NCEPOD are considered. The results in the Audit using the latter scheme and the inconsistencies that emerged are presented.

7.3 Background

CS has traditionally been divided into two groups, either elective or emergency procedures. The emergency category is broad, as it may include procedures done within

minutes to save the life of a mother or baby as well as those in which mother and baby are well but where early delivery is desirable, e.g. a woman with a planned elective CS who is admitted in labour. This classification does not convey the degree of urgency of the procedure. In some centres, this has led to an ad hoc local adaptation with either re-classification of the least 'urgent' cases as elective or the creation of a third 'semi-elective' category. This has resulted in data inconsistencies between hospitals.

A clear classification system would facilitate communication between professionals as to the degree of urgency of a CS. This is important to enable smooth flow of events, while ensuring the safety of both mother and baby, in cases where the decision to deliver by CS has been made during labour.[69] If used consistently, such a classification system would facilitate comparison of process and outcome measures between hospitals.

The NCEPOD classification recommended the categorisation of operations into four grades of urgency. This categorisation was developed for non-obstetric surgery and each category has an associated interval for 'decision to operation' time.[70] Adaptation of this categorisation for obstetric cases has been proposed[71] and been endorsed by the RCOG and the RCA.[72]

An evaluation of the two categorisation schemes was undertaken as part of this audit. Two questions relating to the urgency of CS were included. The first used a modified version of the four grades of urgency.[72] Piloting revealed that the use of category names increased confusion and resulted in greater misclassification when compared with the use of the definitions alone. A reason for this is that the category names were already associated with existing classification systems (local and national). Hence, in this Audit, the category names were removed. The classification was new to most maternity units and examples were given for each category to facilitate its use (appendix Civ). There were four possible categories:

1. Immediate threat to the life of the woman or fetus.
2. Maternal or fetal compromise which was not immediately life-threatening.
3. No maternal or fetal compromise but needs early delivery.
4. Delivery timed to suit the woman and staff.

The second question used the traditional binary classification of emergency or elective.

7.4 The Audit results

The use of the four categories of urgency was compared with the traditional binary emergency/elective categories and to the indication for the procedure (Table 7.1). Generally, there was consistent use of the new scheme when compared with the binary categories, with misclassification occurring in about 5% of cases. There were three types of inconsistency:

1. 'Immediate threat to the life of the woman or fetus' in the new scheme was classified as an 'elective' procedure in the old (0.3% of cases).
2. 'Maternal or fetal compromise that was not immediately life-threatening' in the new scheme was classified as an 'elective' procedure in the old (3.7%).
3. 'Delivery was timed to suit the woman and staff' in the new scheme and the procedure was reported to be an emergency in the old (1.0%).

For each type of inconsistency, the indications (primary and contributory) and clinical details (e.g. in labour, CTG abnormality) of the case were reviewed. Using this information, the misclassified cases were recoded.

Table 7.2 shows the classification of CS by grades urgency by region.

The overall elective CSR was 37% and the emergency rate was 63%. Sixteen percent of procedures were performed because there was reported to be 'an immediate threat to the

Table 7.1 Classification of urgency of caesarean section; binary versus four grades of urgency

Grade of urgency	Emergency *n* (%)	Elective *n* (%)	Total *n* (%)
1. Immediate threat to life of woman or fetus	4787 (16.2)	–	4787 (16.2)
2. Maternal or fetal compromise not immediately life threatening	9498 (32.2)	–	9498 (32.2)
3. No maternal or fetal compromise but needs early delivery	3889 (13.2)	1519 (5.2)	5408 (18.4)
4. Delivery timed to suit woman and staff	–	8994 (30.5)	8994 (30.5)
Missing data on grade of urgency	360 (1.2)	410 (1.4)	770 (2.6)
Total	18,534 (62.9)	10,923 (37.1)	29,457(100.0)

life of the mother or fetus'. Between regions, this varied from 14% to 19% and between units from 4% to 33%.

Thirty-two percent of procedures were performed because there was reported to be 'maternal or fetal compromise which was not immediately life threatening'. Between regions, this ranged from 30% to 34% and between units from 7% to 58%.

Eighteen percent of procedures were performed because it was reported that the 'mother needed early delivery but there was not maternal or fetal compromise' and between regions this ranged from 17% to 22% and between units from 6% to 36%.

In 31% of cases, 'delivery was timed to suit the mother and the staff'. Between regions this ranged from 28% to 34% and between units from 15% to 79%.

The use of the four categories of urgency was compared with the primary indication reported for the procedure. Data on reported primary indications should be treated with caution because there maybe more than one valid indication contributing to the decision to perform CS (e.g. a woman may have both a breech presentation and placenta praevia) and there may inconsistencies in deciding the primary indication. The indications by grade of urgency are given in Table 7.3. Due to the inconsistent use of primary indications and the possible variation in use of urgency grade-2 and -3 categories, consistency checks were limited to the categories of urgency grades 1 and 4.

The indications or clinical features consistent with category 1 (immediate threat to life of the mother or fetus) were thought to be: placental abruption, cord prolapse, uterine rupture, actively bleeding placenta praevia, intrapartum haemorrhage, presumed fetal compromise with severely abnormal CTG or an FBS pH less than 7.2. Of the cases reported to be in category 1, 51% filled these criteria.

The primary indication in 59% of the cases that do not fit the criteria was presumed fetal compromise. Of these, the CTG was reported to be normal in 8% of cases and abnormal (but not severely abnormal) in 89%. FBS was reported to have been performed in 19% of the cases with an abnormal CTG; in all these cases, the pH was greater than 7.2.

The primary indication in 12% of cases that did not fit the criteria was failure to progress. Of these, the CTG was reported to be normal in 57% of cases and abnormal in 41% of cases.

Using the indications and clinical features that were thought to be consistent with a classification into category 1 (immediate threat to life of the mother or fetus), the percentage of CS included in this category would be 8%. This represents about 2% of all births.

The features thought to be consistent with inclusion in category 4 (delivery timed to suit the woman and staff) were: women not in labour, CS performed during daytime on a weekday. Of the cases reported to be in this category, 89% filled these criteria.

Table 7.2 Classification of caesarean section (CS) by grades of urgency, by region (%)

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands and Isle of Man
Overall CSR	21.5	19.3	19.6	20.4	21.8	21.4	24.2	22.6	19.4	24.2	23.9	24.8
Grade of urgency												
1. Immediate threat to life of woman or fetus	16.2	18.4	17.6	14.8	19.1	15.9	16.6	14.2	14.4	15.6	9.9	12.4
2. Maternal or fetal compromise not immediately life threatening	32.2	29.8	31.9	31.2	32.4	29.5	34.0	33.8	33.4	31.9	27.2	19.1
3. No maternal or fetal compromise but needs early delivery	18.4	17.2	17.9	18.9	17.5	21.5	19.3	17.5	16.6	20.0	21.0	29.5
4. Delivery times to suit woman and staff	30.5	32.6	29.4	32.8	27.5	30.5	27.5	31.7	34.4	29.6	40.1	35.2

Table 7.3 Primary indications for caesarean section (CS), as reported by clinicians, by grade of urgency[a]

Primary indication to perform caesarean section	Grade of urgency[a] 1	2	3	4
Breech presentation	1.0	4.0	17.1	19.3
Malpresentation/unstable lie	2.1	3.5	5.2	3.0
Multiple pregnancy	0.5	0.5	2.2	1.7
Presumed fetal compromise/IUGR/ Abnormal CTG	63.2	34.1	1.1	0.8
Cord prolapse	3.1	0.1	0.0	0.0
Chorioamnionitis	0.3	0.5	0.1	0.0
Other (Fetal)[b]	2.4	2.5	2.3	2.0
Placenta praevia, actively bleeding	2.4	1.1	0.6	0.2
Placenta praevia, not actively bleeding	1.1	1.3	3.8	2.6
APH/Intrapartum haemorrhage	2.6	1.2	0.5	0.0
Placental abruption	4.3	0.6	0.1	0.0
Pre-eclampsia/eclampsia/HELLP	4.4	4.1	0.9	0.3
Maternal medical disease[b]	0.6	1.8	2.4	2.4
Failure to progress (induction/in labour)	6.9	37.0	36.4	0.8
Previous caesarean section	0.4	1.6	13.4	33.7
Uterine rupture	0.6	0.1	0.1	0.0
Maternal request[c]	0.3	0.9	5.8	18.5
Previous poor obstetric outcome	0.0	0.2	1.1	1.9
Previous physically or emotionally traumatic vaginal delivery	0.1	0.2	1.0	4.5
Previous infertility	0.0	0.0	0.1	0.3
Other (maternal)[b]	0.5	1.7	2.6	4.0

[a] Definition of grades of urgency:
1. immediate threat to life of woman or fetus
2. maternal or fetal compromise not immediately life threatening
3. no maternal or fetal compromise but needs early delivery
4. delivery times to suit the woman and staff

[b] See key in Appendix Ciii

[c] Maternal request as reported by clinicians on question 24 of the clinical data form; this is not necessarily maternal request in the absence of any maternal or fetal medical complications (see Appendix Civ)

8. Decision-to-delivery intervals for emergency caesarean section

8.1 Summary

- The generally accepted standard in cases of serious maternal or fetal compromise is that decision-to-delivery time by CS should be within 30 minutes, although the literature suggests that there is minimal research evidence to show that this standard improves fetal outcomes.
- There may be conflicting priority of concerns about the mother and her baby. Rapid decision-making has the potential to cause adverse effects. Delays in delivery possibly associated with poor outcomes have also been attributed to poor communication.
- Overall, in the Audit, the median decision-to-delivery time for the cases included in the category 'immediate threat to the life of the mother or the fetus' and meeting clinical criteria of urgency (see Chapter 7) was 27 minutes. Twenty-five percent of cases were delivered within 18 minutes; 75% by 40 minutes; 63% of units delivered at least 50% of cases within 30 minutes.

8.2 Introduction

This chapter considers the generally accepted interval for decision-to-delivery for emergency CS. The implications of this expectation suggested by research studies and the results achieved in this Audit are examined.

8.3 Background

There has been a generally accepted standard that, in cases of severe maternal or fetal compromise, the time between decision and delivery by CS should be within 30 minutes.

The majority of cases undertaken because of a reported 'threat to the life of the mother or fetus' were for presumed fetal compromise (63% in this Audit). There is minimal research evidence to support that delivery within 30 minutes improves fetal outcome.[68] In these circumstances, the priority of ensuring maternal safety may conflict with concerns about the baby.[73] Delivery should be accomplished as fast as possible but without endangering the condition of the mother. Regional anaesthesia has been shown to be safer than general anaesthesia. Achieving satisfactory anaesthesia within a tight timescale requires experience and skill.[69]

The rapid decision making in stressful circumstances may generate anxiety for all involved. The majority of CS are performed as emergency procedures (63%, representing 13% of all births). While it is appropriate that maternity services can meet and exceed these targets

Table 8.1 Decision-to-delivery interval (in minutes) for acute obstetric emergencies[a]

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland
All CS (*n*)	29,488	2935	3282	2261	3245	3504	4205	5989	2327	1640	1167
pH < 7.2 (*n*)	424	73	59	36	43	50	31	76	41	15	8
Median (IQR)	27 (20, 36)	28 (20, 36)	27 (22, 36)	29 (23, 35)	26 (16, 38)	26 (20, 39)	32 (23, 39)	26 (16, 35)	25 (17, 35)	38(23,55)	38 (25, 57)
Severely abnormal CTG (*n*)	1530	201	165	119	180	160	212	281	139	73	32
Median (IQR)	26 (17,40)	26 (15, 40	25 (18,37)	25 (17, 36	23 (15, 37)	28 (17, 42)	30 (18, 46)	29 (19, 43)	23 (14, 36)	27 (16, 42)	28 (18, 44)
Cord prolapse (*n*)	147	18	16	18	13	21	18	22	14	7	9
Median (IQR)	17 (12,26)	17 (12, 23)	14 (10, 20)	20 (12, 33)	15 (12, 30)	21 (14, 25)	21 (14, 26)	17 (11, 26)	18 (12, 28)	11 (9, 14)	15 (11, 17)
Placental abruption (*n*)	253	30	35	22	15 (12, 30)	26	33	39	19	13	28
Median (IQR)	29 (20, 44)	33 (25, 63	35	30 (25, 48)	35 (25, 54)	26 (17, 40)	24 (15, 43)	26 (20, 38)	25 (16, 32)	34 (31, 44)	36 (20, 59)
Urgency 1 and any of above indications (*n*)	2385	313	286	192	286	262	297	433	206	110	52
Median (IQR)	27 (18,40)	27 (17,38)	27 (19,42)	27 (18,36)	25 (16,40)	27 (17,41)	30 (19,47)	28 (18,41)	25 (15,36)	31(16,47)	23 (17,46)

[a] Data for Isle of Man and Channel Islands not presented as small numbers; (*n*) = number of cases; median measured in minutes; IQR = interquartile range, in minutes

for situations for example where there is a 'threat to the life of the mother or fetus' (about 2% of all births), the potential for causing adverse effects of using this as a benchmark for any or all emergencies need to be considered.

Delays in delivery possibly associated with poor outcome have been attributed to poor communication. Rapid and precise communication between health professionals may reduce delays.[69] The use of the four-category system, as discussed in Chapter 7, may facilitate communication about the degree for urgency for a CS and hence reduce the decision-to-delivery interval in appropriate cases.

Two studies have recently reported on the ability of individual maternity units to achieve this standard.[73,74] These studies reported that the percentage delivered in 30 minutes or less were 23%[74] and 66%.[73] Different methods of classification of urgency were used in these studies.

Using the four-grade categorisation of urgency of CS (Chapter 7), it was reported that 16% of procedures were performed because there was thought to be 'an immediate threat to the life of the mother or fetus'. The primary indications reported for CS in these groups are given in Table 7.3.

8.4 Auditable standard

The decision-to-delivery interval for CS performed for 'immediate threat to the life of the mother or fetus' and pH of less than 7.2, severely abnormal CTG, uterine rupture, cord prolapse or abruption should be less than 30 minutes.[68]

8.4.1 The Audit results

Median decision-to-delivery times (in minutes) for each indication by region are shown in Table 8.1. Overall, median decision-to-delivery time for cases where there was an 'immediate threat to the life of the mother or fetus', a fetal scalp pH of less than 7.2, a severely abnormal CTG, placental abruption or cord prolapse was 27 minutes; of all cases, 25% were delivered within 18 minutes and 75% were delivered by 40 minutes. Between regions, the median delivery time varied between 25 minutes to 31 minutes. Unit level ranges are not shown because, within a three-month period, the number of cases per unit are small and the differences observed may have arisen by chance. However, 63% of units were able to deliver at least 50% of cases within 30 minutes.

The organisational factors which potentially impact on a unit's ability to meet this standard (such as theatre location and staffing provision) are discussed in the Chapter 10.

9. Reducing morbidity from caesarean section

9.1 Summary

- Antibiotic prophylaxis: CS is an important risk factor for postpartum maternal infections. Prophylactic antibiotics reduce that risk.
- In the Audit, antibiotics were reported to have been given to 87% of women who had emergency CS and 86% of those with an elective CS.
- Thromboprophylaxis: CS is a major factor for thromboembolic disease. The RCOG proposed a risk assessment profile for thrombosis and that prophylaxis should be based on that assessment. A thromboprophylaxis strategy should be part of the management of all women post CS.
- In the Audit, no thromboprophylaxis was used in 11% of emergency CS and 13% of elective CS. Details are given of the frequency of usage of thromboembolic-disease stockings (TEDS), pneumatic, aspirin, NSAIDs and heparin.

9.2 Introduction

This chapter considers the treatment of two important risks in CS: infection and thromboembolic disease, and the clinical responses to them: antibiotic prophylaxis and thromboprophylaxis. The evidence about their usage during this Audit is reported.

9.3 Antibiotic prophylaxis

9.3.1 Background

CS is an important risk factor for postpartum maternal infection. Research evidence from systematic reviews of randomised controlled trials shows that the use of prophylactic antibiotics at CS substantially reduces the incidence of episodes of fever, endometritis, wound infection, urinary tract infection and serious infection after CS. The reduction in the risk is similar across different patient groups and results are consistent across trials.[75]

9.3.2 Auditable standard

Prophylactic antibiotic cover should be administered to all women having a CS.

The Audit results

Table 9.1 shows the reduction in morbidity from CS. Prophylactic antibiotic cover was administered to 87% of women who were delivered by emergency CS. Between regions, this varied from 81% to 95% and between units it varied from 51% to 100%.

Prophylactic antibiotic cover was administered to 86% of women who delivered by elective CS. Between regions, this varied from 76% to 93% and between units it varied from 8% to 100%.

Table 9.1 Reducing morbidity from caesarean section (CS)

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands and Isle of Man
Emergency CS (*n*)	18,534	1824	2118	1390	2095	2161	2751	3733	1439	1023	620	55
Elective CS (*n*)	10,923	1105	1262	870	1145	337	1453	2251	886	614	547	49
Antibiotic use (%)												
emergency CS	87.4	85.6	82.8	95.3	86.9	80.6	90.2	87.4	90.6	92.2	91.3	94.6
elective CS	85.6	83.8	76.0	92.9	86.6	77.7	90.2	87.8	88.4	90.4	91.8	77.6
Thromboprophylaxis use:												
TED stockings (%)												
emergency CS	50.9	49.6	41.0	44.1	36.9	45.8	80.1	60.1	35.2	31.8	6.7	43.6
elective CS	51.2	53.1	41.8	45.3	42.5	43.8	82.9	61.6	28.8	27.4	4.6	40.8
Flowtron (%)												
emergency CS	34.6	27.1	45.7	32.6	6.9	32.6	36.4	49.7	37.5	24.8	0.0	0.0
elective CS	35.7	28.1	46.0	37.1	7.3	33.1	38.3	49.4	35.0	29.3	0.2	2.0
NSAIDs (%)												
emergency CS	2.5	2.8	2.9	2.5	3.1	1.5	2.9	1.4	4.9	0.8	0.7	0.0
elective CS	2.8	4.1	3.0	4.4	3.4	1.5	2.8	1.1	5.5	1.0	0.9	0.0
Heparin (%)												
emergency CS	54.4	52.9	43.5	73.2	76.1	57.9	54.9	36.9	57.3	78.0	54.5	87.3
elective CS	48.9	35.9	40.7	71.8	77.5	49.4	52.1	30.6	38.0	78.2	45.5	71.4
No thromboprophylaxis (%)												
emergency CS	10.8	16.0	14.4	11.6	11.3	9.1	5.2	7.7	18.1	11.2	38.1	9.1
elective CS	12.7	20.2	15.1	10.8	11.2	14.4	3.1	7.4	30.3	12.7	49.5	20.4

9.4 Thromboprophylaxis

9.4.1 Background

CS is a major risk factor for thromboembolic disease. Thromboembolic disease is a major cause of direct maternal deaths in the United Kingdom.[76] The RCOG proposed a risk assessment profile for thrombosis and suggested that prophylaxis should based on this assessment. For low-risk women (those with an uncomplicated pregnancy, having an elective CS and who have no other risk factors) early mobilisation and hydration is advised. Moderate-risk women who have one or two of the following:

- age over 35 years old
- obese
- have had more than four children
- have gross varicose veins
- current infection
- pre-eclampsia
- more than four days immobility before surgery
- major current illness
- emergency CS in labour.

For this group, the RCOG advises considering one of a variety of prophylactic measures. High-risk women are those with three or more of the above risk factors or having extended surgery, lower-limb paralysis, a family or personal history of thromboembolic disease or thrombophilia, who have anti-phospholipid antibody.

9.4.2 Auditable standard

A thromboprophylaxis strategy should be part of the management of all women post-CS.[77]

The Audit results

For emergency CS, no thromboprophylaxis was used in 11% of emergency CS. Between regions this varied from 5% to 16%, between units it varied from 0% to 85%.

For emergency CS, thromboembolic disease stockings (TEDS) were used in 51% cases, pneumatic, (e.g. Flowtrons) in 35% cases, aspirin or NSAIDs in 3% cases, heparin in 55% cases.

For elective CS, no thromboprophylaxis was used in 13% of elective CS. Between regions this varied from 3% to 50% and between units it varied from 0% to 95%.

For elective CS, TED stockings were used in 51% of cases, pneumatic (e.g. Flowtrons) in 36% cases, aspirin or NSAIDs in 3% cases, heparin in 49% cases.

10. Organisational factors

10.1 Summary

- 23% of hospitals provide neonatal intensive care facilities. The median caesarean rate in these hospitals was 21% compared with 18% in units without such facilities.
- Continuous support of the mother in labour has been shown to reduce the CSR. This was reported to be achieved by 93% of units on at least 60% of occasions during data collection.
- 66% of midwives on labour-ward rotas (75% of the whole-time equivalence) were reported to be in senior posts (G Grade or higher).
- For maternity units with an annual delivery rate of more than 1000 there should be at least 40 hours of consultant time dedicated to the labour ward. This was achieved in only 16% of units.
- A consultant should be present for at least 10% of potentially complicated CS. Consultants were present in theatre for 21% of these cases.
- Staff should be drilled in managing acute obstetric emergencies; 83% of units reported they provide such training.

10.2 Introduction

Organisational factors are known to impact on the CSR. In this chapter the maternity service provision, levels of midwifery and obstetric staffing are described. Levels of compliance with the relevant auditable standards are presented.

A number of organisational and staffing factors are known to be associated with both the CSR and the quality of care women receive. The adequacy of levels of staffing for labour ward is dependent on many factors, both clinical and organisational. There are complex issues to be considered and this aspect of service provision will need further evaluation.

10.3 Type of hospital

10.3.1 Background

The organisational factors that have been evaluated with respect to their association with CSR include:

- size of maternity unit as assessed by annual delivery rate
- presence of a neonatal intensive care unit (NICU) or perinatal services
- being a tertiary referral centre
- affiliation with a medical school
- availability of a 24-hour anaesthetist.[19]

These factors are not independent of each other or of the clinical characteristics of the population for which they provide care, i.e. hospitals with NICUs tend to have higher annual delivery rates and care for women at higher risk of an adverse outcome. When assessing the association between organisational factors and CSR, differences in the

Table 10.1 Inpatient beds (antenatal, intrapartum, postnatal) and admission rooms, by region

	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands & Isle of Man
Total units in region (*n*)	33	31	16	21	22	28	49	21	18	12	3
Total inpatient beds in unit per 1000 deliveries:											
Units (*n*)	31	28	17	17	21	26	40	19	17	12	3
Median	21.9	21.1	20.1	18.8	17.4	18.0	18.9	19.8	24.9	24.1	33.9
(IQR)	(18.1–28.4)	(17.5, 23.2)	(17.6, 22.5)	(17.1, 22.3)	(15.5, 20.7)	(16.1, 21.9)	(16.8, 24.1)	(15.7, 30.5)	(20.9, 29.1)	(21.1, 29.0)	(31.6, 37.3)
Range	14.7–285.7 28	6.2–117.0 17	1.8–26.8 17	12.3–32.0 21	12.9–25.2 26	2.0–28.8 40	13.0–107.1 19	11.1–65.9 17	19.5–500.0 12	20.3-43.1 3	31.6–37.3
Beds intended for Intrapartum care per 1000 deliveries:											
Units (*n*)	32	25	15	19	21	26	41	19	16	12	2
Median	4.2	3.5	4.2	3.6	3.3	3.7	3.6	3.6	4.0	4.1	5.5
(IQR)	(3.4, 6.1)	(3.2, 4.4)	(3.5, 4.9)	(2.7, 4.4)	(2.8, 4.3)	(3.0, 4.4)	(3.0, 4.9)	(2.9, 5.5)	(3.4, 5.0)	(3.2, 4.9)	(5.3, 5.7)
Range	2.8–35.7 25	0.0–16.1 15	2.5–6.3 19	2.3–12.8 21	2.0–5.4 26	2.2–21.1 41	0–35.7 19	1.7-12.0 16	2.8–83.3 12	2.3–6.8 2	5.3–5.7
Beds intended for routine antenatal/postnatal care per 1000 deliveries:											
Units (*n*)	31	24	15	18	21	26	41	19	16	12	2
Median	16.1	16.6	15.3	14.1	13.5	14.0	15.1	16.1	18.2	20.3	27.3
(IQR)	(12.5, 21.1)	(15.0, 19.2)	(12.6, 19.3)	(10.5, 15.6)	(11.1, 16.6)	(13.2, 17.0)	(13.1, 17.7)	(12.1, 25.0)	(14.5, 22.7)	(17.3, 24.2)	(26.3, 28.3)
Range	0.0–250.0	4.0–101.1	6.8–19.9	0.0–21.2	8.6–21.8	9.8–23.6	7.7–107.1	8.3–53.9	0.4–34.1	14.6–38.8	26.3–28.3
Beds equipped for high-dependency antenatal/postnatal care per 1000 deliveries:											
Units (*n*)	29	23	14	19	17	24	35	16	15	11	2
Median	0.7	0.4	0.5	0.3	0.5	0.7	0.4	0.5	0.4	0.4	2.6
(IQR)	(0.0, 1.4)	(0.0, 3.1)	(0.0, 1.0)	(0.0, 0.6)	(0.0, 1.2)	(0.1, 1.3)	(0.0, 1.0)	(0.0, 1.8)	(0.0, 1.3)	(0.0, 1.9)	(0.0, 5.3)
Range	0–.12.0	0.0–.9.6	0.0–7.3	0.0–11.6	0.0–5.2	0.0–21.1	0.0–5.1	0.0–3.1	0.0–3.9	0.0–5.0	0–5.3
Beds intended for maternal postoperative delivery per 1000 deliveries:											
Units (*n*)	29	21	12	18	16	21	38	17	14	11	2
Median	0.7	1.2	0.2	0.5	0.4	0.6	0.5	0.4	0.6	0.9	1.2
(IQR)	(0.0, 1.4)	(0.0, 3.0)	(0.0, 1.1)	(0.2, 0.8)	(0.1, 1.0)	(0, 1.2)	(0.0, 1.5)	(0.0, 1.2)	(0, 3.3)	(0.4, 4.3)	(1.1, 1.3)
Range	0.0–4.4	0.0–16.5	0–20	0.0–11.2	0.0–1.9	0.0–21.1	0.0–20.0	0.0–35.9	0–7.9	0-8.0 2	1.1–1.3

Table 10.1 cont'd Inpatient beds (antenatal, intrapartum, postnatal) and admission rooms, by region

	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands & Isle of Man
Units (*n*)	33	21	12	18	16	21	38	17	14	11	2
Units with admission room for assessment of antenatal women (%)	45.5	46.4	23.5	52.6	31.8	25.9	35.7	30.0	35.3	58.3	33.3
Admission rooms per unit per 1000 deliveries:											
Median	0.7	1.2	0.3	0.5	0.4	0.7	0.5	0.5	0.4	1.0	0
(IQR)	(0.4, 4.9)	(0.6, 1.9)	(0.3, 0.7)	(0.3, 0.8)	(0.3, 0.6)	(0.3, 26)	(0.3, 18)	(0.3, 23)	(0.3, 07)	(0.8, 1.9)	–
Range	0.0–35.7	0–3.3	0.3–0.8	0.3–01.2	0.3–3.4	0.3–3.0	0–7.1	0.32–02.8	0–1.3	0.4–.2.2	
Beds in admission rooms per 1000 deliveries:											
Median	1.2	1.4	0.7	0.8	0.6	3.5	1.4	2.2	0.4	1.1	–
(IQR)	(0.4, 4.5)	(0.7, 4.1)	(0.3, 1.4)	(0.5, 2.2)	(0.2, 1.6)	(0.9, 4.5)	(0.4, 4.5)	(0.7, 7.0)	(0.3, 0.7)	(0.4, 2.0)	
Range	0.0–35.7	0.0–6.1	0.3–1.6	0.3–3.3	0.0–3.4	0.7–6.0	0.0–10.7	0.6–13.2	0.0–1.3	0.0–2.2	
Units (*n*)	33	28	17	19	22	26	42	20	17	11	3
Units with day assessment or fetal welfare unit/total units (%)	69.7	71.4	88.2	84.4	63.6	76.9	69.0	50.0	23.5	54.5	66.7

clinical characteristics of the population should be taken into account. The rates reported here have not been adjusted for differences in the clinical characteristics of the population. Methods of examining the interplay of organisation and clinical factors and its contribution to the CSR will be the subject of continuing evaluation.

10.3.2 The Audit results

The median total number of inpatient beds (antenatal, intrapartum or postnatal) per 1000 maternities per maternity unit was 20 (IQR: 17, 24). Thirty-eight percent of units reported having an admission room on the labour ward for the assessment of antenatal women (Table 10.1).

Twelve percent (n = 30) of maternity units had an estimated annual delivery rate of more 4000. There were 16% (n = 42) units, with an estimated annual delivery rate of less than 1000. The median annual delivery rate of maternity units in England, Wales and Northern Ireland was estimated to be 2482 (IQR: 1564, 3404) (Table 10.2).

The median overall CSR in hospitals with a delivery rate of more than 4000 was 22% (IQR 20.0%, 23.4%); in hospitals with a delivery rate of less than 1000 it was 19.7% (IQR 14.9%, 25.2%) (Table 10.2).

The data collected in this audit enable the estimation of annual birth rates for all NHS trusts. However, as the data collection form did not include place of birth, the actual place of these births within the trust is not known. (e.g. homebirths and some community units are not identified separately from the main maternity hospital). The estimates for CSR provided for any unit are based on the total population from which a woman having a CS in that unit could have come from as the denominator.

Table 10.3 shows the national and regional provision of neonatal services. Two hundred and eleven hospitals reported that they had a NICU or special care baby unit (SCBU) within the hospital. Of these, 26% reported they were regional referral centres for neonatal intensive care. The average number of NICU and SCBU cots was six per 1000 maternities. The average number of NICU cots was one per 1000 maternities. Ten percent of these units reported that they were regional referral centres for surgical neonatal care.

The median overall CSR in hospitals with a SCBU/NICU was 21% (IQR 18.7%, 24.1%). The median overall CSR among hospitals which had neither special care nor intensive care was 18% (IQR 14.9%, 23.4%).

10.4 Midwifery staffing

10.4.1 Background

Evidence from systematic review of RCTs has shown that continuous support of the mother in labour reduces the CSR and the use of analgesia in labour.[78] Continuous support within these trials was provided by both healthcare professionals and lay people (trained 'doulas', friends or family members). Therefore, direct extrapolation to the provision of one-to-one midwifery care should not be made from these data. However, within UK health services, it is recognised that the majority of women will be cared for by midwives and the importance of one-to-one midwifery care has been highlighted in a number of clinical guidelines[49,79] and expert reports.[80,81]

The RCM/RCOG working party recommended that, in order to achieve one-to-one support of women in labour, the ratio of midwives to women in labour on labour ward should be 1:1.15. The audit also collected information on staffing models of midwifery care and grades of midwives on the labour ward.

Table 10.2 Size of maternity units; percentage of units within a region according to number of deliveries

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands & Isle of Man
Units in region (*n*)	239	33	31	16	21	22	28	49	21	18	12	3
Annual deliveries (*n*):												
<1000	15.1	15.2	16.1	0.0	4.8	0.0	10.7	24.5	23.8	27.8	16.7	100.0
1000–1999	19.7	42.4	16.1	25.0	14.3	0.0	7.1	16.3	19.1	38.9	41.7	0.0
2000–2999	30.1	27.3	41.9	31.3	19.1	40.9	35.7	28.6	19.1	22.2	33.3	0.0
3000–3999	23.0	6.1	22.6	25.0	42.9	40.9	35.7	14.3	23.8	11.1	0.0	0.0
4000–5999	11.3	9.1	0	18.8	19.1	18.2	10.7	14.3	14.3	0.0	8.3	0.0
≥6000	0.8	0.0	3.2	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0

Table 10.3 Provision of neonatal services, national and regional

	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands & Isle of Man
Total units in region (*n*)	33	28	17	19	22	27	41	20	17	12	3
Units with NICU or SCBU (%)	87.9	92.9	100.0	89.5	100.0	96.3	87.8	21.4	82.4	58.3	100.0
Units with NICU or SCBU that are regional referral-centre NICUs (%)	24.1	12.0	35.3	26.7	22.7	53.8	25.0	21.4	21.4	14.3	0.0
Cots in NICU or SCBU:											
Units (*n*)[a]	27	26	17	16	22	25	34	14	13	7	3
Median (IQR) per 1000 deliveries	8.1 (6.9,9.0)	6.1 (5.6, 7.3)	5.9 (5.3, 6.6)	5.6 (4.6–6.7)	5.1 (4.4–5.8)	6.1 (5.6–7.1)	5.2 (4.5-6.3)	5.8 (4.5-6.5)	8.0 (6.9-10.0)	5.4 (4.8,7.5)	10.5 (9.0,11.2)
Range per 1000 deliveries	4.0–14.1	4.4–8.6	4.4–7.6	3.2–44.0	3.3–6.6	3.3–34.6	2.6–16.6	1.6–7.2	5.4–11.8	3.6–7.7	9.0–11.2
Cots for 'intensive care' in NICU or SCBU:											
Units (*n*)	28	26	17	16	22	26	33	14	13	7	3
Median (IQR) per 1000 deliveries	0.8 (0,1.8)	1.1 (0.6, 1.4)	1.2 (0.9, 1.6)	0.5 (0, 1.7)	1.0 (0.6, 1.5)	1.7 (1.0, 2.3)	0.8 (0, 1.2)	1.3 (1.0, 1.5)	1.5 (1.1, 2.8)	1.2(0.4, 1.8)	2.3 (1.9, 2.6)
Range per 1000 deliveries	0.0–2.9	0.0-0-3.8	0.0–2.6	0–5.3	0.0–2.7	0.0–11.5	0.0–3.0	0.0–2.1	0.0–4.2	0.0–2.0	1.9–2.6
Cots for 'high-dependency care' in NICU or SCBU:											
Units (*n*)	26	25	17	16	19	25	31	12	12	7	2
Median (IQR) per 1000 deliveries	0.9 (0, 2.0)	1.4(0.9, 2.6)	1.1 (0.2, 2.2)	0.8(0.1, 1.8)	1.0 (0.8, 1.6)	1.1 (0.4, 1.9)	0.9 (0-1.6)	1.2 (0.2, 2.0)	2.1 (1.7, 3.0)	1.5 (0.9, 2.9)	1.2 (1.1, 1.3)
Range per 1000 deliveries	0.0–5.8	0.0–6.1	0.0–4.1	0.0–15.9	0.0–2.9	0.0–11.5	0.0–4.5	0.0–3.0	0.0–3.9	0.0–3.2	1.1–1.3
Cots for 'special care' in NICU or SCBU:											
Units (*n*)	28	24	16	16	21	25	32	12	12	6	2
Median (IQR) per 1000 deliveries	5.5 (4.2, 7.1)	3.7 (2.6, 4.9)	3.7 (1.3, 4.5)	3.9 (3.0, 4.3)	2.9 (2.5, 3.8)	3.3 (2.4, 4.3)	3.8 (2.6, 4.6)	3.5 (2.3, 4.0)	4.2 (3.2, 5.6)	3.7 (3.0, 4.1)	6.1 (5.7, 6.6)
Range per 1000 deliveries	0.0–9.2	0.0–7.7	0.0–7.6	2.0–28.2	0.0–5.1	0.0–11.5	1.6–10.5	0.0–4.5	1.9-6.7	2.9–4.5	5.7–6.6

[a]211 units reported a NICU or SCBU

Table 10.4 Median percentage of days (or nights) for each unit when there were at least 1.15 midwives per woman in labour by region

	Weekday		Weekend	
	Day	Night	Day	Night
North Eastern (*n* = 33):				
Median	100	92.3	100	100
IQR)	85.4–100.0	81.2–100.0	87.5-100.0	100.0–100.0
Range	50.0–100.0	59.0–100.0	0–100.0	25.0-100.0
North Western (*n* = 30):				
Median	100	100	100	100
(IQR)	91.7–100.0	92.9-100	87.5–100.0	87.5–100.0
Range	0.0–100.0	0.0–100.0	25.0-100.0	29.2–100.0
East Midlands (*n* = 17):				
Median	93.7	93.7	100	100
(IQR)	89.4–97.2	88.6–100.0	87.5–100.0	83.3–100.0
Range	68.7–100.0	61.9–100.0	50.0–100.0	66.7–100.0
West Midlands (*n* = 20):			100	
Median	93.7	94.4	85.4–100	100
(IQR)	85.0-100.0	90.0–100.0	0.0–100.0	87.5–100.0
Range	[0.0-100.0	14.1–100.0		0.0–100.0
Wales (*n* = 17):				
Median	88.9	81.2	83.3	100
(IQR)	64.2–100.0	66.7–100.0	50.0-100.0	62.5–100.0
Range	0.0–100.0	29.2-100.0	0.0-100.0	25.0-100.0
Eastern (*n* = 22):				
Median	93.3	94.4	100	100
(IQR)	87.8–95.2	89.4-100.0	87.5–100.0	100.0–100.0
Range	73.3-100.0	75.7–100.0	83.3–100.0	75.0–100.0
London (*n* = 27):				
Median	94.4	100	89.6	100
(IQR)	91.7–100.0	90.0–100.0	83.3–100.0	93.7–100.0
Range	64.3–100].0	[8.3-100.0	[1.7-0100.0	[0.0–100.0
South East (*n* = 43):				
Median	94.4	91.7	100	100
(IQR)	85.7-100.0	80.8-100.0	87.5–100.0	77.1–100.0
Range	0.0–100.0	0.0–100.0	50.0-100.0	25.0-100.0
South West (*n* = 21):				
Median	100	100	100	100
(IQR)	86.4–100.0	91.0–100.0	90.6–100.0	90.6–100.0
Range	16.7–100	43.7–100.0	75.0–100.0	50.0–100.0
Northern Ireland (*n* = 12):				100
Median	87.5	90.0	100	75.0–100.0
(IQR)	69.0–100.0	63.3–100.0	37.5–100.0	41.7–100.0
Range	0.0–100.0	25.0-100.0	0.0-100.0 100	
Channel Islands & Isle of Man (*n* = 3)[a]:				
Median	79.2	91.7	100	N/A
(IQR)	58.3–100.0	83.3–100.0		
Range	58.3–100.0	83.3–100.0		
Total (*n* = 245):				
Median	94.4	94.4	100	100.0
(IQR)	85.7–100).0	85.5–100.0	87.5-0100.0	87.5–100.0
Range	0.0–100.0	0.0–100.0	0.0-100.0	0.0-100.0

Note: number of units within a region on which each median is based varies due to missing data; (*n*) = number of units;
N/A = not available; [a] For this region, only 1 unit had data available for weekend daytimes, and no units had data for weekend nights

Table 10.5 Units where the standard of at least 1.15 midwives per woman in labour was met at least 60% of the time (day or night), by region

	Weekday[a]		Weekend[a]	
	Day, *n* (%)	Night, *n* (%)	Day, *n* (%)	Night, *n* (%)
North Eastern (*n* = 33)	29 (96.7)	27 (96.4)	25 (89.3)	25 (92.6)
North Western (*n* = 30)	27 (93.1)	27 (93.1)	25 (92.6)	24 (96.0)
East Midlands (*n* = 17)	17 (100.0)	17 (100.0)	14 (87.5)	16 (100.0)
West Midlands (*n* = 20)	17 (89.5)	18 (94.7)	15 (88.2)	18 (94.7)
Wales (*n* = 17)	13 (76.5)	12 (80.0)	9 (69.2)	11 (78.6)
Eastern (*n* = 22)	22 (100.0)	22 (100.0)	22 (100.0)	22 (100.0)
London (*n* = 27)	27 (100.0)	26 (96.3)	25 (96.2)	22 (91.7)
South East (*n* = 43)	36 (90.0)	37 (92.5)	35 (97.2)	31 (86.1)
South West (*n* = 21)	17 (89.5)	17 (94.4)	16 (100.0)	15 (93.8)
Northern Ireland (*n* = 12)	10 (90.9)	9 (81.8)	6 (66.7)	N/A
Channel Islands & Isle of Man (*n* = 3)	1 (50.0)	2 (100.0)	1 (100.0)	N/A
Total (*n* = 245)	216 (92.7)	214 (93.9)	193 (91.5)	190 (92.2)

[a] Percentages calculated out of the number of units within a region with available data; N/A = data not available

Table 10.6 Median (IQR) percentage of days (or nights) for each unit there was at least one widwife per woman in labour, by region[d]

	Weekday		Weekend	
	Day, *n* (%)	Night, *n* (%)	Day, *n* (%)	Night, *n* (%)
North Eastern (*n* = 33)	100.0 (100.0–100.0)	100.0 (100.0–100.0)	100.0 (100.0–100.0)	100.0 (100.0–100.0)
North Western (*n* = 30)	100.0 (100.0–100.0)	100.0 (100.0–100.0)	100.0 (100.0–100.0)	100.0 (100.0–100.0)
East Midlands (*n* = 17)	100.0 (93.7–100.0)	100.0 (96.9–100)	100.0 (100.0–100.0)	100.0 (100.0–100.0)
West Midlands (*n* = 20)	100.0 (90.0-100.0)	100.0 (93.7–100)	100.0 (93.7–100)	100.0 (100.0–100.0)
Wales (*n* = 17)	100.0 (100.0–100.0)	100.0 (90.0–100)	100.0 (93.7–100)	100.0 (100.0–100.0)
Eastern (*n* = 22)	100.0 (93.5–100.0)	100.0 (98.7–100)	100.0 (100.0–100.0)	100.0 (100.0–100.0)
London (*n* = 27)	100.0 (95.8–10.0)	100.0 (95.4–100)	100.0 (87.5–100)	100.0 (100.0–100.0)
South East (*n* = 43)	100.0 (93.2–100.0)	100.0 (92.9–100)	100.0 (100.0–100.0)	100.0 (100.0–100.0)
South West (*n* = 21)	100.0 (100–100.0)	100.0 (100–100)	100.0 (100.0–100.0)	100.0 (100.0–100.0)
Northern Ireland (*n* = 12)	100.0 (94.4–100.0)	100.0 (90.0–100)	100 (83.3–100)	100.0 (100.0–100.0)
Channel Islands & Isle of Man (*n* = 3)b	79.2 (58.3–100.0)	100.0 (100-100)	100.0	N/A
Total (*n* = 245)	100.0 (94.4–100.0)	100.0 (96.6-100)	100.0 (100.0–100.0)	100.0 (100.0–100.0)

IQR = interquartile range; N/A = not available;[a] number of units within a region on which each median is based varies due to missing data; b for this region only one unit had data available for weekend daytimes and no units had data for weekend nights

Table 10.7 Mean ratio (standard deviation) of total number of midwives to total number of women on labour ward, by region[a]

	Weekday		Weekend	
	Day mean (SD)	Night, mean (SD)	Day mean (SD)	Night mean (SD)
North Eastern (*n* = 33)	1.4 (0.4)	1.6 (0.4)	1.4 (0.4)	1.6 (0.7)
North Western (*n* = 30)	1.3 (0.4)	1.5 (0.4)	1.4 (0.5)	1.6 (0.6)
East Midlands (*n* = 17)	1.1 (0.2)	1.4 (0.5)	1.3 (0.6)	1.4 (0.5)
West Midlands (*n* = 20)	1.1 (0.3)	1.5 (0.6)	1.4 (0.5)	1.6 (0.6)
Wales (*n* = 17)	1.3 (0.4)	1.2 (0.4)	1.4 (0.6)	1.4 (0.6)
Eastern (*n* = 22)	1.1 (0.3)	1.3 (0.2)	1.2 (0.4)	1.5 (0.4)
London (*n* = 27)	1.1 (0.5)	1.2 (0.4)	1.2 (0.6)	1.3 (0.6)
South East (*n* = 43)	1.2 (0.4)	1.3 (0.4)	1.1 (0.3)	1.3 (0.4)
South West (*n* = 21)	1.4 (0.5)	1.5 (0.4)	1.4 (0.5)	1.6 (0.6)
Northern Ireland (*n* = 12)	1.6 (0.4)	2.0 (1.0)	2.0 (0.9)	2.3 (1.0)
Channel Islands & Isle of Man (*n* = 3)	0.8 (0.8)	0.8 (0.8)	1.2 (0.9)	1.0 (0.7)
Total (*n* = 245)	1.2 (0.4)	1.4 (0.5)	1.3 (0.5)	1.5 (0.6)

[a] Number of units within a region on which each mean is based varies due to missing data; ratio of midwives to women in labour was approximately normally distributed, hence results are presented as means and standard deviations

10.4.2 Auditable standard

A RCOG/RCM working party recommended that a good practice standard for midwifery staffing on the labour ward was 1.15 midwives to one woman in labour.[81] It suggested that this level should be reached on 60% of occasions.

The Audit results

Midwifery managers reported that 97% units aim to provide one-to-one support during labour. Ninety-four percent aimed to do this for low-risk women and all aimed to do so for high-risk women; 1.8% of units did not answer the question. However, only 19% of units reported that they evaluated how often they achieved this standard (Tables 10.4 and 10.5).

All labour wards completed a diary of staffing and activity levels for two weeks during the data collection period (Appendix Cviii). The number of occasions that units could meet the audit standard of 1.15 midwives on the labour ward to every woman in established labour is expressed as the average (median) percentage of occasions. During data collection, 50% of maternity units achieved this ratio for 94% of the time. Maternity units should aim to achieve this for 60% of the time; 93% of units achieved or exceeded this standard.

To evaluate whether meeting this standard equated with the ability of the unit to provide one-to-one care to women in active labour, the ratio of the total number of midwives looking after women currently in established labour to the number of women in established labour was examined. Again, during data collection, 50% of maternity units achieved this ratio for 94% of the time (Table 10.6).

These estimates need to be interpreted with caution. During episodes of peak activity, midwives from other areas (e.g. antenatal or postnatal wards) of the maternity service maybe redeployed to the labour ward or admissions from these areas maybe deferred. The use of or impact of such strategies was not assessed.

The ratio of the total number of midwives to the total number of women in labour was calculated to provide an overview of all labour ward activity (Appendix Cviii) The average (mean) ratio of midwives to women on the labour ward was 1.2 during weekday daytime; the 95% range for this was 0.4–2.0. This range varies markedly between regions (Table 10.7).

Table 10.8 Midwifery models for staffing

	North East	North West	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Units with midwifery-led care, *n* (%)	12/33 (36)	9/28 (32)	9/17 (53)	8/19 (42)	9/17 (53)	9/22 (41)	13/26 (50)	22/42 (52)	13/18 (72)	3/12 (25)	0/3 (0)
Units with midwifery-led care with data on estimated number and percentage of deliveries (*n*)	6	6	5	3	5	6	4	11	6	3	0
Median estimated deliveries (*n*)	90	178	496	344	484	421	492	266	393	202	N/A
(IQR)	(29–179)	(110–1594)	(115-1203)	(312–728)	(28–83)	(225–1033)	(25–995)	(100–836)	(103–579)	(50–226)	
[Range]	[28–297]	[16-2759]	[0-1725]	[312–728]	[12–2088]	[196–1987]	[23–1008]	[31–1949]	[17–894]	[50–226]	
Median deliveries (approximate %)	35	6	20	24	50	15	13	30	13	5	N/A
(IQR)	(6–85)	(3–39)	(3–52)	(15–100)	(28–83)	(6–23)	(1-29)	(10-90)	(9-33)	(2-20)	
[Range]	[5–100]	[1–95]	[0–64]	[15–100]	[25–100]	[6–40]	[1-30]	[2-100]	[5-40]	[2-20]	
Units with core midwives, *n* (%)	22/33 (67)	19/28 (68)	15/17 (88)	10/19 (53)	9/17 (53)	11/22 (50)	15/27 (56)	26/42 (62)	10/18 (56)	8/12 (67)	0/3 (0)
Units with core midwives with data on estimated number and percentage of deliveries (*n*)	4	9	5	2	2	3	3	6	4	3	0
Median estimated deliveries (*n*)	1267	758	496	2952	145	542	75	983	697	706	N/A
(IQR)	(818–2340)	(502–2619)	(399–1585)	(2274–3629)	(144–145)	(291–720)	(0–955)	(641–1234)	(506–2167)	(83–2469)	
[Range]	[754–2612]	[145–3192]	[340–2125]	(2274–3629)	[144–145]	[291–720]	[0–955]	[298–1500]	[474–2625]	[83–2469]	
Median deliveries (approximate %)	65	29	20	86	9	20	2	31	28	70	N/A
(IQR)	(25–96)	(22–73)	(16–51)	(75–98)	(9–10)	(7–34)	(0–25)	(17–46)	(24–73)	(5–98)	
[Range]	[20–100]	[5–100]	[12–70]	[75–98]	[9–10]	[7–34]	[0–25]	[12–67]	[24–88]	[5–98]	
Units with rotation model, *n* (%)	27/33 (82)	20/28 (71)	11/17 (65)	15/19 (79)	9/17 (53)	16/22 (73)	14/26 (54)	25/42 (60)	10/18 (56)	10/12 (83)	2/3 (67)
Units with rotation model with data on estimated number and percentage of deliveries	6	7	4	2	2	4	4	8	3	2	2
Median estimated deliveries (*n*)	1410	1150	1199	2775	974	1397	2647	1613	2496	1148	818
(IQR)	(862–2975)	(500–2595)	(546–1693)	(1948–3602)	(913–1036)	(799–3618)	(1755–2986)	(956–2996)	(474–2625)	(705–1592)	(752–884)
[Range]	[704–4064]	[189–2780]	[425–2122]	[1948–3602]	[913–1036]	[699–4259]	[1528–3030]	[81–3839]	[474–2625]	[705–1592]	[752–884]
Median deliveries (approximate %)	82	71	45	79	51	44	79	82	88	82	99
(IQR)	(37–94)	(70–92)	(26–65)	(74–85)	(47–55)	(32–85)	(48–84)	(32–96)	(30–95)	(70–95)	(99–100)
[Range]	[30–100]	[7–100]	[25–67]	[74–85]	[47–55]	[32–95]	[40–85]	[3–100]	[30–95]	[70–95]	[99–100]

Table 10.8 cont'd Midwifery models for staffing

	North East	North West	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Units with hospital-based team midwifery, *n* (%)	2/33 (6)	4/28 (14)	6/17 (35)	6/19 (32)	3/17 (18)	4/22 (18)	6/25 (24)	4/42 (10)	5/18 (28)	4/12 (33)	0/3 (0)
Units with hospital-based team midwifery with data on estimated number and percentage of deliveries (n)	0	2	2	1	1	2	2	2	1	2	0
Median estimated deliveries (*n*)	N/A	2789	3706	31	1650	1785	1627	2105	2076	880	N/A
(IQR)		(2026–3552)	(3024–4387)			(1099–2472)	(1521–1733)	(1550–2661)		(705–1056)	
[Range]		[2026–3552]	[3024–4387]			[1099–2472]	[1521–1733]	[1550–2661]		[705-1056]	
Median deliveries (approximate %)	N/A	77.5	89	1	73	47	48	62	63	85	N/A
(IQR)		55–100	(79.0–99.0)			(32–63)	(46–51)	(57–67)		(70–100)	
[Range]		[55–100]	[79–99]			[32–63]	[46–51]	[57–67]		[70–100]	
Units with community-based teams, (*n*) (%)	7/33 (21)	9/28 (32)	7/17 (41)	8/19 (42)	7/17 (41)	13/22 (59)	16/25 (64)	20/42 (47)	9/18 (50)	2/12 (16)	0/3 (0)
Units with community-based teams with data on estimated number and percentage of deliveries (*n*)	2	4	2	1	1	6	5	4	3	0	0
Median estimated deliveries (*n*)	61	1104	127.5	60	289	420	229	245	164	N/A	N/A
(IQR)	(23–98)	(264–2550)	(0–255)			(283–1292)	(29–630)	(84–833)	(158–200)		
[Range]	[23–98]	[144–2872]	[0–255]			[224–2169]	[0–808]	[39–1020]	[158–200]		
Median deliveries (approximate %)	13.5	46.5	7.5	2	20	12	6	9	10.0	N/A	N/A
(IQR)	(7–20)	(10–93)	(0–15)			(8–38)	(1–16)	(2–18)	(5–100)		
[Range]	[7–20]	[8–100]	[0–15]			[5–80]	[0–20]	[1–21]	[5–100]		
Units with caseload teams, (*n*) (%)	2/33 (6)	3/28 (10)	1/17 (6)	1/19 (5)	2/17 (12)	2/22 (9)	5/25 (20)	5/42 (12)	2/18 (11)	2/12 (17)	0/3 (0)
Units with caseload teams with data on estimated number and percentage of deliveries (*n*)	0	1	0	0	2	1	2	2	0	1	0
Median estimated deliveries (*n*)	N/A	241	N/A	N/A	201	130.9	239	1322	N/A	226	N/A
(IQR)					(113–289)		(76-403)	(458–2185)			
[Range]					[113–289]		[76-403]	[458–2185]			
Median deliveries (approximate %)	N/A	10	N/A	N/A	13	4	7.0	50.0	N/A	5	N/A
(IQR)					(6–20)		(2–12)	(12–88)			
[Range]					[6–20]		[2–12]	[12–88]			

Table 10.8 cont'd Midwifery models for staffing

	North East	North West	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Units with group practice midwifery, *n* (%)	3/33 (9.1)	3/28 (10.7)	2/17 (11.8)	0/19 (0)	2/17 (11.8)	5/22 (22)	7/25 (28)	8/42 (19)	2/18 (11)	0/12 (0)	0/3 (0)
Units with group practice midwifery with data on estimated number and percentage of deliveries (*n*)	3	1	2	0	1	3	2	3	1	0	0
Median estimated deliveries (*n*)	232	2112	79	N/A	1044	312	270	595	357	N/A	N/A
(IQR)	(35–451)		(44–114)			(274–580)	(76–464)	(164–874)			
[Range]	[35–451]		[44–114]			[274–580]	[76–464]	[164–874]			
Median deliveries (approximate %)	10	75	2	N/A	33	9	9	40	16	N/A	N/A
(IQR)	(10.0–55.0)		(1.0, 3.0)			(8.0–20.0)	(2.0–16.0)	(22.0–100.0)			
[Range]	[10–55]		[1–3]			[8–20]	[2–16]	[22–100]			
Units with integrated teams, *n* (%)	2/33 (6)	5/28 (17)	6/17 (35)	2/19 (10)	7/17 (41)	4/22 (18)	2/25 (8)	11/42 (26)	5/19 (26)	1/12)	2/3 (66)
Units with integrated teams with data on estimated number and percentage of deliveries (*n*)	1	2	0	0	5	2	0	1	1	0	1
Median estimated deliveries (*n*)	148	2180	N/A	N/A	687	1195	N/A	2448	1274.5	N/A	536
(IQR)		(1760–2600)			(393–1100)	(339–2052)					
[Range]		[1760–2600]			[176–1466]	[339–2052]					
Median deliveries (approximate %)	100	82	N/A	N/A	90	58	N/A	100	57	N/A	100
(IQR)		(65–100)			(33–95)	(16–100)					
[Range]		[65–100]			[27–100]	[16–100]					

Table 10.9 Median number of consultant obstetricians/gynaecologists employed per unit per 1000 deliveries

Region	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands and Isle of Man
Total units (*n*)	198	28	25	17	18	21	23	35	15	15	12	3
Consultant obstetricians and gynaecologists per 1000 deliveries:												
Median	1.8	2.4	1.0	2.2	1.7	1.6	1.7	1.6	1.8	2.2	2.7	3.9
(IQR)	(1.6,2.4)	(1.8, 3.0)	(1.8, 2.4)	(1.8, 2.6)	(1.6, 2.1)	(1.4, 1.8)	(1.4, 21.1)	(1.5, 2.0)	(1.4, 2.0)	(1.9, 2.8)	(2.2, 3.3)	(2.3, 5.6)
Range	0.7–4.0	1.3–5.3	1.4–4.0	0.7–3.3	1.4–2.6	1.2–2.6	1.2–2.7	1.0–2.7	1.2–3.2	1.6–3.9	1.8–4.3	2.3–5.6
Consultant obstetricians per 1000 deliveries:												
Median	1.1	1.1	0.5	0.6	1.1	1.2	1.0	0.9	0.3	1.5	2.1	2.3
(IQR)	(0,1.8)	(0, 2.6)	(0, 1.8)	0, 1.4)	(0, 1.7)	(0,1.5)	(0.3,1.8)	(0,1.6)	(0,1.4)	(0,2.8)	(0.7, 2.8)	(0, 3.9)
Range	0–5.3	0–5.3	0–2.5	0–3.1	0–2.3	0–1.7	0–2.1	0–2.7	0–3.2	0–3.9	0–4.3	0–3.9

Table 10.10 Median (IQR) percentage of days (or nights) for each unit when a consultant obstetrician ward round occured, by region[a]

	Weekday		Weekend	
	Day	Night	Day	Night
North Eastern (*n* = 33)	15.0 (5.0–30.0)	15.0 (5.0–25.0)	12.5 (0.0–18.7)	12.5 (0.0–25.0)
North Western (*n* = 30)	11.8 (5.0–26.2)	10.0 (0.0–26.2)	12.5 (0.0–15.6)	0.0 (0.0–12.5)
East Midlands (*n* = 17)	30.0 (12.5–42.5)	30.0 (7.8–38.2)	12.5 (6.2–25.0)	12.5 (0.0–37.5)
West Midlands (*n* = 20)	30.6 (20.0–44.1)	18.5 (10.0–35.0)	12.5 (0.0–21.9)	12.5 (0.0–25.0)
Wales (*n* = 17)	10.0 (2.5–22.5)	12.5 (0.0–27.5)	0.0 (0.0–12.5)	0.0 (0.0–12.5)
Eastern (*n* = 22)	21.8 (10.0–40.0)	17.5 (10.0–36.2)	12.5 (0.0–37.5)	4.2 (0.0–25.0)
London (*n* = 27)	27.8 (10.0–45.0)	16.7 (10.0–30.0)	8.3 (0.0–25.0)	0.0 (0–25.0)
South East (*n* = 43)	10.0 (0.0–30.0)	15.0 (0.0–30.0)	0.0 (0.0–12.5)	0.0 (0.0–12.5)
South West (*n* = 21)	11.5 (0.0–26.1)	20.0 (2.5–28.6)	0.0 (0.0–25.0)	12.5 (0.0–12.5)
Northern Ireland (*n* = 12)	47.5 (15.0–57.5)	0.0 (0.0–10.0)	25.0 (3.1–25.0)	0.0 (0.0-0.0.)
Channel Islands & Isle of Man (*n* = 3)	50.0 (5.0–60.0)	5.0 (0.0–5.5)	37.5 (0.0–37.5)	0.0 (0.0–0.0)
Total (*n* = 245)	15.0 (5.0–36.9)	15.0 (5.0–30.0)	12.5 (00.–25.0)	0 (0–25.0)

IQR = interquartile range; [a] number of units within a region on which each median is based varies due to missing data

Table 10.11 Median (IQR) percentage of days (or nights) for each unit when there was a consultant obstetrician present, by region

	Weekday		Weekend	
	Day	Night	Day	Night
North Eastern (*n* = 33)	30.0 (15.0–47.5)	18.2 (5.0–30.0)	25.0 (0.0–37.5)	12.5 (0.0–25.0)
North Western (*n* = 30)	30.0 (18.2–45.0)	23.9 (9.8–35.0)	12.5 (0.0–25.0)	0.0 (0.0–25.0)
East Midlands (*n* = 17)	45.0 (18.3–64.1)	20.0 (15.0–40.0)	12.5 (12.5–31.2)	12.5 (0.0–37.5)
West Midlands (*n* = 20)	45.0 (20.0–60.0)	20.4 (15.0–30.0)	12.5 (0.0–25.0)	6.2 (0.0–25.0)
Wales (*n* = 17)	20.0 (7.5–40.0)	15.0 (2.5–27.5)	0.0 (0.0–18.7)	0.0 (0.0–18.7)
Eastern (*n* = 22)	30.9 (18.7–37.5)	25.0 (10.0–31.2)	20.8 (0.0–25.0)	4.2 (0.0–25.0)
London (*n* = 27)	38.9 (25.0–55.0)	25.0 (10.0–33.3)	12.5 (0.0–25.0)	12.5 (0.0–25.0)
South East (*n* = 43)	25.0 (8.3–45.0)	10.0 (5.0–30.0)	12.5 (0.0–25.0)	0.0 (0.0–12.5)
South West (*n* = 21)	25.0 (0.0–40.9)	25.0 (2.5–31.3)	12.5 (0.0–25.0)	12.5 (0.0–22.5)
Northern Ireland (*n* = 12)	57.5 (41.2–75.0)	15.0 (6.2–20.0)	37.5 (12.5–50.0)	0.0 (0.0–12.5)
Channel Islands & Isle of Man (*n* = 3)	55.5 (40.0–60.0)	11.1 (0.0–25.0)	25.0 (12.5–37.5)	0.0(0.0–0.0)
Total (*n* = 245)	30.0 (15.0–50.0)	20.0 (9.1–30.0)	12.5 (0.0–25.0)	0.0 (0–25.0)

IQR = interquartile range; [a] number of units within a region on which each median is based varies due to missing data

Most (67%) maternity units reported that at least part of the organisation of midwifery care on their labour ward was based on the rotation of midwives who worked for periods of time in different clinical areas, e.g. antenatal clinic, labour ward (Table 10.8). This model was used to provide care for an average of 74% of mothers in these units. Sixty-one percent of units reported having core labour-ward midwives who were allocated to work permanently on the labour ward. These midwives provided care for 29% of mothers in these units.

Labour wards were asked to provide information on the number and grade of midwives in post and the number of 'whole-time equivalent' midwives on their current rota for the labour ward. Overall, 66% of these midwives were in senior posts (G, H or I grades), providing 75% of whole-time equivalence. The 33% of midwives who were in E- or F-grade posts provided 25% of whole-time equivalence.

Table 10.12 Dedicated obstetric consultant cover per week for units with greater than 1000 delivery rate, by region[a]

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland
Units with an annual delivery rate > 1000 and ≥ 40 hours dedicated consultant cover per week (%)	14.3	13.6	22.2	16.7	29.4	9.5	27.3	19.4	6.7	0.0	25.0
Median (IQR) hours of dedicated consultant cover per week per unit	16 (4, 28)	16 (0, 24)	14 4, 32)	20 (14, 28)	20 (4, 40)	16 (12, 28)	24 (12, 40)	12 (0, 20)	4 (0, 14)	4 (0, 16)	25 (18, 38)

[a] Channel Islands and Isle of Man units were estimated to have annual delivery rates of less than 1000 and are therefore not included

Table 10.13: Consultant presence at caesarean sections (CS)

	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales
Number of units	29	30	16	21	22	26	38	17	17
A consultant should be contacted prior to an emergency CS:									
Median	86.9	71.8	77.0	63.6	75.4	78.5	69.9	72.9	72.6
(IQR)	(74.1, 95.0)	(52.6, 83.8)	(65.2, 86.5)	(38.5, 80.0)	(66.7, 85.9)	(55.9, 91.9)	(53.3, 84.9)	(55.4, 88.4)	(45.6, 81.3)
A consultant should be present for 10% of potentially complicated CS:									
Placenta praevia:									
Median	60.0	50.0	53.1	35.4	50.0	36.7	33.3	26.8	16.3
(IQR)	(33.3, 80.0)	(0.0,6.7)	(45.0, 100)	(25.0, 45.0)	(28.6, 66.7)	(0.0, 66.7)	(0.0, 75.0)	(0.0, 53.6)	(0.0, 33.3)
Placental abruption:									
Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(IQR)	(0.0, 50.0)	(0.0, 0.0)	(0.0, 25.0)	(0.0, 33.3)	(0.0, 100.0)	(0.0, 33.3)	(0.0, 100.0)	(0.0, 33.3)	(0.0, 50.0)
Full cervical dilatation:									
Median	0.0	4.0	10.6	0.0	8.9	7.7	7.9	6.8	0.0
(IQR)	(0.0, 28.6)	(0.0, 20.0)	(5.8, 19.1)	(0.0, 10.0)	(0.0, 20.0)	(0.0, 13.3)	(0.0, 14.3)	(2.0, 12.9)	(0.0, 11.1)
Obese women (BMI ≥ 35)									
Median	10.6	6.7	20.8	10.4	19.1	18.2	9.1	12.5	0.0
(IQR)	(0.0, 26.8)	(00., 18.8)	(13.0, 41.2)	(0.0, 17.8)	(16.0, 26.7)	(0.0, 28.6)	(0.0, 17.4)	(5.9, 17.6)	(0.0, 12.5)
Premature deliveries (< 32 weeks)									
Median	32.5	33.3	33.3	31.8	33.3	27.6	25.0	25.0	33.3
(IQR)	(0.0, 60.0)	(11.1, 60.0)	(21.5, 66.7)	(23.1, 50.0)	(14.3, 66.7)	(16.7, 44.2)	(0.0, 57.1)	(0.0, 28.6)	(12.5, 45.0)
Multiple pregnancy (twins):									
Median	14.6	25.0	33.3	14.3	20.0	18.2	20.0	0.0	18.1
(IQR)	(0.0, 38.2)	(0.0, 42.2)	(16.3, 40.0)	(0.0, 42.9)	(0.0, 37.5)	(0.0, 36.7)	(0.0, 30.0)	(0.0, 16.2)	(0.0, 50.0)
Multiple previous CS:									
Median	20.0	15.5	23.6	18.2	34.2	38.2	17.1	18.2	10.6
(IQR)	(0.0, 42.9)	(0, 26.3)	(20.0, 51.6)	(5.8, 39.4)	(14.3, 50.0)	(16.7, 46.2)	(0.0, 41.2)	(12.5, 25.0)	(0.0, 30.7)
Total complicated cases:									
Median	19.7	22.8	28.3	19.0	24.8	21.5	17.0	12.7	13.8
(IQR)	(12.0, 35.5)	(12.8, 26.3)	(20.9, 35.6)	(15.3, 26.8)	(16.7, 30.4)	(13.3, 33.3)	(11.1, 27.7)	(10.5, 16.7)	(8.1, 20.5)

IQR = interquartile range

Thirty-six percent of units reported that staffing requirements for the labour ward were determined using Birthrate or Birthrate Plus (Royal College of Midwives framework).[82] Fifty-nine percent reported that it was historically determined. Fifty-three percent of units reported that the labour ward 'core' staffing requirements were last reviewed within the last year; 33% reported that it was reviewed one to five years ago and 9% reported that review was more than five years ago.

10.5 Obstetric staffing

10.5.1 Background

The standards used for obstetric staffing come from the RCM/RCOG working party.[81] The information on consultant presence or ward round was assessed from the labour-ward diary (Appendix Cviii). Information regarding CS came from the data collected on all CS (Appendix Ciii).

10.5.2 Auditable standard

For maternity units with a delivery rate of more than 1000, there should be a minimum of 40 hours per week of consultant supervision for labour wards. For maternity units with a delivery rate of less than 1000 per year, there should be two consultant ward rounds per day to assess problems. Maternity units with over 6000 deliveries a year should aim to have 24-hour consultant cover on the labour ward.[81]

The Audit results

There were 213 consultant-led maternity units with a delivery rate of more than 1000; 16% (n = 42) of all units have fewer than 1000 deliveries per year but only 7% of these units are consultant led. Less than one percent of units had an annual delivery rate exceeding 6000.

On average, there were two consultants per 1000 deliveries per maternity unit. This ranged between 0.7 and 5.6. In Northern Ireland, this ratio is three per 1000 deliveries (Table 10.9).

Diaries were available for only 66% of consultant-led units with less than 1000 deliveries. In 25% of these units, a consultant was present on 55% of weekdays but few consultant ward-rounds were reported. During data collection, in 50% of maternity units consultant ward-rounds were reported to have been undertaken on only 15% of weekdays (i.e. once every seven to eight days). This varied markedly between regions (Table 10.10). Maternity units also reported a consultant presence on the labour ward. In 50% of maternity units, consultants were present on the labour ward for 30% of weekdays. This varied markedly between regions (Table10.11).

Maternity units with more than 1000 deliveries per annum should have 40 hours of dedicated consultant cover on labour ward per week. Sixteen percent of these reported having at least 40 hours dedicated consultant cover per week. No units reported having 24-hour cover; 15% reported not having any dedicated consultant cover. The average consultant cover per week in these units was 16 hours (Table 10.12).

10.5.3 Auditable standard

A consultant should be contacted prior to an emergency CS.[81]

The Audit results

A consultant was the most senior person involved in the decision to perform a CS in 67% of emergency cases. Between regions this varied from 64% to 87% and between units from 16% to 100% (Table 10.13).

Table 10.14 Labour ward staffing and facilities

	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands and Isle of Man
Units (*n*)	33	28	17	19	22	27	42	19	17	12	3
Units providing in-service or 'drills' for the management of major obstetric emergencies, neonatal and adult resuscitation (%)	87.9	75.0	88.2	73.7	90.9	81.5	92.9	73.7	76.5	83.3	66.7
Units with regular in-service meetings concerning CTG monitoring (%)	81.8	78.6	100	94.7	100	81.5	85.7	52.6	70.6	83.3	100
Units with regular in-service meetings concerning risk management (%)	63.6	78.6	76.5	89.5	81.8	81.5	78.6	73.7	70.6	58.3	100

Table 10.15 Labour ward facilities

	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands and Isle of Man
Units (*n*)	30	27	17	19	22	26	36	16	16	12	3
Units with dedicated obstetric theatres (%)	86.7	88.9	82.4	79.0	86.4	88.5	91.7	87.5	81.3	50.0	33.3
Units with dedicated obstetric theatre delivering at least 50% of urgency = 1 cases within 30 minutes (%)	60.0	81.8	78.6	80.0	73.7	47.6	69.7	85.7	50.0	50.0	100.0
Units without dedicated obstetric theatre delivering at least 50% of urgency = 1 cases within 30 minutes	50.0	66.7	100	0.0	66.7	66.7	33.3	100	50.0	83.3	
Location of obstetric theatre:											
– within labour-ward area (%)	66.7	66.7	47.1	84.2	68.2	76.9	66.7	56.3	56.3	41.7	66.7
Units delivering at least 50% of urgency = 1 cases within 30 minutes (%)	57.9	88.2	75.0	68.8	73.3	55.6	75.0	88.9	50.0	60.0	100.0
– adjoining the labour-ward area (%)	13.3	18.5	17.7	5.3	18.2	7.7	19.4	25.0	25.0	0.0	0.0
Units delivering at least 50% of urgency = 1 cases within 30 minutes (%)	50.0	60.0	100.0	100.0	50.0	0.0	42.9	75.0	33.3	–	–
– not adjoining the labour-ward area but on the same floor (%)	6.7	11.1	17.7	0.0	4.6	7.7	8.3	0.0	12.5	16.7	0.0
Units delivering at least 50% of urgency = 1 cases within 30 minutes (%)	100.0	100.0	66.7	–	100.0	50.0	66.7	–	50.0	50.0	–
– on a different floor from labour ward but within the same building (%)	6.7	0.0	0.0	5.3	9.1	7.7	2.8	0.0	6.3	41.7	33.3
Units delivering at least 50% of urgency = 1 of cases within 30 minutes (%)	50.0	–	–	0.0	100.0	50.0	100.0	–	100.0	80.0	100.0
– requires referral to another hospital (%)	3.3	0.0	0.0	5.3	0.0	0.0	0.0	6.3	0.0	0.0	0.0
Units delivering at least 50% of urgency = 1 cases within 30 minutes (%)	0	–	–	–	–	–	–	–	–	–	–

Table 10.16 Availability of fetal heart monitors

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands and Isle of Man
Units in region having two CTG monitors on labour ward per 1000 patients (%)	92.9	97.0	92.9	100.0	84.2	100.0	86.4	88.9	95.2	89.5	83.3	100.0
Units having at least one twin monitor (CTG) (%)	89.7	84.9	92.9	100.0	100.0	94.7	82.4	90.9	96.3	88.1	79.0	100.0

10.5.4 Auditable standard

A consultant should be present for at least 10% of potentially complicated CS.[81]

For the purposes of this Audit, the Working Group came to the consensus that potentially complicated CS could include those performed for the following indications or in the following circumstances:

- placenta praevia
- placental abruption
- at full cervical dilatation
- in obese women
- for premature deliveries less than 32 weeks
- for multiple pregnancy twins
- in women who have had multiple previous CS.

The Audit results

A consultant was present in theatre for 21% of these potentially complicated cases. Between regions this varied from 13% to 28% and between units from 4% to 100% (Table 10.13). By comparison, overall, a consultant was the most senior obstetrician present at 24% of elective sections and for 11% of emergency sections. In 50% of units, a consultant was present in theatre for about 12% of daytime emergency cases (IQR 6–16%). For most CS, both elective and emergency, the most senior person in theatre was a specialist registrar, year 1–3.

10.6 Labour-ward facilities

10.6.1 Background

The standards used for obstetric staffing come from the RCM/RCOG joint working party.[81]

10.6.2 Auditable standard

All clinical staff involved with care in labour should attend management of labour/CTG refresher courses every six months (arranged locally).

The Audit results

The majority of units (83%) reported that they had regular in-service meetings on electronic fetal monitoring (Table 10.14). In addition, many units held regular meetings concerning risk management (76%).

10.6.3 Auditable standard

Staff should have practice drills in managing acute obstetric emergencies (e.g. shoulder dystocia, cord prolapse).

The Audit results

Overall, 83% of units reported that they provided in-service education and training sessions on the management of major obstetric emergencies (e.g. dystocia, postpartum haemorrhage and cord prolapse), neonatal and adult resuscitation (Table 10.14).

10.6.4 Auditable standard

Operating theatres dedicated for obstetrics should be close to the delivery unit or preferably in it. One theatre is sufficient for a delivery load of up to 4000 babies a year.

Table 10.17 Audit standards: staffing and facilities survey, by region, units with evidence-based referenced guidelines for management[a]

	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands and Isle of Man
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Guideline on:											
Diabetes	15 (50.0)	12 (48.0)	12 (70.6)	10 (52.6)	10 (58.8)	12 (54.5)	12 (44.4)	19 (50.0)	10 (55.6)	3 (33.3)	2 (66.7)
Major haemoglobinopathy	11 (40.7)	10 (41.7)	7 (41.2)	7 (41.2)	8 (53.8)	7 (33.3)	12 (44.4)	13 (39.4)	6 (35.3)	2 (66.7)	2 (100)
Failed adult intubation	10 (34.5)	10 (43.5)	8 (53.3)	8 (44.4)	5 (38.5)	5 (22.7)	9 (36.0)	14 (38.9)	5 (29.4)	2 (25.0)	0
Prostaglandin use	16 (51.6)	13 (52.0)	11 (64.7)	13 (68.4)	11 (68.8)	11 (50.0)	13 (48.1)	19 (50.0)	9 (50.0)	4 (44.0)	2 (100)
Severe hypertension/pre-eclampsia and eclampsia	22 (71.0)	15 (57.7)	11 (64.7)	12 (66.7)	11 (64.7)	10 (45.5)	14 (51.9)	22 (56.4)	11 (55.0)	7 (58.3)	2 (66.7)
Antepartum haemorrhage incl. placental abruption	19 (63.3)	15 (60.0)	8 (47.1)	12 (70.6)	10 (62.5)	6 (30.0)	14 (51.9)	19 (47.5)	9 (47.4)	6 (54.5)	2 (66.7)
Severe postpartum haemorrhage	20 (64.5)	16 (61.5)	8 (47.1)	13 (68.4)	9 (56.3)	8 (36.4)	15 (55.6)	23 (56.1)	9 (45.0)	6 (50.0)	2 (66.7)
Unexplained intrapartum/postpartum collapse, incl. amniotic fluid embolism	11 (37.9)	12 (48.0)	8 (50.0)	10 (58.8)	6 (40.0)	7 (31.8)	8 (29.6)	18 (54.5)	6 (30.0)	2 (33.3)	1 (100)
Ruptured uterus	16 (55.2)	14 (63.6)	6 (40.0)	12 (66.7)	4 (23.5)	8 (36.4)	8 (33.3)	16 (45.7)	4 (20.0)	2 (66.7)	1 (100)
Definition and repair of third-degree tear	12 (41.4)	13 (50.0)	8 (47.1)	12 (63.2)	5 (29.4)	13 (59.1)	11 (40.7)	18 (52.9)	5 (27.8)	3 (75.0)	2 (100)
Antibiotics for caesarean section	15 (50.0)	12 (50.0)	9 (60.0)	14 (77.8)	10 (62.5)	8 (36.4)	9 (33.3)	13 (38.2)	5 (29.4)	6 (54.5)	1 (100)
Thromboprophylaxis in caesarean section	18 (58.1)	14 (56.0)	10 (58.8)	14 (73.7)	10 (66.7)	7 (33.3)	10 (37.0)	22 (59.5)	10 (55.6)	7 (70.0)	3 (100)
Management of women who decline blood products[b]	11 (40.7)	10 (43.5)	7 (43.8)	9 (52.9)	8 (47.1)	4 (21.1)	7 (28.0)	16 (43.2)	5 (26.3)	3 (37.5)	0
Water birth	14 (50.0)	17 (68.0)	12 (75.0)	11 (57.9)	9 (52.9)	14 (63.6)	13 (48.1)	25 (65.8)	14 (70.0)	3 (60.0)	0
Eating and drinking in labour	13 (44.8)	10 (43.5)	8 (53.3)	9 (50.0)	8 (47.1)	10 (50.0)	11 (40.7)	17 (45.9)	9 (45.0)	1 (20.0)	0
Multiple pregnancy	13 (44.8)	13 (52.0)	10 (58.8)	10 (55.6)	8 (50.0)	7 (31.8)	10 (37.0)	16 (42.1)	7 (38.9)	2 (33.3)	2 (66.7)
Cord prolapse	14 (48.3)	15 (57.7)	8 (47.1)	11 (61.1)	9 (52.9)	8 (36.4)	9 (33.3)	18 (42.9)	7 (36.8)	3 (42.9)	2 (66.7)
Shoulder dystocia	21 (70.0)	16 (61.5)	11 (64.7)	16 (84.2)	11 (64.7)	13 (59.1)	15 (55.6)	27 (64.3)	13 (65.0)	7 (58.3)	2 (66.7)
Breech presentation incl. ECV and selection for vaginal delivery	18 (62.1)	13 (52.0)	8 (47.1)	12 (66.7)	10 (62.5)	10 (45.5)	12 (44.4)	19 (48.7)	8 (42.1)	2 (33.3)	1 (100)

[a] Percentages calculated out of the number of units in each region with data, data missing for some units; [b] e.g. Jehovah's Witnesses; ECV = external cephalic version;

The Audit results

The ratio of at least one dedicated obstetric theatre per 4000 deliveries was met by 96% of maternity units. The units that did not meet this standard had on average one theatre per 5000 deliveries (Table 10.15).

Decision-to-delivery intervals for acute obstetric emergencies have been discussed in Chapter 8. Where CS was performed for: 'immediate threat to the life of the woman or the fetus' and pH less than 7.2, severely abnormal CTG, placental abruption or cord prolapse, in 59% of these cases the decision-to-delivery interval was within 30 minutes.

Of units that had a dedicated obstetric theatre, 69% met this standard in at least 50% of these cases, compared with 58% of units that did not have a dedicated obstetric theatre. Of units that had an area on the labour ward that can be converted into a theatre, 69% meet this standard in at least 50% of cases with urgent indications, compared with 62% of units that did not have such a facility.

The ability to meet this standard for the urgent cases did not appear to be associated with reported provision of in-service training or drills for the management of obstetric emergencies. However, only a minority (17%) of units did not undertake such drills.

10.6.5 Auditable standard

Two to four FHR monitors should be available per 1000 deliveries a year, including at least one instrument capable of monitoring twins.

The Audit results

Overall, 93% of units have at least two FHR monitors per 1000 deliveries. Ninety percent of units have at least one instrument capable of monitoring twins (Table 10.16).

10.6.6 Auditable standard

There should be a set of referenced, evidence-based guidelines that should be dated, signed and reviewed on a regular basis, every one to three years.

The Audit results

The proportion of units with evidence-based referenced guidelines for the various categories ranged from 36% for failed intubations to 65% for shoulder dystocia. Almost all of these units had updated the guidelines within the previous three years (Table 10.17).

11. Anaesthetic care

11.1 Summary

- Overall, the level of compliance with standards recommended in the *Guidelines for Obstetric Anaesthesia* is shown to be high.
- Almost all maternity units offer a regional analgesia service for women in labour. In the majority of units this is a 24-hour service.
- An auditable standard is that the majority of CS should be performed with a regional block. Overall, 77% of emergency CS and 91% of elective CS were using regional anaesthesia.
- An auditable standard is that acid prophylaxis should be administered prior to regional or general anaesthesia. This was reported to have been done in 90% of cases overall.
- Estimated blood loss was more than one litre in 4% of CS.
- 95% of units have cross-matched blood facilities on site at all times.
- 10% of women who had a CS required care in addition to routine postoperative care. Most (91%) of this care was provided within a high-dependency area within the maternity unit; 3.5% required transfer to an intensive care unit.

11.2 Introduction

In this chapter, aspects of anaesthetic service provision in maternity services are described. Levels of compliance with recommended auditable standards are measured.

11.3 Background

The anaesthetic standards used in the Audit were derived from Guidelines for Obstetric Anaesthesia published by the Association of Obstetrics Anaesthetists of Great Britain.[21] The results are derived from a survey sent to the lead obstetric anaesthetist in maternity units and from the forms completed for all caesarean births (Appendices Ciii and Cvi).

11.4 The Audit results

Almost all units (98%) offered a regional analgesia service for women in labour. The four units that did not offer any regional analgesia had less than 2000 deliveries annually (Table 11.1).

The majority (96%) reported that they offered a 24-hour regional analgesia service. Almost half of these units (49%) were able to offer a 24-hour combined spinal–epidural regional analgesia service.

The majority of respondents (97%) gave estimates for their units of the epidural rate in labour (includes epidurals and combined spinal–epidurals). The median overall reported epidural rate for these hospitals was 24.5% (IQR: 18%, 34%). In units that had an epidural rate of less than 20% the median CSR was 20% (IQR 17.5%, 23.3%). In units that had an epidural rate of at least 30% the CSR was 23% (IQR 19.3%, 24.7%). Ninety percent of these latter units had an annual delivery rate of at least 2000 (Table11.1).

Table 11.1 Regional analgesia service-provision

Region	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Eastern	London	South East	South West	Wales	Northern Ireland	Channel Islands and Isle of Man
Units (*n*)	203	27	27	17	17	16	21	25	37	16	12	3
Units offering regional analgesia service for women in labour (%)	98.5	100.0	92.6	100.0	100.0	93.8	100.0	100.0	100.0	100.0	91.7	100.0
Median epidural rate reported by these units	24	22	19	30	21	20	22	37	26	27	35	22
(IQR)	(18, 34)	(13, 34)	(15, 24)	(21, 37)	(17, 27)	(14, 25)	(18, 27)	(23, 47)	(21, 35)	(21, 37)	(11, 37)	(6, 37)
Units giving women information about the availability of epidural or other forms of analgesia during labour on a routine basis (%)	97.5	100.0	96.3	100.0	100.0	100.0	95.2	96.0	97.3	93.8	100.0	100.0
Source of information:												
Antenatal classes (%)	95.0	100.0	92.3	94.1	100	87.5	90.0	95.8	97.2	93.3	100.0	100.0
Antenatal clinic (%)	71.7	85.2	88.5	82.4	64.7	75.0	60.0	75.0	50.0	73.3	91.7	66.7
Patient information leaflets (%)	81.3	85.2	84.6	88.2	82.4	87.5	80.0	75.0	75.0	80.0	83.3	100.0
Patient-controlled analgesia used routinely as a method of postoperative analgesia (%)	33.5	48.2	59.3	17.7	11.8	56.3	33.3	32.0	16.2	25.0	50.0	0.0

11.4.1 Auditable standard

The majority of CS should be performed with a regional block.[81]

The Audit results

Overall, 77% of emergency CS and 91% of elective CS were performed with a regional block. This varied from 30% to 100% for emergency and 70–100% for elective CS between units (Table 11.2).

11.4.2 Auditable standard

Acid prophylaxis should be administered prior to general or regional anaesthesia.[83]

The Audit results

Acid prophylaxis was administered prior to regional or general anaesthesia in 90% of cases overall. This varied between units from 34% to 100% (Table 11.2).

Ninety-nine percent of units reported that gastric acidity prophylaxis was routine for all elective CS, and 98% of units reported that gastric acidity prophylaxis was routine for all emergency CS; 38% of units reported that gastric acidity prophylaxis was routine for all for all women in labour; 54% reported that they gave it to selected at-risk women (e.g. women with pre-eclampsia) (Table 11.3).

Ninety-eight percent of units reported they used histamine H_2-receptor blockers, 2% used proton pump inhibitors and 99% used non-particulate antacid (e.g. sodium citrate) (Table 11.3).

11.4.3 Auditable standard

Cross-matched blood should be available within 30 minutes of receipt of a sample by the blood bank. All obstetric units should have at least two units of uncross-matched O-negative blood available within five minutes.[21]

The Audit results

Estimated blood loss for women who delivered by CS was reported to be 500 millilitres or less in 62% of cases. Blood loss was estimated to be between 501 millilitres and 1000 millilitres in 32% cases and in excess of 1000 millilitres in 4% of cases (Table 11.4).

The majority of units (95%) reported having on-site cross-match facilities at all times. Three percent have cross-matching facilities during the day only. The remainder kept O-negative blood on the labour ward at all times (Table 11.5).

11.5 Anaesthetic facilities on the labour ward

11.5.1 Auditable standard

For operative deliveries under regional block, continuous pulse oximetry, non-invasive blood pressure capable of one minute cycles and continuous ECG monitoring are required during induction, maintenance and recovery.[21]

The Audit results

Ninety-nine percent (n = 214) of hospitals reported having facilities to perform continuous pulse oximetry, non-invasive blood pressure monitoring capable of one-minute cycles and continuous ECG monitoring. Two units did not have continuous pulse oximetry, one unit did not have non-invasive blood pressure monitoring capable of one-minute cycles and three units did not have continuous ECG monitoring (Table 11.6).

Table 11.2 Anaesthesia: percentage of units meeting audit standards for regional anaesthesia and acid prophylaxis

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
The majority of caesarean sections should be performed with a regional block:												
Units meeting standard:												
Emergency (%)	77.2	79.1	62.6	79.4	70.2	76.1	76.4	84.0	82.4	79.4	79.2	74.6
Elective (%)	90.5	92.0	87.7	90.0	88.2	89.7	90.1	89.2	92.4	93.7	90.1	95.9
Acid prophylaxis should be administered prior to regional or general anaesthesia												
Units meeting standard (%)	89.9	88.5	90.7	93.3	90.2	88.5	88.6	88.6	89.1	93.7	92.2	79.1

Table 11.3 Anaesthesia: unit policies for acid prophylaxis

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Units (*n*)	203	27	27	17	17	16	21	25	37	16	12	3
Gastric acidity prophylaxis routinely given for:												
all elective CS (%)	98.5	96.3	100.0	100.0	100.0	100.0	100.0	92.0	100.0	100.0	91.7	100.0
all emergency CS (%)	97.5	96.3	100.0	100.0	94.1	100.0	95.2	92.0	100.0	100.0	91.7	100.0
all labouring women (%)	36.5	55.6	44.4	35.3	52.9	56.3	33.3	20.0	27.0	6.3	75.0	33.3
only selected at-risk women (%)	54.2	40.7	44.4	64.7	17.7	37.5	66.7	56.0	67.6	87.5	16.7	33.3
Acidity prophylaxis used:												
H_2-receptor blockers (%)	97.5	100.0	96.3	100.0	94.1	100.0	100.0	92.0	97.3	100.0	91.7	100.0
proton pump inhibitors (%)	2.0	3.7	3.7	0.0	0.0	0.0	0.0	4.0	2.7	0.0	8.3	0.0
non-particulate antacid (%)	98.5	100.0	100.0	100.0	100.0	100.0	95.2	92.0	100.0	100.0	91.7	100.0

Table 11.4 Estimated blood loss at caesarean section (%)

Region	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Estimated blood loss (% of cases):												
≤ 500 ml	62.3	64.7	64.7	60.5	60.0	64.0	60.1	59.6	64.6	61.2	68.4	67.6
> 500–1000 ml	32.2	30.2	30.8	33.0	33.2	31.2	33.3	35.6	29.7	34.2	28.7	28.6
> 1000 ml	4.0	3.7	2.9	5.0	4.0	2.9	4.6	4.0	4.1	4.0	1.9	1.9

Table 11.5 Anaesthesia: percentage of units meeting audit standard for transfusion services

Region	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Units (*n*)	203	27	27	17	17	16	21	25	37	16	12	3
Crossmatched blood should be available within 30 minutes of receipt of a sample by the blood bank												
Units meeting the standard:												
during the day and night (%)	94.7	100.0	87.0	82.4	93.8	100.0	90.0	100.0	97.3	100.0	100.0	100.0
during the day only (%)	3.2	–	4.4	11.8	6.3	–	5.0	–	2.7	–	–	–
All obstetric units should have at least two units of uncrossmatched O negative blood available within five minutes												
Units meeting the standard (%)	92.1	85.2	92.6	100.0	94.1	81.3	80.9	96.0	97.3	100.0	91.7	100.0

11.5.2 Auditable standard

In maternity units with obstetric anaesthesia services, high-dependency care should be available.[21]

The Audit results

Two hundred and twelve maternity units had a general intensive care unit (ICU) within the trust; 82% of these were on the same site as the maternity unit. Forty-seven percent of maternity units reported having a high-dependency unit (HDU) dedicated to obstetrics; 37% of HDUs were located within the maternity unit and 6% were located elsewhere (Table 11.7).

Units also reported the facilities available in these HDUs (Table 11.7). Overall, all units had facilities to measure pulse oximetry; 98% had facilities for the measurement of central venous pressure; 86% had facilities for the measurement of direct arterial pressure; 33% had facilities for the measurement of pulmonary artery pressure and 21% had facilities for the measurement of cardiac output.

Of women who were delivered by CS, 10% required 'special care' which was in addition to 'routine' postoperative care (Table11.8). Between regions, this ranged from 8% to 14%. This represents 2% of all maternities. Ninety-one percent of women who needed 'special' care following a CS received this additional postoperative care in a high-dependency area within the maternity unit, 0.8% were transferred to an HDU outside the maternity unit, 3% were transferred to an ICU within the hospital, less than 0.5% were sent to an ICU outside the hospital.

11.5.3 Auditable standard

All obstetrics anaesthetic departments should have agreed and regularly updated guidelines on the following topics:[21]

- antenatal referral to the anaesthetist (e.g. maternal cardiac disease, diabetes, severe asthma)
- major haemorrhage
- pre-eclamptic toxaemia
- failed intubation drill
- management for regional anaesthesia including:
  - regional blocks for analgesia
  - regional blocks for surgery
  - unintentional dural puncture
  - severe hypertension
  - total spinal anaesthesia
- admission and discharge criteria from delivery suite to HDU.

The Audit results

Only 42% of units had guidelines on antenatal referral to the anaesthetist for pertinent medical problems (Table 11.9). Only 37% of maternity units with an HDU had guidelines for admission or discharge criteria from delivery suite to the HDU.

The majority (89%) of units had a guideline in operation on the labour ward regarding the presence of birth partners during CS. All of the units with guidelines allowed the presence of birth partners for the delivery of the baby by CS under epidural or spinal anaesthesia. Five percent of these units reported that birth partners were allowed into theatre if the CS was performed under general anaesthetic.

Where there were guidelines, at least 80% had been updated in the last two years. However, few (less than 50%) of these guidelines were reported to be evidence-based.

Table 11.6 Anaesthesia: percentage of units meeting audit standard for monitoring equipment during anaesthesia

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Units (*n*)	203	27	27	17	17	16	21	25	37	16	12	3
Requirements during induction, maintenance and recovery for operative delivery under regional block:												
Continuous pulse oximetry (%)	98.5	100.0	100.0	94.1	100.0	93.8	100.0	100.0	97.3	100.0	100.0	100.0
Non-invasive blood pressure (one-minute cycles) (%)	99.0	100.0	100.0	100.0	100.0	100.0	95.2	100.0	97.3	100.0	100.0	100.0
Continuous ECG monitoring (%)	98.0	100.0	100.0	94.1	100.0	93.8	100.0	100.0	94.6	100.0	100.0	100.0

ECG = Electrocardiograph

Table 11.7 Availability of high-dependency or intensive-care units and facilities available within maternity high-dependency units (HDU)

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Units (*n*)	203	27	27	17	17	16	21	25	37	16	12	3
In maternity units with obstetric anaesthesia services, high dependency care units should be available												
Units meeting the standard (%)	48.8	59.3	44.4	64.7	58.8	31.3	42.9	48.0	51.4	31.3	16.7	0.0
Units with HDU with facilities that measure:												
Central venous pressure (%)	98.0	93.8	100.0	100.0	90.0	100.0	100.0	100.0	100.0	100.0	100.0	–
Direct arterial pressure (%)	85.9	87.5	91.7	90.9	80.0	80.0	88.9	83.3	79.0	100.0	100.0	–
Pulmonary artery pressure (%)	32.3	50.0	50.0	45.5	40.0	40.0	11.1	25.0	15.8	0.0	50.0	–
Cardiac output (%)	20.2	37.5	25.0	18.2	20.0	40.0	11.1	25.0	5.3	0.0	50.0	–
Pulse oximetry (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	–

Table 11.8 Mothers who needed high-dependency or intensive care after caesarean section (CS), by location of facility

	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Mothers requiring special care post CS (%)	9.9	8.0	9.9	13.0	8.9	13.5	8.5	10.8	10.2	8.4	5.0	9.5
Transferred to HDU within maternity unit (%)	91.2	88.9	90.5	93.9	87.5	93.2	90.6	91.4	92.7	90.8	87.9	–[a]
Transferred to HDU outside maternity unit (%)	0.8	0.0	1.5	0.7	0.7	2.3	0.7	0.4	1.0	0.0	1.7	–
Transferred ITU within hospital (%)	3.0	4.7	2.7	3.1	5.5	1.4	2.0	2.6	2.6	3.6	3.5	–
Transferred ITU hospital outside hospital (%)	0.5	0.0	1.5	0.3	0.0	0.5	0.3	0.9	0.3	0.0	0.0	–

[a]estimates not given as numbers are small; HDU = high-dependency unit

Table11.9 Distribution of units with operational anaesthetic guidelines in labour ward, by region

Region	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Units (*n*)	203	27	27	17	17	21	25	37	16	16	12	3
Written guidelines in labour ward												
Antenatal referral to the anaesthetist for pertinent medical problems (%)	42.4	63.0	25.9	41.2	23.6	42.9	52.0	43.2	50.0	31.3	25.0	33.3
Major haemorrhage (%)	98.5	100.0	96.3	100.0	100.0	100.0	96.0	100.0	100.0	93.8	91.7	100.0
Sever pre-eclampsia (%)	99.0	100.0	96.3	100.0	100.0	100.0	96.0	100.0	100.0	100.0	91.7	1000
Failed intubation drill (%)	95.1	96.3	92.6	100.0	94.1	100.0	88.0	100.0	100.0	81.3	75.0	66.7
Unintentional dural puncture (%)	83.3	81.5	74.1	82.4	70.6	95.2	84.0	89.2	93.8	75.0	66.7	66.7
Severe hypotension (%)	59.6	77.8	51.9	70.6	41.1	71.4	48.0	56.8	62.5	56.3	58.3	66.7
Total spinal anaesthesia (%)	57.6	63.0	44.4	52.9	35.3	66.7	52.0	59.5	81.3	68.8		
Admission and discharge criteria from delivery suite to HDU (%)	23.2	33.3	22.2	23.5	17.7	28.6	20.0	24.3	0.0	12.5	16.7	66.7
Monitoring after intrathecal opioids (%)	45.8	48.2	29.6	70.6	35.3	52.4	44.0	43.2	56.3	43.8	66.7	66.7
Guideline for presence of birth partners during CS (%)	90.2	85.2	88.9	82.4	88.2	87.5	100	84.0	97.3	93.8	75.0	100.0
Of those with guidelines, presence of partners for CS under:												
epidural/spinal anaesthesia (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
general anaesthesia (%)	4.4	13.0	0.0	0.0	0.0	0.0	14.3	2.8	6.7	0.0	0.0	33.3

CS = caesarean section; HDU = high-dependency unit

Table 11.10 Units meeting anaesthetic services and staffing standards

Region	England & Wales	North Eastern	North Western	East Midlands	West Midlands	Wales	Eastern	London	South East	South West	Northern Ireland	Channel Islands and Isle of Man
Units (*n*)	203	27	27	17	17	16	21	25	37	16	12	3
For units with > 1000 deliveries per year, there should be at least one day consultant obstetric anaesthetist cover per week												
Units meeting standard (%)	99.5	96.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	80.0	N/A
Consultant support and on call availability through out the 24 hour period, should be available every day of the year												
Units meeting standard (%)	91.3	88.9	96.3	100.0	82.4	87.5	95.2	92.0	94.6	75.0%	75.0	100.0
A duty anaesthetist should be available immediately 24-hours a day												
Units meeting standard (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
A second anaesthetist should be available if needed												
Units meeting standard (%)	87.2	92.6	74.1	94.1	94.1	93.8	90.5	80.0	89.2	81.3	66.7	100.0
A multidisciplinary resuscitation team should be available for maternal emergencies 24-hours a day												
Units meeting standard (%)	86.7	88.9	70.4	100	82.4	75.0	95.2	80.0	91.9	100.0	50.0	100.0

11.6 Anaesthetic staffing

11.6.1 Auditable standard

Guidelines for obstetric anaesthetic services recommend that, for units delivering more than 1000 women per year, there should be at least one day of consultant obstetric anaesthesia cover per week.[21]

The Audit results

Overall, 96% of units had at least one consultant per 500 deliveries. Of the 4% (n = 8) units that did not meet this standard, five had less than 1000 deliveries annually and the other three had less than 2000 annual deliveries.

11.6.2 Auditable standard

Consultant support and on-call availability throughout the 24-hour period, should be available every day of the year.[21] A duty anaesthetist should be available immediately for 24-hours a day. If the anaesthetists is a trainee, they should have at least one year's experience.[21] A second anaesthetist should be available if needed.[21]

The Audit results

Almost all (91%) units reported having a consultant anaesthetist on call to cover obstetrics for 24-hours a day (Table 11.10). In the majority of units, the grade of anaesthetist first on call to cover obstetrics was a senior house officer (with at least one year's experience), a non-consultant grade or specialist registrar. Ninety percent of first on-call anaesthetists covering obstetrics were resident on the same site as the maternity unit.

Chapter 8 discussed the ability of units to achieve a decision-to-delivery interval of 30 minutes or less for cases of immediate threat to the life of the mother or fetus. The ability of units to meet this standard in at least 50% of their patients did not appear to differ whether or not the first on-call anaesthetist covering obstetrics was resident on the same site as the maternity unit.

11.6.3 Auditable standard

A multidisciplinary resuscitation team should be available for maternal emergencies for 24-hours a day.[21]

The Audit results

The majority of units (87%) reported that they had a multidisciplinary resuscitation team available for maternal emergencies at all times. Twelve percent reported that they did not have this and, of these units, 21% had less than 1000 deliveries per year.

11.6.4 Auditable standard

The person assisting the anaesthetist during anaesthesia should have no other duties at that time.[21]

The Audit results

In the majority of units (62%) an operating-department person assisted the anaesthetist during anaesthesia; 11% of units reported that a trained nurse performed this role; 23% used both nurses and operating-department personnel.

During the day, 68% hospitals had personnel to provide assistance with anaesthesia dedicated to obstetrics only. However, at night and weekends only about 49% provided this support; 95% of these units had more than 1000 deliveries per year.

In Chapter 8, the ability of units to achieve a decision-to-delivery interval of 30 minutes or less for cases of immediate to the life of the mother or fetus was discussed. The ability of units to meet this standard in at least 50% of their patients did not appear to differ whether or not there was dedicated staffing provision for anaesthetic assistance or with the reported place of residence of the on-call anaesthetist.

11.6.5 Auditable standard

Elective CS should be arranged at times when there is a dedicated team of anaesthesia, obstetric, midwifery and operating-theatre staff available who are not, at the same time, required to cover other operating activities or emergencies.[21]

The Audit results

Sixty-one percent of units report that elective CS were routinely covered by a separate anaesthetist; 38% of units said that they did not provide this.

Overall, a consultant anaesthetist was present at 54% of elective and 16% of emergency CS that took place during the phase one study period. A specialist registrar was the most senior anaesthetist present at 55% of emergency CS; in 11% of cases it was an SHO.

12. Maternal views of childbirth

12.1 Summary

- The *Changing Childbirth* report conveyed the right of women to be involved in decisions about and have a choice in childbirth.
- Maternal request is said to have contributed to the increasing CSR. Studies in Australia, Eire, Sweden and the UK have shown rates from 1.5 to 28%; this wide range is in part due to the diversity of definitions in the studies.
- 2475 women from 40 randomly selected maternity centres in England, Wales and Northern Ireland returned completed questionnaires.
- Women who responded to the questionnaire were older, more likely to report their ethnic group as white and more likely to be in their first pregnancy compared with other mothers who delivered in these hospitals.
- A significant proportion of women reported that they would like more information on the risks and benefits of CS.
- Almost all mothers expressed a wish to have a birth that was 'the safest option for their baby'.
- 5.3% of mothers reported that they would prefer to deliver by CS. Women who have had previous CS were more likely to express this preference.
- Women who preferred a CS were more likely to also express a wish for the birth to be the safest option for them and to be as pain-free as possible.

12.2 Introduction

This chapter presents a summary of the research evidence on maternal request for CS. A survey of maternal views about CS was undertaken as part of phase two of the audit, the findings of which are presented.

12.3 Background

The *Changing Childbirth* report[80] explicitly conveyed the right of women to be involved in decisions and to have a choice in childbirth. One of the priorities of maternity care is to enable women to make informed decisions regarding their care or treatment. To do so, they require access to evidence-based information, to help them in making their decisions.

It has been proposed that maternal request for CS has been a factor contributing to the observed increases in CSR.

On examining the literature, one systematic review of observational studies[84] and three further studies[85–87] published since the review that evaluated the contribution of maternal request to the overall CSR were found. This review includes twelve primary studies published between 1993 and 2001; these included 13 285 pregnant women. Of the 12

studies, three were set in Australia,[85,88–90] one in the Republic of Ireland,[91] one in Sweden[92] and the remaining seven were undertaken in the UK.[84,86,87,93–96] The studies used either structured questionnaires, structured interviews or reviews of clinical case notes. The studies were conducted during the antenatal period, on admission for delivery and within the three months of the birth.

The maternal request rate for CS reported in the studies ranged from 1.5%[91] to 28%[89] of all CS. The reported rate of maternal request for elective CS ranged from 5%[94] to 48%.[89]

There are a number of explanations for the observed heterogeneity in the reported frequency of maternal request. The timing of data collection varied between studies. Women's expectations change over time,[97] there may be recall bias and post hoc rationalisation within retrospective studies.[89,91,93,94,96] A variety of sources and methods was used to ascertain information about incidence of maternal request.[94]

There is also heterogeneity in the use of the term 'maternal request'. Studies varied in the extent to which they explored other possible reasons for maternal request, either clinical or psychosocial factors such as anxiety surrounding previous birth experiences, safety, psychological trauma or sexual abuse.[88–91,94–96,98] The inclusion or exclusion of women with 'clinical' indications for CS varied between studies. The extent to which a clinical indication was considered to be sufficient justification for the procedure is not clear.

Information and explanation is valued by mothers.[80,99] Surveys have reported that women want more antenatal information about CS and obstetric interventions.[100]

12.4 The Audit results

Details of response rates to the survey are given in Chapter 3; 2475 women from 40 randomly selected maternity centres in England, Wales and Northern Ireland returned completed questionnaires.

Table 12.1 shows the comparison of the characteristics of women who completed the questionnaire to all other women from these centres. Compared with other mothers who delivered at the participating hospitals, women who responded to the survey were older, more likely to their report ethnic group as white and more likely to be in their first pregnancy.

The majority of respondents reported English to be their first language. Most had at least GCSE-level qualifications and were working full time. Average gestation at time of completing the questionnaire was 35 weeks (IQR 33–36 weeks).

Five percent of women reported it had taken them more than two years to become pregnant.

Most women (58%) reported that they had had no complications during their pregnancy. Of the complications reported, 13% had a big baby, 10% had had a previous CS, 9% had a breech presentation, 8% said that they had a health problem that may affect the baby, 4% reported they had a low lying placenta, and 3% said that their baby had or may have had a health problem.

Most women (57%) reported that a midwife or team of midwives had responsibility for their antenatal care. For 14% of women this was their general practitioner and for 31% of women it was a hospital doctor. The majority (75%) had received most of their antenatal care in a primary-care setting. However, 24% of women had received more than half of their care at a hospital. Three percent of mothers said that they expected to give birth at home, 95% expected to give birth in hospital, 0.5% in a GP unit and 1% in a midwifery-led unit.

Overall, 45% of women said they had attended antenatal classes. The majority (79%) of women attending classes were in their first pregnancy. Most of these women (86%) said that antenatal classes had helped them to find out things about birth.

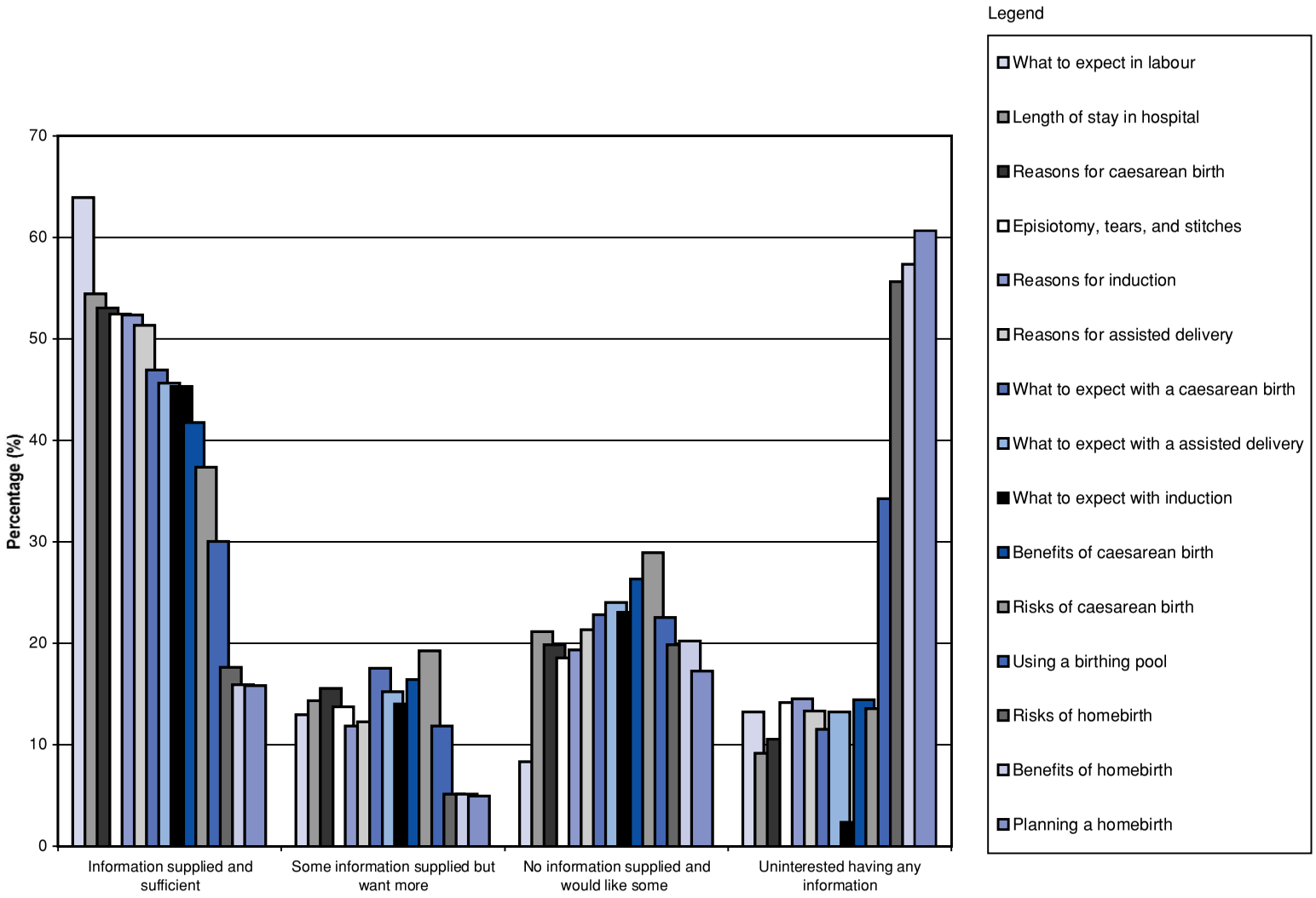

Figure 3 Information about birth (order of legend – top to bottom – corresponds to order of columns, left to right)

Table 12.1 Characteristics of women responding to the maternal survey

	Women who completed maternal survey (*n* = 2475) (%)	All other women (*n* = 25647) (%)
Age (years)		
<20	4.7	8.4
20–24	9.8	19.6
25–29	27.6	27.4
30–34	34.6	27.8
35–39	18.6	13.5
40–50	4.0	2.6
Ethnicity		
White	94.3	83.1
Black African	0.3	1.4
Black Caribbean	0.9	1.2
Black other	0.2	0.7
Bangladeshi	0.2	2.4
Indian	1.1	2.6
Pakistani	0.9	4.0
Chinese	0.3	0.7
Asian other	0.2	1.8
other	1.0	1.5
Parity		
Primiparous	44.7	41.6
Multiparous, no previous CS	44.4	48.0
Multiparous with previous CS	10.7	9.9
Number of babies		
Singleton	98.4	98.3
Multiple	1.3	1.7
Mode of delivery		
Vaginal delivery rate	76.2	77.4
Caesarean section rate	23.3	22.0
Emergency	58.4	62.0
Elective	41.4	37.0
Primary indications (as reported by clinician)		
Breech	11.5	10.7
Previous caesarean section	16.8	15.3
Failure to progress	20.7	19.6
Presumed fetal compromise	20.9	22.2
Maternal request	9.2	6.3

Women were asked if they had been given enough or wanted more information in this pregnancy about a range of topics (Appendix Di q18). The range of responses from all women is given in Figure 3. Less than 1% of women felt that they had excessive information about any topic. These have been included in the 'sufficient information' category. Around 50% of the respondents reported that they had sufficient information about labour and common possible interventions (e.g. what to expect in labour, induction of labour). About 40% of women reported that they had sufficient information about the risks and benefits of CS but a significant proportion of women reported that they would like more information on the risks (48%) and benefits (43%) involved as they had either no or insufficient information about the procedure.

Women who attended antenatal classes were more likely to report that they had enough information on all topics compared with those who had not attend antenatal classes.

Women were asked to express their feelings about the birth of their baby by agreeing or disagreeing with statements (Appendix Di q22). The range of responses from all women is given in Figure 4. Nearly all women expressed a strong desire for a birth that was 'the safest option for their baby' and that was the 'least stressful for their baby' and this was considered to be the most important aspect of the birth. Their own safety, a desire for a

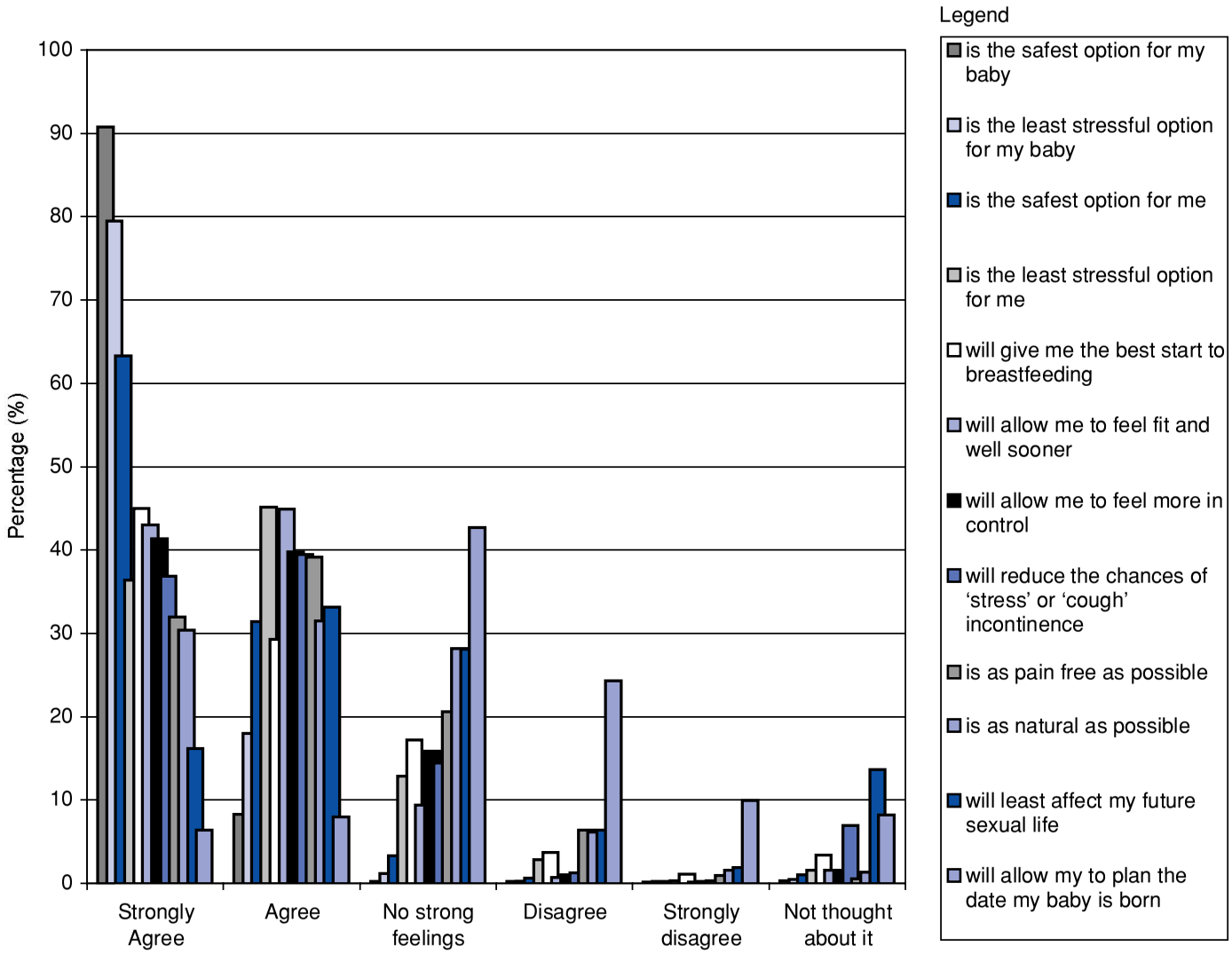

Figure 4 Maternal preferences for this birth (order of legend – top to bottom – corresponds to order of columns, left to right)

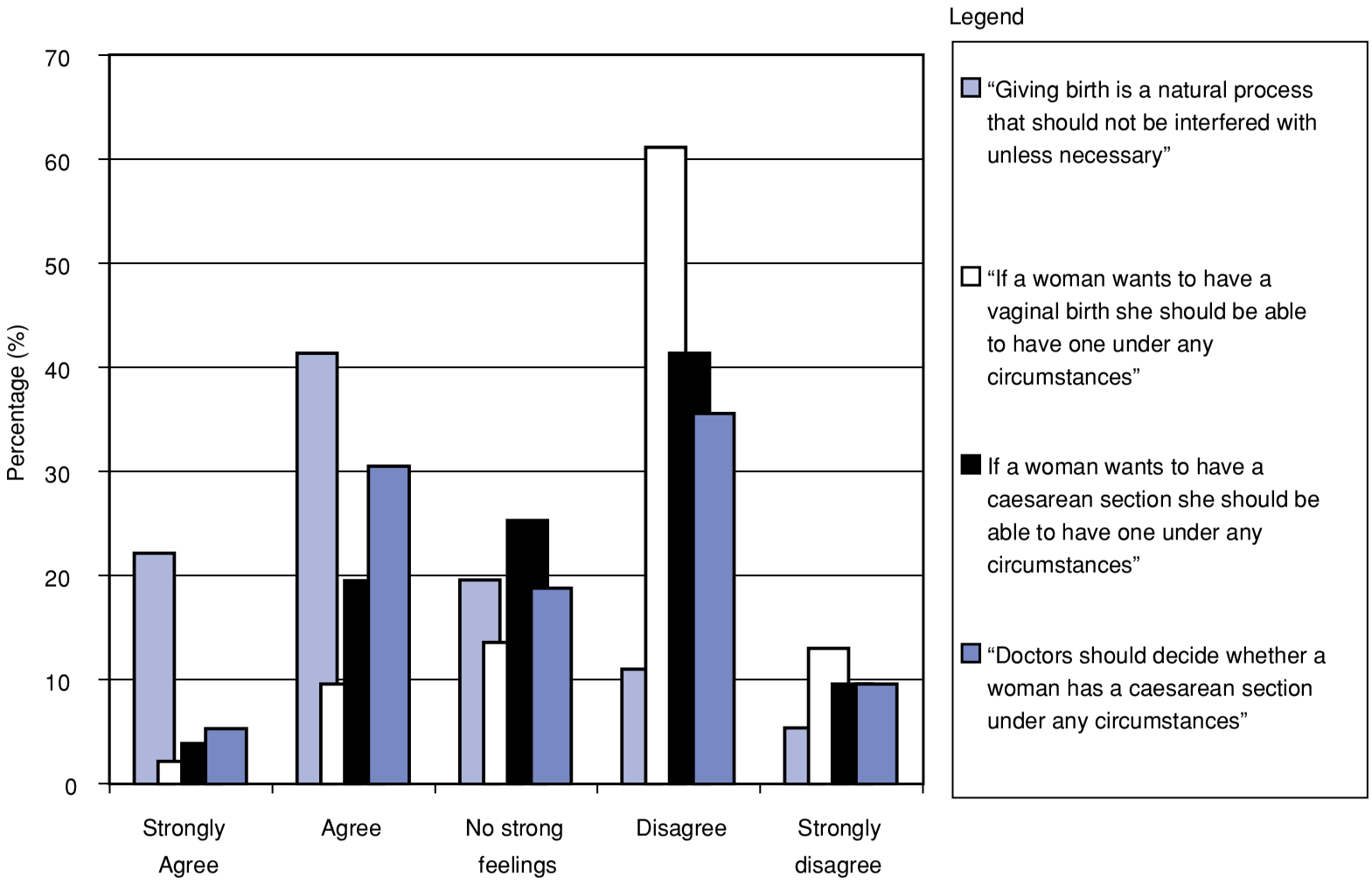

Figure 5 Maternal views on childbirth (order of legend – top to bottom – corresponds to order of columns, left to right)

Table 12.2 Maternal preferences for childbirth

	Vaginal delivery	Caesarean section	No preference dictated by medical reasons	Preference	Don't know
All women	76.2	5.3	6.5	8.7	2.5
Primigravida	75.8	3.3	10.1	6.7	3.6
Multiparous (all)	76.6	7.0	3.5	10.3	1.6
Multiparous, previous SVD only	86.1	3.2	2.9	5.3	1.3
Multiparous with previous CS	45.0	19.9	3.1	27.1	3.1
Multiparous with previous vaginal operative delivery	76.1	7.0	5.6	9.9	1.1
Multiparous with previous still birth/neonatal death	65.6	9.4	3.1	10.8	3.1
More than two years to conceive or treatment for infertility	72.3	5.9	6.4	10.1	2.7
No problems reported in current pregnancy	79.8	4.7	6.7	5.7	2.4
Pregnancy problems reported:					
placenta praevia	74.3	5.5	6.4	11.0	2.8
breech	59.7	8.2	6.6	20.9	4.1
maternal health problem	58.2	10.6	3.5	24.7	1.8
health problem with baby	69.2	1.9	7.7	17.3	1.9

Cs = caesarean section; SVD = spontaneous vaginal delivery

quick recovery and a birth that would not impede breastfeeding were also strong preferences. Most women agreed that they would like a birth that would reduce the chances of urinary incontinence. However, the potential impact of birth on future sexual function had either not been considered or did not impact strongly on the birth preferences of many women. Preferences towards aspects of intrapartum care were diverse. Feeling in control was important to most women; most also wanted a birth which was as natural as possible but most also wanted as little pain as possible. In contrast, planning the date that the baby is born was considered unimportant by most women.

Women were also asked to express their views about childbirth in general (Appendix Di q22). The range of responses from all women is given in Figure 5. Most women (63%) agreed with the statement that 'that giving birth is a natural process that should not be interfered with unless necessary'. However, there was disagreement with both statements about the right of women to choose either a vaginal birth (73%) or CS (50%) under any circumstance. Maternal views on the statement 'Doctors should decide whether a woman has a CS under any circumstances' were more widely spread: 45% disagreed, 36% agreed and 19% had no strong feelings.

Women were asked to express a preference about how they would like their baby to be born. During piloting, some women expressed the view that they had pregnancy complications (for example placenta praevia) that determined how the baby was to be born and they therefore felt unable to express a preference. As a result, this option was included in the question but it should be noted that neither the details of mode of delivery nor the underlying medical reason were collected (Appendix Di Q24).

Of all respondents, 5.3% reported a preference for a caesarean birth (Table 12.2). Multiparous women were more likely to prefer a CS in this pregnancy than primigravidae. This increase is mainly attributable to a higher preference for caesarean birth among women who have had a previous CS (19.9%). Women who reported a health problem in their pregnancy were also more likely to prefer CS.

Seven percent of women had no preference about how their baby was born. However, nearly 9% of mothers felt that their preference was dictated by medical reasons. This

Table 12.3 Maternal survey: views on childbirth in general (*n* = 2019)

Statement	Strongly disagree (%)	Disagree (%)	No strong feelings (%)	Agree (%)	Strongly agree (%)
"Giving birth is a natural process that should not be interfered with unless necessary"					
Prefer vaginal delivery	3.9	8.6	16.5	44.4	25.9
Prefer caesarean section	13.6	22.0	37.1	20.5	5.3
"If a woman wants to have a vaginal birth she should be able to have one under any circumstances"					
Prefer vaginal delivery	12.4	62.0	12.8	9.8	2.4
Prefer caesarean section	13.6	51.5	17.4	13.6	1.5
"If a woman wants to have a caesarean section she should be able to have one under any circumstances"					
Prefer vaginal delivery	10.1	43.4	25.5	17.7	2.7
Prefer caesarean section	3.0	24.2	10.6	40.2	19.7
"Doctors should decide whether a woman has a caesarean section under any circumstances"					
Prefer vaginal delivery	10.0	36.0	18.3	29.4	5.3
Prefer caesarean section	9.9	36.4	15.2	31.1	5.3

percentage was highest (27.1%) among women who had had a previous CS. For most (60%) of these women it was not possible within the data collected to identify the associated health problem. Women who had intercurrent pregnancy problems were also more likely to report that their preference was dictated by medical reasons.

As previously discussed, nearly all women strongly agreed with the statement that they would like a birth that is the safest option for their baby. Evaluating the most important factor that women considered about birth indicated that the priorities about birth varied between women who expressed a preference for CS with those who preferred a vaginal birth (Figure 6). Women who preferred a CS were more likely to place a high priority on their own safety and being as pain free as possible. Women in their first pregnancy were more likely than multiparous women (including those who had had a previous CS) to express these opinions.

Women requesting CS were more likely to disagree with the statement that birth was a natural process that should not be interfered with unless necessary and agree with a woman's right to choose to have a CS (Table 12.3). However, they also tended to agree with the right of a women to choose a vaginal birth.

The outcome of pregnancy and mode of delivery was known for 80% of these women (Table 12.1). Of the women who reported antenatally that they would prefer to deliver vaginally, 16% percent delivered by CS. Of the women who said they would prefer a CS, 60% delivered by CS. Of these, the majority (73%) were elective procedures. The median proportion of women who expressed a preference for a CS within each maternity unit was 4% (IQR: 3%, 7%).

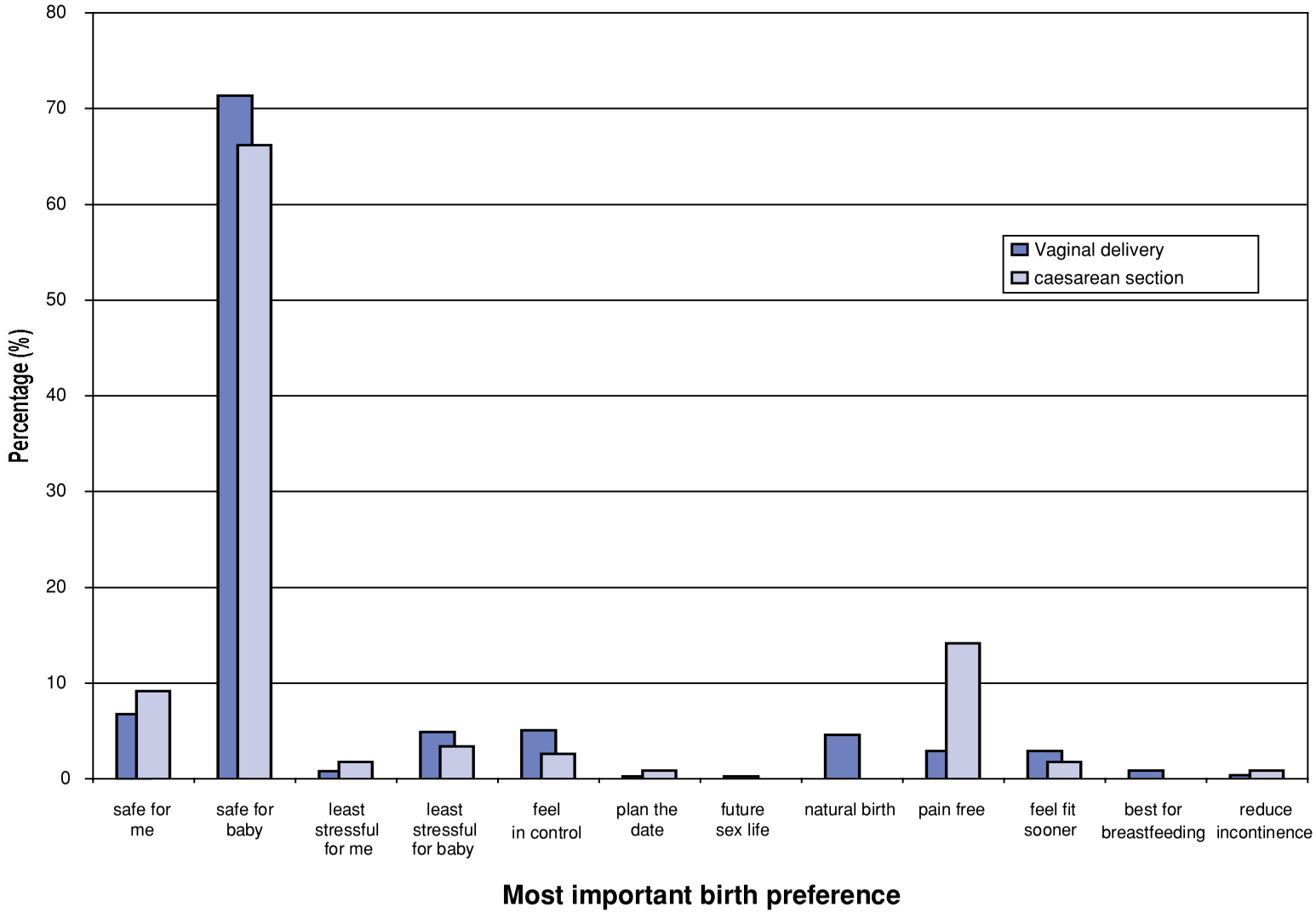

Figure 6 Maternal birth preferences by preferences about mode of delivery

13. Obstetricians' views of childbirth

13.1 Summary

- There has been a growing consensus that patients ought to be involved in their care, as this produces better health outcomes. Maternity care has led the way in this.
- It has been averred that the increase in the CSR has been an appropriate response to maternal preferences.
- Surveys of obstetricians express a higher rate of preference for CS for themselves or their partners compared with other groups.
- Surveys in the UK and Brazil have concluded that doctors under-appreciate their influence on women's decision making.
- Consultant views appear to support maternal views in decision making about mode of delivery.
- Many consultants regard a CSR of 20% as being 'too high'.
- The majority agreed that elective CS is not the safest option for the mother, although 50% thought it was the safest option for the baby.
- The majority agreed that CS results in a slower recovery but were less clear about the overall pain when compared to vaginal delivery.
- There was consensus that elective CS reduced the chances of faecal incontinence.
- On average, consultants reported that about 3% of women requested elective CS in the absence of any medical indications. These requests were agreed to in about 50% of cases. Consultants were more likely to agree if the mother was older and was in her first pregnancy.

13.2 Introduction

This chapter presents a summary of the research evidence on clinicians' views about CS. A survey of obstetricians was undertaken as part of phase two of the audit, the findings of which are presented.

13.3 Background

In all areas of medicine there is a growing consensus that patients ought to be involved in their own care and that expanding patient involvement in care produces better health outcomes.[101] In this aspect of medicine, maternity care has led the way. The *Changing Childbirth* report[80] explicitly conveyed the right of women to be involved in decisions about their care during pregnancy and childbirth. Respecting patient preferences is a fundamental goal of medicine. Decisions about health care involve not only access to evidence-based information but consideration of patients' values about their health and their attitude to risk. Increases in CS have been attributed by some as an appropriate clinical response to maternal preferences about their care.

An evaluation in the UK has shown that, while doctors are actively aware of the right for women to have choice in childbirth and to make informed decisions, there is less recognition of their own influence on patients' decision-making processes.[102] In Brazil, CSR has exceeded 35%. The increased rate has been attributed by clinicians to maternal preference and request for the procedure. However, evaluation in Brazil has also shown that doctors did not recognise the importance of their role in decisions to perform CS.[103]

There have been four surveys of obstetricians' views on mode of delivery either for themselves or their partners. These have been conducted in the UK, Ireland and the USA. The rates of preference for elective CS ranged from 7% in Ireland to 46% in the USA.[104–107] These rates are higher than those reported in maternal surveys and contrast with those reported in a survey of midwives, 96% of whom would prefer a vaginal delivery.[108]

An evaluation of differences between maternity units that had low CS and those that had higher rates revealed an important attitudinal factor was a belief and pride in a low CSR and culture of birth as a normal physiological process.[56]

The increase in CSR may reflect clinical uncertainty about the magnitude and direction of risks and benefits of the procedure in many clinical situations. CSR have been shown to vary, as have intrapartum management strategies between clinicians.[104,109,110] In addition, there are inconsistencies in decision making between clinicians and, when given the same information at different times, the same clinician may not act consistently.[111]

A number of studies have evaluated the effect of specific characteristics clinicians to see if these were associated with differences in CSR.[112–117] These characteristics have included gender, assessment of experience (e.g. age, year of graduation) quality of training or training experience (e.g. graduate of foreign university, university type), current type of practice single or group, or academic interest.

Some factors such as age and recent medico-legal claims have not been consistently shown to be associated with higher CSR. However, other factors, such as being less experienced and of male gender, are more consistently associated with higher rates of CS.

FIGO has reviewed maternal request as an indication for CS and concluded that, because no net benefit exists, performing a CS for non-medical reasons was not justified.[118] However, a survey of consultant response to maternal request for CS suggest that two out of three would agree to perform a CS for this indication.[119]

13.4 The Audit results

One hundred and sixty-two consultants from the 40 units participating in phase two responded to the questionnaire.

Of these, 15% were clinical directors, 18% were the lead clinician for the delivery suite, 28% were members of the risk management team. The median number of patients that these consultants cared for in the NHS was 600 (IQR: 425, 800).

Most (80%) consultants agreed with the statement that 'birth was a natural process that should not be interfered with unless necessary' (Figure 7). There was concurrence with the view that women's preferences were a priority in decisions regarding mode of delivery. However, consultants were more likely to agree that a woman should have a vaginal birth if she wanted than to agree that she could have a CS if she wanted one.

Consultants were asked if they thought that the CSR in their unit was too high. Fifty-one percent thought that their unit rate was too high. The median CSR in units where these consultants were based was 23.3% (IQR: 20.3%, 25.9%). In the units where the consultants did not think that the rate was too high the median rate was 19.0% (IQR: 16.6%, 20.9%).

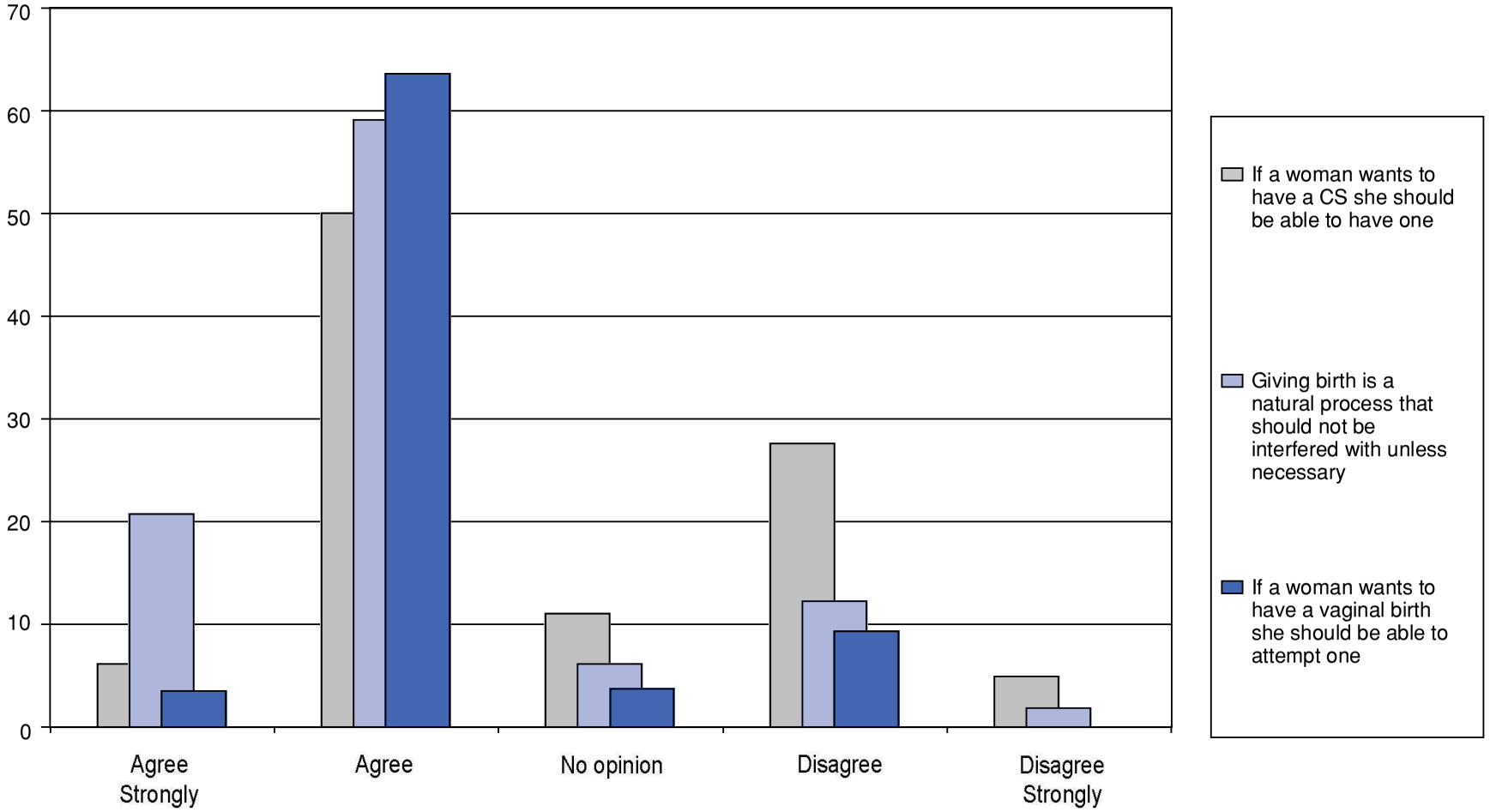

Figure 7 Clinicians' views of childbirth

Table 13.1 Clinical management

Clinical scenario	Offer elective caesarean section, *n* (%) [95 CI]	Offer vaginal delivery, *n* (%) [95 CI]
Advice given to women with uncomplicated twin term pregnancies about mode of delivery		
Both babies are cephalic	4 (2.4) [0.67, 6.2]	160 (97.6) [93.9, 99.3]
Baby 1 is cephalic and baby 2 is breech or transverse	22 (13.5) [8.6, 19.7]	141 (86.5) [80.3, 91.3]
Baby 1 is breech and baby 2 is cephalic or breech	149 (91.4) [86.0, 95.2]	14 (8.6) [4.8, 13.9]
Mode-of-delivery counsel to women with uncomplicated singleton pregnancy with cephalic presentation		
One previous CS for breech	8 (4.9) [2.1, 9.5]	154 (95.1) [89.1, 97.4]
One previousCS for fetal distress	9 (5.6) [2.6, 10.3]	153 (94.4) [89.7, 97.4]
One previous CS with failure to progress	43 (27.6) [20.7, 35.3]	114 (72.4) [64.7, 79.3]

Consultants were asked to report what, if any, CSR they considered to be 'too high'. The median rate that would be considered too high was 20% (IQR: 20%,25%).Twenty-one percent of consultants (n = 34) reported that a high CSR did not concern them. These consultants worked in 23 units.

Clinicians from 98% of units reported that CSR was audited regularly in their hospital. In most units (73%) this comprised a monthly audit meeting. In the majority (75%), this meeting included regular discussion and review of the indications for emergency CS.

All but two consultants said that they believed there was a shift in obstetric culture towards a lower threshold for performing CS.

The majority (78%) of consultants agreed that elective CS was not the safest option for the mother (Figure 8). Views on the benefits of CS for the baby were almost equally divided but, overall, the majority (51%) believed that CS was safer for the baby. Most believed that elective CS had benefits of reducing the chances of urinary (68%) and faecal incontinence (78%) and 50% believed it would least affect the mother's future sexual function. Most (87%) agreed that CS would not allow the mother to feel fit and well sooner but were more evenly divided as to whether or not there was more pain with an elective CS.

Consultants were asked about the advice they would give to women on mode of delivery in different clinical situations (Table 13.1). In managing twin pregnancies at term, there was general consensus on management strategies. Where both babies or the first baby was cephalic, the majority (97% and 86% respectively) would advise vaginal delivery and where the first twin was breech, 91% would offer a CS.

Five percent of consultants would offer an elective CS to women with uncomplicated singleton pregnancy, cephalic presentation, who had had a previous CS for breech presentation or fetal distress. Seventy-two percent would offer vaginal delivery and 28% would offer CS if the previous section was for failure to progress. In the management of women with a previous CS, again there was consensus that women who have had a CS either for breech (95%) or fetal distress (94%) should be offered a vaginal delivery. The majority (72%) would also advise vaginal delivery for women with a previous CS for failure to progress.

In concordance with guidelines, most (60%) never used pelvimetry in decision making about mode of delivery in women with a previous CS (Table 13.2). Most (91%) would advise continuous EFM during labour. There are no guidelines on the use of epidural during labour for women with a uterine scar but almost all (98%) of consultants reported that they were not against its use. There was more uncertainty about the role of induction of labour: 48% of consultants would advise against this for these women.

Consistent with the view that CS will reduce the chance of faecal incontinence, 45% of consultants considered a previous third- or fourth-degree tear that is asymptomatic to be an indication for elective CS.

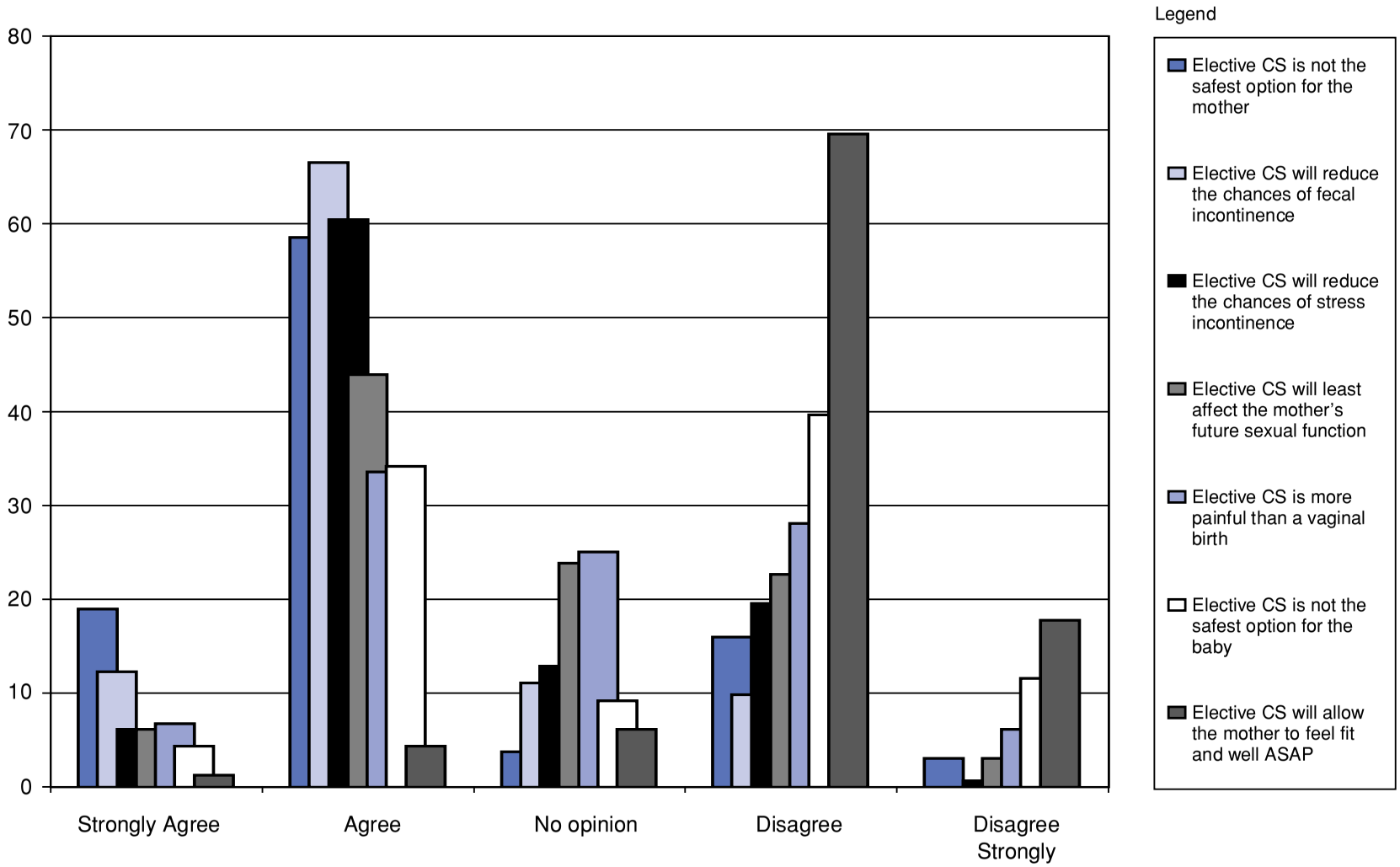

Figure 8 Clinicians' views about risks and benefits of elective caesarean section (order of legend – top to bottom – corresponds to order of columns, left to right)

Table 13.2 Clinician advice for women in labour who have had a previous caesarean section

	Yes *n* (%) [95 CI]	No *n* (%) [95 CI]
Use of pelvimetry to inform decision-making for subsequent mode of delivery in women with previous c-section (*n* = 164)		
Always	2 (1)	0.15, 4.3
Usually	6 (4)	1.4, 7.8
Occasionally	58 (35)	28.1, 43.2
Never	98 (60)	51.8, 67.3
Advise continuous electronic fetal monitoring	142 (87) [80.4, 91.4]	22 (13) [8.6, 19.6]
Advise against an epidural	3 (2) [0.37, 5.3]	161 (98) [94.7, 99.6]
Advise against induction of labour	78 (48) [39.9, 55.8]	85 (52) [44.2, 60.0]

The three most frequently mentioned complications of CS that consultants discussed with women were:

- increased risk of thromboembolism
- severe haemorrhage
- risks for subsequent pregnancies.

Ninety percent of consultants said that they discussed CS in antenatal clinic only when clinically indicated.

The reported number of requests for elective CS from women with no maternal medical, obstetric or fetal complications ranged from 0 to 20 per 100 women seen in antenatal clinic. Fifty percent of consultants reported that they received at least three requests per 100 women seen in antenatal clinic. These requests were agreed to at least 50% of the time.

Asked how they would advise women requesting CS in the absence of medical indications, most reported that they would advise vaginal delivery but accepted maternal choice for an elective CS (Table 13.3). However, consultants' thresholds for agreeing to book elective CS in this situation varied with maternal age and parity. They were less likely to agree to the CS in younger or parous women and more likely to agree in older or nulliparous women.

Table 13.3 Clinical management: response to maternal request for a caesarean section (CS) in the absence of any medical indications

	Agree to book elective CS *n* (%) [95 CI]	Recommend vaginal delivery but accept maternal choice as to vaginal delivery or elective CS *n* (%) [95 CI]	Recommend vaginal delivery and refer to a colleague for 2nd opinion *n* (%) [95 CI]	Total
25-year-old woman with no previous pregnancies	6 (3.7) [1.4, 7.9]	116 (72.1) [64.4, 78.8]	39 (24.2) [17.8, 31.6]	161
25-year-old multiparous woman with no previous CS or complicated pregnancies	5 (3.1) [1.0, 7.1]	105 (65.2) [57.3, 72.5]	51 (31.7) [24.6, 39.5]	161
42-year-old woman with no previous pregnancies	50 (30.9) [23.9, 58.6]	101 (62.4) [54.4, 69.8]	11 (6.8) [3.4, 11.8]	162
42-year-old multiparous woman with no previous CS or complicated pregnancies	10 (6.2) [3.0, 11.1]	125 (77.6) [70.4, 83.8]	26 (16.2) [10.8, 22.5]	161

Conclusion

1. This extensive audit has had good response rates and a tremendous amount of local support enabling the comprehensive presentation of a large amount of data in this report.

2. Current caesarean section rates, as well as current (clinical and organisational) practice impacting on the quality of care for women undergoing CS have been documented. Data on current practice are presented in this report and considered against appropriate auditable standards. In many important respects, the Audit provides reassurance (e.g. in clinical management to reduce morbidity in CS). In some cases, however (e.g. the use of fetal blood sampling), compliance is relatively low, suggesting that the particular issue warrants further evaluation.

3. The audit has not been about judgement of practice but about gathering essential and relevant data to inform the development of guidelines for caesarean section. The findings presented here are restricted to descriptive statistics and associations. In some areas, further evaluation is required. There is a hierarchical structure to the data collected in this audit. Data have been collected on individual women who are clustered within maternity units, which in turn are clustered within regions. The effect of maternity unit-level factors (such as availability of neonatal intensive care) on caesarean section rates will require further analysis that takes into account the hierarchical nature of the data. This is the subject of continuing work.

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Appendices

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