

Scottish Audit of the Prevention and Management of Emergencies in Labour

An audit of progress *Towards Safer Childbirth*

SEPTEMBER 2001

Audit conducted by the
Scottish Programme for Clinical Effectiveness in Reproductive Health



with supplementary data from the CSO-funded study
Workload, Staffing & Quality of Care in Scottish Labour Wards
conducted by the
Dugald Baird Centre for Research on Women's Health
Department of Obstetrics & Gynaecology, University of Aberdeen



Scottish Audit of the Prevention and Management of Emergencies in Labour
An Audit of Progress Towards Safer Childbirth

September 2001

Scottish Programme for Clinical Effectiveness in Reproductive Health



SPCERH is funded by the Clinical Resource and Audit Group of the SEHD

Further copies of this report are available from:

SPCERH, Room 66, Aberdeen Maternity Hospital, Cornhill Road, Aberdeen, AB25 2ZD

Telephone 01224 554476/552614

Fax 01224 550553

ISBN 1-902076-12-5

© SPCERH First published September 2001

CONTENTS

Acknowledgements	6
Confidentiality and Anonymity	6
Executive Summary	7
1 Background and Methods	13
1.1 Objectives of the audit	13
1.2 Audit methods	14
1.2.1 Assessing progress <i>Towards Safer Childbirth</i> through site visits and structured interviews	14
1.2.2 Appraisal of local protocols/guidelines	15
1.2.3 Assessing the management of women with selected emergencies in labour	16
2 Results	17
2.1 Assessing progress <i>Towards Safer Childbirth</i> through site visits and structured interviews	17
2.1.1 Participation	17
2.1.2 Awareness of <i>Towards Safer Childbirth</i>	18
2.1.3 Changes in response to <i>Towards Safer Childbirth</i>	18
2.1.4 Meeting <i>Towards Safer Childbirth</i> audit standards	20
2.2 Appraisal of local protocols/guidelines	40
2.2.1 Availability of protocols for key topics	40
2.2.2 Dating of protocols for key topics	42
2.2.3 Quality of the content of two local protocols	42
Postpartum Haemorrhage	42
Management of eclampsia	44
2.3 Assessing the management of women with selected emergencies in labour	45
2.3.1 Management of severe postpartum haemorrhage (PPH)	45
Illustrative cases	51
2.3.2 Continuous electronic fetal monitoring in labour (CEFM)	52
Illustrative cases	58
3 Recommendations	60
4 References	61

ACKNOWLEDGEMENTS

SAPMEL Steering Committee

Miranda Page
Gillian Penney
Ian Bashford
Sandy Buchan
Andrew Calder
Edith Hillan

Tahir Mahmood
Patricia Purton
Andrew Symon
Claire Taylor
Janet Tucker

Audit Midwives and Participating Units

Helen Colville	Aberdeen	Marie Mununga	Ninewells
Margaret Pritchard	Aberdeen	Ann Duncan	QMH
Rossana Ralston	Ayrshire Central	Beatrice Sutherland	QMH
Jan Gray	Bellshill	Mary Kirkwood	RAH
Rosemary Murphy	Bellshill	Christine White	RAH
Veronica Teague	Bellshill	Diane Mckay	Raigmore
Vi Hunter	Borders	Angela Watt	Raigmore
Margaret Hart	Caithness	Fiona Beveridge	SMMP
Fran Grainge	Cresswell	Susan Brown	SMMP
Brenda Dyer	Elgin	Ruth Morrison	SMMP
Gillian Morton	Falkirk	Sylvia Morrison	Southern Gen
Doreen Brown	Forth Park	Sally Mulholland	Southern Gen
Linda Kirk	Forth Park	Karen McIntosh	St Johns
Laura Anderson	GRMH	Linda Cunningham	Stirling
Charlotte Weir	GRMH	Mary Miller	Stirling
Jane Howie	Inverclyde	Joyce DeVenny	Vale of Leven
Maureen Millar	Ninewells	Catherine MacDonald	Western Isles

Data handling

Jane Carmichael

Additional Contributors at National Meeting

Alan Cameron

Frances Day-Stirk

Steve Walkinshaw

Report Production Team

Editors

Miranda Page, Gillian Penney

DeskTop Publishing

Jane Carmichael

CONFIDENTIALITY AND ANONYMITY

The Scottish Audit of the Prevention and Management of Emergencies in Labour was undertaken to assist colleagues in the maternity services in Scotland to assess the organisation of, and care provided in, the labour wards for which they are responsible. In the spirit of clinical audit, as a confidential, enabling, peer review exercise, individual maternity units are not identified by name in this report. Where results are presented at the level of the individual unit, each unit is identified only by a number. Staff have been informed of the number identifying their own unit. Professionals can therefore compare their own practice with the range of performance of their peer-group units.

Where individual unit results are presented, every effort has been made to reflect accurately the findings from the site visits and structured interviews. Any inaccuracies or transcription errors are entirely the responsibility of the SPCERH team, and we apologise for any that may have arisen.

EXECUTIVE SUMMARY

During 2000, SP CERH undertook a national audit to assess the extent to which the staffing, organisation and care provided in the labour wards of Scotland's 23 consultant-led maternity units met agreed standards derived from the joint RCOG/RCM publication *Towards Safer Childbirth*.

The audit comprised three principal components:

- **Site visits** and group structured interviews with members of the labour ward team in all 23 labour wards to assess the extent to which 19 agreed standards developed from the recommendations in *Towards Safer Childbirth* were being met. These standards cover four broad areas: *organisation, staffing, education & training* and *equipment*. Additional information on staffing was obtained from a separately funded *Workload, Staffing & Quality of Care* study which collected detailed data on the numbers of staff and patients in Scottish labour wards during the month of September 2000.
- Appraisal of the availability and quality of **local protocols** / guidelines for key labour ward topics.
- **Case note review** to assess the quality of care provided to individual women with each of two emergency situations in labour: severe postpartum haemorrhage and fetal heart rate abnormalities.

Site Visits

All 23 units participated.

A total of 115 staff were interviewed, including heads of midwifery, consultant obstetricians, senior labour ward midwives, obstetric registrars, core labour ward midwives and consultant anaesthetists.

In 20/23 units, at least one representative of each discipline attended.

All staff interviewed were aware of *Towards Safer Childbirth*. Staff felt that the report principally addressed 'communication and multi-disciplinary working', 'standards' and 'staffing issues'.

All but two units had made some recent changes relating to topic areas covered in *Towards Safer Childbirth*. The most common types of changes were the introduction or revision of local protocols, improvements to consultant cover of the labour ward and the establishment of forums or committees to discuss labour ward issues.

Organisation

18/23 units had a designated lead consultant obstetrician and 14/23 had a clinical midwifery manager for labour ward.

8/23 units had a labour ward forum specifically to address labour ward issues, 11 further units had a similar committee but with a broader remit. Only 3/8 labour ward forums had the full multi-disciplinary membership recommended in *Towards Safer Childbirth*.

Staffing

18/23 units had >1000 deliveries/year and fell into the *Towards Safer Childbirth* 'supervisory' category. Of these, only two units (both with >4000 deliveries) met the target of 40hrs/week labour ward cover by a consultant obstetrician with no additional commitments.

Towards Safer Childbirth recommends that consultants should conduct labour ward rounds at least twice during the day with a telephone or physical round during the evening.

According to their responses during the site visits only 5/23 units met this standard on a regular basis. The *Workload, Staffing & Quality of Care* study showed that two or more consultant rounds occurred on only 32% of labour ward days observed.

All units provided a named midwife co-ordinator for labour ward on each shift. In 17/23 units the co-ordinator would always be a 'G' grade or equivalent. In four smaller units, the midwife co-ordinator had responsibility for the whole maternity unit, not just the labour ward.

Towards Safer Childbirth recommends a midwifery staffing level of 1.15 midwives per woman in normal labour, and suggests that this target should be met on 60% of occasions. The *Workload, Staffing & Quality of Care* study showed that, after allowing for the needs of other women in the labour ward, this target was met in 68% of time periods observed. Sensitivity analysis using different staffing assumptions, suggests that Scottish labour wards have insufficient midwives to meet workload requirements between 15% and 38% of the time.

19/21 units had a designated lead consultant anaesthetist for obstetrics. All units provided 24 hour anaesthetic cover (although this was off-site at nights/weekends in four units). All units with >1500 deliveries/year had a full epidural service. Of nine smaller units, two had no service and five a 'partial' service.

Education & Training

13/23 units ran formal multi-disciplinary training on 'high risk labours' and 11/23 ran similar training on 'CTG interpretation'. In all units, junior medical staff had access to some form of training on these topics. There was less formal provision for training of midwives.

5/23 units had conducted 'fire drills' (near-to-life obstetric emergency training); four of these were multi-professional; only one unit runs such drills on a regular six-monthly basis.

All units routinely measured some of 16 recommended outcomes (eg total deliveries, DOMINO deliveries, instrumental and Caesarean deliveries, epidural rate, incidence of postpartum haemorrhage). Only four units routinely have access to the required data to measure all 16 outcomes.

Equipment

All units had the recommended number of fetal heart rate monitors. Three units did not have, or never used, a blood gas analyser.

Local protocols/ guidelines

All units had protocols in place for at least six of 15 key topics. Nineteen units had a date of compilation on all protocols and sixteen units operated a 'rolling programme' of protocol review every one to three years.

All 23 units had local protocols for postpartum haemorrhage (PPH) and eclampsia. The content of these protocols was compared in detail with the recommendations of relevant national guidelines published by SPICERH and the RCOG.

Postpartum haemorrhage

Most local PPH protocols were judged to be of high quality, with detailed coverage of all topic areas addressed in the corresponding national guideline. 14/23 local protocols included at least 80% of 40 'essential' national recommendations.

Eclampsia

Local eclampsia protocols were less comprehensive, with only 5/23 covering all topic areas addressed in the corresponding national guideline. Nine protocols included less than half of 53 'essential' national recommendations and no protocol scored more than 75%.

Case-note review

Management of severe postpartum haemorrhage (PPH)

Audit midwives identified a total of 411 cases of primary postpartum haemorrhage with an estimated blood loss of ≥ 1500 ml during a 12-month period (1/9/99 to 31/8/00). The overall rate of severe PPH was 8.4/1000 deliveries. Rates in individual units ranged from zero to 14 per 1000, suggesting differences in ascertainment. There were no maternal deaths among the cases studied.

A consultant obstetrician was alerted to the PPH in 234 (57%) of cases and a consultant anaesthetist in 141 (34%). A consultant obstetrician had 'hands-on' involvement in management in only 185 (45%) of cases, although an obstetrician of registrar grade or above was involved in 347 (84%) cases. A 'senior' midwife was involved in 342 (83%) cases.

An intravenous line was sited during the management of all 411 cases, although the recommended two or more lines were sited in only 229 (56%).

Cross-matching of blood was undertaken during the management of 335 (81%) cases, but only 106 (26%) were cross-matched for the recommended six units or more.

Urine output was monitored by use of an indwelling Foley catheter in 380 (92%) of cases and output was monitored at least hourly in 299 (73%). Pulse and blood pressure were monitored continuously in 247 (60%) cases but a central venous pressure line was sited in only 25 (6%). Moreover, only 17/26 (65%) of women with an estimated blood loss of >4000 ml had a CVP line inserted.

Oxytocic drugs (additional to those used for third stage prophylaxis) were used in the management of 358 (87%), the most commonly used agent being syntocinon by infusion. Intramyometrial carboprost was used in 22 cases and hysterectomy in eight.

The care of 368 (90%) of the 411 cases met at least nine of 12 key criteria for good quality care based on the recommendations in the national, SOGAP guideline. However, all 12 criteria were met in only 24 (6%) cases.

Continuous electronic fetal monitoring in labour (CEFM)

Appropriate selection for CEFM

Audit midwives reviewed the case records of 1561 women delivering in consultant-led labour wards between 11th and 24th September 2000. Of these, 1168 (75%) underwent continuous electronic fetal monitoring (CEFM) in labour.

1017/1561 (65%) women had one or more documented antenatal or intrapartum risk factors which were considered to warrant CEFM in labour. Of these, 924 (91%) had CEFM and 93 (9%) were monitored intermittently.

The remaining 544 women (35%) had no documented risk factors. CEFM may be unnecessary or inappropriate for such women. Of these, 244 (45%) had CEFM and 300 (55%) were monitored intermittently.

On the basis that CEFM is appropriate for all women with documented risk factors and inappropriate for those without, 1224/1561 (78%) of women were monitored appropriately.

Appropriate response to CEFM abnormalities

Of the 1168 women who underwent CEFM, 881 (75%) had at least one 'CTG abnormality' documented in their clinical notes. 'Severe CTG abnormalities' (based on FIGO criteria) were documented in 299 women (26% of all with CEFM). 'Repetitive, prolonged decelerations' was the commonest severe abnormality, occurring in 127 women; followed by 'bradycardia, baseline <100 beats/min' which occurred in 77 women.

Following documentation of a 'severe CTG abnormality', the midwife acting as primary caregiver first sought advice from a more senior midwife in 171 cases (57%). In 116 cases (39%) the caregiver midwife sought advice directly from medical staff. In only 12 cases (4%) was there no record of referral to a senior colleague. When midwife-medical staff referral occurred, this was usually to a 'middle grade' trainee (SHO3 or SpR) (213 cases, 71%). Referral to a junior SHO seldom occurred (35 cases, 12%).

Among the 299 women with 'severe CTG abnormalities', a total of 29 (10%) appear to have been managed by midwives without any medical referral. Medical staff of various grades were involved in the care of the remaining 270 women. A consultant was involved in only 63 cases (23%).

For women with a severe CTG abnormality, an obstetrician of registrar grade or above was involved in 193 (65%) cases. In 82 (43%) of these 193 cases, a registrar or more senior obstetrician was already involved in patient care before the onset of a severe abnormality. For the remaining 101 cases, a registrar or above was involved within one hour in 77 (70%) cases, and within two hours in 92 (91%).

Fetal blood sampling was undertaken in only 57 (19%) of the 299 cases with a 'severe CTG abnormality'. Excluding women with an undilated cervix at the time of the CTG abnormality and those who delivered within 30 minutes of the abnormality arising, fetal blood sampling was performed in 24% of cases.

Recommendations for consultant-led labour wards in Scotland

The following 10 recommendations are based on the findings of the SAPMEL audit and take account of the views expressed by over 100 representatives of Scottish maternity units at a feedback meeting held in Glasgow in June 2001. The SAPMEL audit team endorses the 12 recommendations made in Towards Safer Childbirth and the 27 principles outlined in the Framework for Maternity Services in Scotland. Only those where there is evidence of scope for substantial improvement in Scottish maternity services are re-iterated here. Our recommendations reflect the evolution of intrapartum care from a consultant-led to a consultant-based service. Increasingly, clinical leadership, diagnosis and opinion will require the experience of a consultant.

1 All labour wards with >1000 deliveries per year should aim to provide a consultant-based service with the '40 hour working week' covered by a consultant obstetrician with no other duties or commitments. In the light of current consultant numbers, it is recommended that, initially, this target should be met by units with >2000 deliveries per year. It is acceptable, though not ideal, for the labour ward consultant to provide cover for gynaecological emergencies on the same hospital site. It is also acceptable for some sessions of senior labour ward cover to be provided by an appropriately experienced career-grade obstetrician (eg staff grade or associate specialist) in units where such doctors are already in post.

2 Labour ward rounds, led by a consultant obstetrician, should routinely be undertaken at least twice during each working day, with a telephone or personal 'round' each evening. The style of labour ward round should be appropriate for the size and case-mix of the unit, but should always include

discussion with other members of the labour ward team and personal visits to those patients requiring obstetric care.

3 An increase in, and reorganisation of, midwifery staffing is required in order that all women in the labour ward have access to a level of midwifery care appropriate to their needs. The case-mix of the unit, particularly with regard to the proportion of high dependency patients, must be considered in planning staffing levels. Many patients in the labour ward require a level of midwifery care higher than the one-to-one care recommended for women in normal labour.

4 As a minimum, all units should be able to offer regional anaesthesia to women requiring operative delivery. Ideally, a full epidural service for women in labour should be available.

5 All units should institute formal, regular, mandatory, multi-professional training in interpretation of cardiotocograph tracings and in the management of high-risk labours. Training should include 'fire drills' – near-to-life simulated emergency situations, ideally provided on a six-monthly basis.

6 Local obstetric database systems should be improved so that a recommended range of outcome indicators can routinely be collated and reported. Units should work towards a common, national system of local data collection that permits linkage of maternal and neonatal information.

7 All units should adopt a 'rolling programme' of regular update and revision of local protocols for key topics. Protocols should be comprehensive, developed by multi-disciplinary groups and based on relevant national guidance, where available. The agreed local protocols should be used, in full, when managing obstetric emergencies including severe postpartum haemorrhage.

8 Local protocols for emergencies and potential emergencies should include guidance on lines of referral to senior colleagues that are appropriate for the staffing structure of the unit. Midwives caring for individual women should involve the midwifery labour ward co-ordinator. Midwife-to-obstetrician referral should usually be to a trainee of SpR-level experience. Increasingly and reflecting the move to a consultant-based service, the labour ward consultant should be alerted to all emergencies and potential emergencies, including severe postpartum haemorrhage and serious CTG abnormalities.

9 The obstetric anaesthetist is a key member of the labour ward team and should be involved early in emergency situations such as severe fetal distress and major PPH – where decisions about transfer to ITU or invasive monitoring may be required.

10 Continuous electronic fetal monitoring should be used selectively, rather than routinely, in labour. When appropriate, abnormal CTG tracings should be investigated by means of fetal blood sampling before recourse to operative delivery.

Summary of audit standards

The 19 audit standards developed by the SAPMEL Steering Group from the recommendations in *Towards Safer Childbirth* were as follows:

- 1 All labour wards should have a lead consultant obstetrician and clinical midwife manager.
- 2 There should be a multidisciplinary labour ward forum to review labour ward activity and develop guidelines, comprising, at a minimum:
 - Lead obstetrician
 - Clinical midwife manager

- Obstetric anaesthetist
 - Neonatal paediatrician
 - Risk manager
 - Representatives of junior medical and midwifery staff
 - Consumer representative from the Maternity Services Liaison Committee
- 3 A minimum consultant supervision for the labour ward should be 40 hours, unless the unit delivers <1000 babies / year.
 - 4 Junior staffing levels will depend on available training opportunities.
 - 5 The consultant covering the labour ward should conduct labour ward rounds at least twice during the day, with a telephone or physical round during the evening.
 - 6 Midwifery staffing levels should provide 1.15 midwives per woman in normal labour.
 - 7 There should be a clinical midwife leader (experienced midwife) available on each shift.
 - 8 Units should use a workload analysis tool to determine the required midwifery staffing level and skill mix in relationship to the workload activity case mix and service provision.
 - 9 At least one consultant anaesthetist should have a major interest in obstetric anaesthesia and intensive care of the pregnant woman and devote a large part of the working week to obstetrics.
 - 10 There should be one consultant anaesthetist (notional half day) per 500 deliveries for units <3000/year and full cover for larger units to assist teaching the trainees and provide support for them.
 - 11 Anaesthetic cover must be immediately available throughout the 24 hours and the anaesthetist involved must have more than one year of experience in anaesthesia.
 - 12 Women should have available an epidural pain relief service and both regional and general anaesthesia for operative delivery.
 - 13 Women under going elective procedures should be seen by the anaesthetist prior to surgery.
 - 14 Six monthly multidisciplinary in-service education/training sessions on the management of “high risk” labours and CTG interpretation should be attended by all clinicians. A logbook of attendances should be kept.
 - 15 Midwives have an increasing role in teaching and mentoring junior doctors.
 - 16 All units should have three monthly obstetric emergency “practice runs”, comprising decision to delivery interval, patient collapse and major haemorrhage.
 - 17 16 described outcome measures should be adopted and audited annually.
 - 18 Between 2 to 4 fetal heart rate monitors per 1000 deliveries a year is considered appropriate. This would include at least one instrument capable of monitoring twins.
 - 19 The ability to assess fetal blood gases by modern, easily used equipment should be available in any unit undertaking continuous fetal heart rate monitoring. Ideally the blood gas analyser should be able to measure pH, pO₂, pCO₂

Scottish Audit of the Prevention and Management of Emergencies in Labour (SAPMEL)

1. Background and Methods

The Scottish Audit of the Prevention and Management of Emergencies in Labour (SAPMEL) has been conducted by the Scottish Programme for Clinical Effectiveness in Reproductive Health (SPCERH). This Programme was instituted in September 1997 in order to undertake a range of audit, guideline and educational activities with the overarching goal:

‘to improve health outcomes for women and their families throughout Scotland by promoting more uniform standards of high quality, evidence-based reproductive healthcare.’

The aim of the SAPMEL audit was :

‘to assess the extent to which the staffing, organisation and care provided in the labour wards of Scotland’s 23 consultant-led maternity units meet agreed standards derived from the joint RCOG / RCM report *Towards Safer Childbirth*.

SAPMEL complements our 1998 audit *Maternity Care Matters*¹, which sought to establish the extent to which recommendations made in two Scottish Executive Health Department (SEHD) reports, *Provision of Maternity Services in Scotland*² and the *CRAG/SCOTMEG Working Group on Maternity Services*³ had been adopted. *Maternity Care Matters* focused primarily on the provision of woman-centred care, particularly for ‘low risk’ women. SAPMEL, our second maternity audit, examines technical aspects of intrapartum care and, in particular, high-risk obstetric care, through an examination of the organisation of, and care provided in, Scotland’s 23 consultant-led labour wards.

This shift in focus was prompted by a number of recent publications from authoritative, national bodies that raised concerns about the care of women in labour. These documents include the report *Towards Safer Childbirth* jointly produced by the RCOG and RCM⁴, the fourth and fifth Annual Reports of the Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI)^{5,6} and the two most recent triennial reports of the Confidential Enquiry into Maternal Deaths (CEMD)^{7,8}. The CESDI fourth report found aspects of sub-optimal care in relation to 77% of intrapartum-related deaths studied. Seventy percent of comments about sub-optimal care related to labour and delivery. The recommendations in *Why Mothers Die*, the most recent CEMD report, also focus on intrapartum care and, like the CESDI report, highlight structural and organisational deficiencies in labour wards. *Towards Safer Childbirth* was a response to the CESDI and CEMD reports and a successor to the RCOG’s own publication *Minimum Standards of Care in Labour* (1994).⁹ *Towards Safer Childbirth* examines the organisation of labour wards and sets standards for the safe care of women in labour.

The standards examined in the SAPMEL audit are derived primarily from *Toward Safer Childbirth*, while also drawing on other contemporary national guidance documents. In particular, we endorse the principles outlined in the recent *Framework for Maternity Services in Scotland*¹⁰ that relate to labour ward care.

1.1 Objectives of the audit

A multidisciplinary Steering Group was convened and agreed the following specific objectives for SAPMEL:

1) To agree audit criteria or standards derived from the recommendations in *Towards Safer Childbirth* and other national guidance documents covering the following:

- Labour ward organisation
- Topics for which local protocols should be available
- The contents of such protocols
- Care of women with selected emergencies in labour

- 2) To design audit tools to measure the extent to which these standards are being met in Scottish labour wards. The selected audit tools comprised:
 - Structured interview schedule for health care professionals
 - Checklist for review of local protocols against national guidance
 - Case note review proformas for assessing care provided to women with each of two emergency situations in labour.
- 3) To assess the organisation of, and care provided in, Scottish labour wards using the chosen audit tools.
- 4) To analyse and summarise the findings.
- 5) To report back to relevant professionals on the extent to which the agreed standards have been met and to make recommendations for any necessary changes in labour ward staffing, organisation and practice.

1.2 Audit Methods

The audit comprised three principal components:

1.2.1. Assessing progress *Towards Safer Childbirth* through site visits and structured interviews

The SAPMEL Steering Group agreed 19 'auditable standards' developed from the standards and recommendations in *Towards Safer Childbirth*. These addressed four broad aspects of labour ward management:

- Organisation
- Staffing
- Education and Training
- Equipment

The extent to which these 19 standards were met in Scotland's labour wards was assessed through group structured interviews with key members of labour ward teams. During a series of site visits, interviews were conducted in each of the 23 consultant-led labour wards in Scotland. In each unit, the clinical director for maternity services and the head of midwifery were contacted for initial agreement to the study and to arrange for a representative group of the 'labour ward team' to be involved in the group structured interview. The suggested personnel were:

- Head of midwifery
- Clinical midwifery manager for labour ward
- Lead consultant obstetrician for labour ward
- Lead consultant obstetric anaesthetist
- Core labour ward midwife
- Obstetric registrar

The SPCERH team undertook visits to all 23 maternity units during the months of March -July 2000. The research midwife, Miranda Page, attended 22 visits, accompanied on 13 visits by a member of the SAPMEL Steering Group. Two members of the Steering Group visited the remaining unit.

Every effort was made to ensure objectivity and consistency of approach during the visits by:

- using a structured proforma
- having the same member of the team visit all units (bar one)
- having an additional member of the team jointly visit units wherever possible.

Following each site visit, the completed structured interview schedule was returned to the Head of Midwifery. This gave staff the opportunity to review the report from the site visit and to confirm that it represented an accurate account of the discussions that took place. The findings from the group-structured interviews were then collated and tabulated.

Supplementary information from CSO-funded study, 'Staffing, Workload and Quality of Care in Scottish Labour Wards'

During the month of September 2000, detailed data were collected on staffing and workload in all 23 Scottish labour wards through a separately funded study undertaken in collaboration with the SAPMEL team. Detailed information on the number and dependency level of women in the labour ward, midwives working in the labour ward and the presence of obstetric staff was collected for each six hour period over 28 days. Complete data were collected for 99% of the designated time periods, amounting to 2576 separate six-hour observation periods. The findings of the *Staffing & Workload* study will be reported in full separately, but relevant data on midwifery and obstetric staffing of labour wards are included in this Report.

1.2.2. Appraisal of local protocols / guidelines

Towards Safer Childbirth made recommendations on the availability of dated local guidelines/protocols. The SAPMEL Steering Group agreed 15 key topics (based on recommendations from the CESDI and CEMD reports, as indicated below). It was agreed that all labour wards should have in place protocols addressing each of these 15 topics. In the course of the site visits, an assessment was made of the number of these 15 protocols that were available in each labour ward:

- 1 Management of pre eclampsia and eclampsia (CEMD)
- 2 Management of obstetric haemorrhage (CEMD)
- 3 Use of antibiotics for Caesarean Section (CEMD)
- 4 Use of thromboprophylaxis (CEMD)
- 5 Management of women who decline blood products (CEMD)
- 6 Management of genital tract sepsis (CEMD)
- 7 Documentation of risk factors identified antenatally (CESDI 4th and 6th report)
- 8 Management of shoulder dystocia (CESDI 5th report)
- 9 Fetal heart rate monitoring during labour (CESDI 4th report)
- 10 Management of fetal heart rate abnormalities (CESDI 4th report)
- 11 Management of women with previous Caesarean Section (CESDI 5th report)
- 12 Management of induction and augmentation of labour (CESDI 5th report)
- 13 Management of cord prolapse (Steering Group)
- 14 Adult resuscitation (Steering group)
- 15 Neonatal resuscitation (CESDI 4th report)

Content of local protocols

In addition to quantifying the availability of local protocols/guidelines, as outlined above, an attempt was made to assess the quality of protocols for two key topics. For each of these selected topics, a relevant national guideline was available. The content of local protocols was appraised against a checklist summarising the recommendations in the relevant national document.

Postpartum Haemorrhage local protocols were assessed against the Scottish Obstetric Guidelines and Audit Project (SOGAP) guideline, *The Management of Postpartum Haemorrhage*.¹¹ Eclampsia local protocols were assessed against the RCOG 'greentop' guideline No.10, *Management of Eclampsia*.¹²

1.2.3. Assessing the management of women with selected emergencies in labour

The care received by individual women was assessed by means of case note review. Two emergency situations were selected for this component of the audit in order to reflect risks to the two patients involved in every labour – the mother and the infant.

Management of severe postpartum haemorrhage (PPH)

This emergency was chosen to represent a labour ward situation where the life of the mother is at risk. The aim was to assess the management of severe primary postpartum haemorrhage (PPH) against auditable standards derived from the SOGAP guideline on PPH.¹¹

A retrospective casenote review (1st September 1999 to 31st August 2000) was undertaken of all women with a PPH with estimated blood loss ≥ 1500 ml within the first 24 hours after delivery. Cases were identified from women who delivered in, or were subsequently managed in, one of Scotland's 23 consultant-led labour wards.

A data extraction form was compiled based on the audit dataset within the SOGAP guideline supplemented by recommendations from the SAPMEL Steering Group.

Continuous electronic fetal monitoring in labour (CEFM)

This emergency was chosen to represent a labour ward situation where the life of the infant is at risk. The aim was to assess the use and interpretation of continuous electronic fetal monitoring (CEFM) by means of cardiotocography (CTG) against standards derived from guidance from FIGO¹³ and the RCOG.¹⁴

This component of the audit addressed two key questions:

- 1 Are women appropriately selected for CEFM?
- 2 Are any abnormalities that arise during CEFM appropriately managed?

A prospective casenote review was undertaken of all women (excluding elective Caesarean section, multiple births and antepartum stillbirths) who delivered in the 23 consultant-led labour wards (excluding attached midwifery-led units) during a two-week period from 11th September to 24th September 2000 inclusive.

The Steering Group approved data extraction forms for both the PPH and CEFM topics. Volunteer audit midwives based in all 23 consultant-led units undertook data extraction. To help ensure consistency of the data extraction process, all these midwives attended a one-day training course on completion of audit forms. Completed forms were forwarded to the SPCERH Aberdeen office for data entry and analysis.

2. Results

2.1 Assessing progress *Towards Safer Childbirth* through site visits and structured interviews

2.1.1. Participation

- All 23 units agreed to participate.
- In total, 115 staff were interviewed:
 - 29 heads of midwifery and/or clinical managers
 - 23 lead consultant obstetricians
 - 22 consultant anaesthetists
 - 30 midwives ranging from G to E grades
 - 11 obstetric registrars
- 20 units had at least one representative from each profession
- 23 units had the lead consultant obstetrician
- 20 units had a consultant anaesthetist
- 23 units had the head of midwifery and/or clinical manager
- 20 units had a core labour ward midwife/senior midwife
- 11 units had an obstetric registrar

Table 1 Staff present at interview

Hosp.	Head MW	Cons. Obs.	Cons. Anaes.	Clinical LW manager	Core LW MW	Obs. SpR	Other	Total
1	0	1	1	1	1	1		5
2	0	1	1	1	1	0		4
3	0	1	1	1	1	1		5
4*	1	1	0	0	2	0		4
5	1	1	2	0	1	0		5
6	1	1	1	1	1	0	1	6
7	1	1	0	0	2	0		4
8	1	1	1	1	1	0	2	7
9	1	1	1	0	2	1		6
10	0	1	1	1	0	0		3
11	1	1	1	0	2	0		5
12	1	1	1	1	1	1		6
13	1	1	0	1	1	1		5
14	0	1	1	1	1	1		5
15	0	1	1	1	1	1		5
16	1	1	1	0	1	0		4
17	1	1	1	0	2	0	1	6
18	0	1	1	1	0	0		3
19	0	1	1	1	1	1		5
20	1	1	1	1	0	1		5
21	1	1	1	0	2	1		6
22	1	1	1	0	1	1		5
23	1	1	2	1	1	0		6
TOTAL	15	23	22	14	26	11	4	115

* In Unit 4 the number of staff present was reduced due to an error on the part of the SP CERH team. The team visited on a day other than that scheduled and available staff very kindly agreed to be interviewed at very short notice.

2.1.2. Awareness of *Towards Safer Childbirth*

The first two questions asked during the group interviews addressed staff awareness of *Towards Safer Childbirth* and their perceptions of the topic areas of its recommendations.

- All present at the interviews were aware of *Towards Safer Childbirth*
- 6 units reported that Heads of Midwifery and Consultants had received individual copies
- 11 units commented that consultant anaesthetists had not received individual copies
- 4 units said that it was easy to obtain further copies
- 5 units said they found difficulties in obtaining further copies
- 10 units said they had disseminated information down to ward areas
- 2 units said they had held presentations on *Towards Safer Childbirth*

Staff were then asked to summarise, in a few words, their perceptions of the main themes of *Towards Safer Childbirth*. Twelve themes emerged, as listed below with an indication of the number of units at which each was mentioned.

Table 2 Staff perceptions of themes in *Towards Safer Childbirth*

	Theme of recommendations	No. of units that mentioned theme
1	Communication/multidisciplinary working eg "Communication between disciplines"	15
2	Standards eg "Gives a framework for the care of labouring women"	13
3	Staffing issues eg "Ensuring adequate staffing both medical and midwifery"	13
4	Miscellaneous	12
5	Safety	10
6	Negative responses eg "Seen as an English document, introduced to address inadequate standards in England & Wales" "Idealistic, commendable but not achievable"	10
7	Protocols/guidelines	8
8	Consultant cover	7
9	Organisational structure	7
10	Clinical governance	6
11	Equipment	4
12	Midwifery practice	3

2.1.3. Changes in response to *Towards Safer Childbirth*

During the structured interviews, staff were asked if they had made any changes to the organisation of their labour ward in the light of *Towards Safer Childbirth*. All but two units (Nos. 4 and 21) reported recent changes in labour ward organisation which reflected the topic areas addressed in *Towards Safer Childbirth*. In most cases, changes had been instigated as a direct response to *Towards Safer Childbirth* though, in some instances, staff indicated that the report had served to validate changes already underway. The main areas

of change were in protocols and guidelines, the provision of consultant cover and in the establishment of multidisciplinary committees. Reported changes are summarised in Table 3 below.

Table 3 Areas of changes in labour ward organisation reported by staff

Unit	CHANGES*								
	1 protocols	2 forum	3 committee	4 training	5 cover	6 rounds	7 staffing	8 statistics	9 equipment
1	✓					✓			
2		✓			✓				
3	✓				✓		✓		
4									
5	✓			✓				✓	
6				✓	✓				
7	✓								
8	✓			✓					
9		✓			✓				
10		✓							
11	✓		✓						✓
12	✓				✓		✓		
13	✓			✓	✓				
14		✓							
15				✓					
16	✓	✓		✓	✓		✓	✓	
17	✓	✓		✓	✓				✓
18					✓		✓		
19			✓		✓	✓			
20					✓				
21									
22	✓			✓					
23	✓								
Total	12	6	2	8	11	2	4	2	2

***Key to changes described**

1. Introduction/updating of local protocols/guidelines
2. Establishment of labour ward forum
3. Establishment of multidisciplinary committee with broader remit but encompassing LW issues
4. Training issues
5. Changes to arrangements for consultant cover of LW
6. Changes to arrangements for consultant rounds in LW
7. Changes to staffing levels of other grades/disciplines
8. Changes to routine collection and presentation of LW statistics
9. New equipment

Barriers to change

The teams were then asked if they could identify any barriers that may have inhibited changes that they wished to make. Six main themes emerged and are listed below.

Table 4 Barriers to change described by labour ward teams

Barriers mentioned	No. of units
Size of unit	13
Staffing structure and training	9
Finance	8
Staffing levels	4
Reorganisation of trusts	3
Time	3

2.1.4. Meeting Towards Safer Childbirth Audit Standards

Further questions were designed to assess the extent to which 19 audit standards developed from the standards and recommendations in *Towards Safer Childbirth* were being met in the individual units. Audit findings are presented in relation to four broad areas, reflecting the content of these standards:

- Organisation
- Staffing
- Education and Training
- Equipment

Organisation

Audit Standard 1

All labour wards should have a lead consultant obstetrician and clinical midwife manager.

18/23 units had a designated lead consultant obstetrician with responsibility for labour ward

14/23 units had a clinical midwifery manager for labour ward

Audit Standard 2

There should be a multidisciplinary labour ward forum to review labour ward activity and develop guidelines, comprising, at a minimum:

- Lead obstetrician
- Clinical midwife manager
- Obstetric anaesthetist
- Neonatal paediatrician
- Risk manager
- Representatives of junior medical and midwifery staff
- Consumer representative from the Maternity Services Liaison Committee

Of the 23 units, eight had a labour ward forum specifically set up to address labour ward issues. Of the remaining 15 units, two were in the process of setting up a forum and 12 had similar committees where labour ward issues could be raised but were not the only focus. Therefore, 22 units had, or were establishing, formal committees that address labour ward issues. Only one unit had no formal mechanism for raising such issues. Of the units that had labour ward forums, only three had the full membership recommended in *Towards Safer Childbirth* and of those, two had additional members over and above the recommended minimum. Information on labour ward forums / committees is summarised in Figure 1 and Table 5.

Figure 1 Number of units with LW forum or similar committee

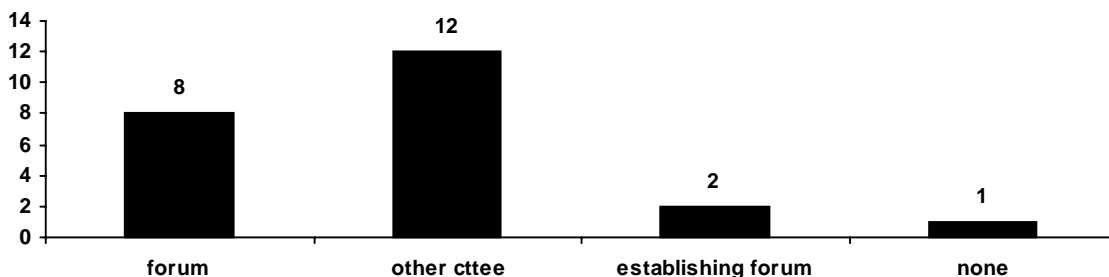


Table 5 Existence of labour ward forum or similar committee by individual maternity unit

Unit	LW forum	Incomplete membership	Full membership	Full membership +	No, but similar committee	No/nothing
1					✓	
2	✓	✓				
3					✓	
4					✓	
5						✓
6					✓	
7					✓	
8					✓	
9	✓		✓			
10	✓			✓		
11					✓	
12					✓	
13	✓*	✓*				
14	✓*	✓*				
15	✓	✓				
16	✓			✓		
17	✓	✓				
18	✓	✓				
19	✓	✓				
20					✓	
21					✓	
22					✓	
23					✓	
Total	8+2*	5+2*	1	2	12	1

* Units that are setting up forums

Audit Standard 3

A minimum consultant supervision for the labour ward should be 40 hours, unless the unit delivers <1000 babies / year.

Audit Standard 4

Junior staffing levels will depend on available training opportunities.

Scotland's 23 consultant-led maternity units are listed in Figure 2 and in Table 6 overleaf, arranged according to size. Units are grouped by size to reflect the level of consultant labour ward cover recommended in *Towards Safer Childbirth*. The recommendations are briefly summarised here:

Category of Unit	Recommended consultant cover arrangements
'A' (<1000 deliveries/year)	'Available' - consultant available in the hospital, but may have other commitments
'B' (1000 - 4000 deliveries/year)	'Supervisory' - 40 hours /week of set consultant sessions in LW. No other commitments on consultant's work plan
'C' (>4000 deliveries/year)	'Supervisory' - aiming for 'Full Cover' - 24 hour consultant involvement in the LW with no other commitment

Information on total obstetric staffing complement, as reported by Clinical Directors during the group-structured interviews is shown in Table 6. Table 7 summarises the grades of staff providing cover for the labour ward during the Monday-Friday, 9.00 to 5.00 working week. The extent of additional commitments being undertaken while covering the labour ward is also shown.

Figure 2 The 23 consultant-led units in Scotland by 'consultant cover category'

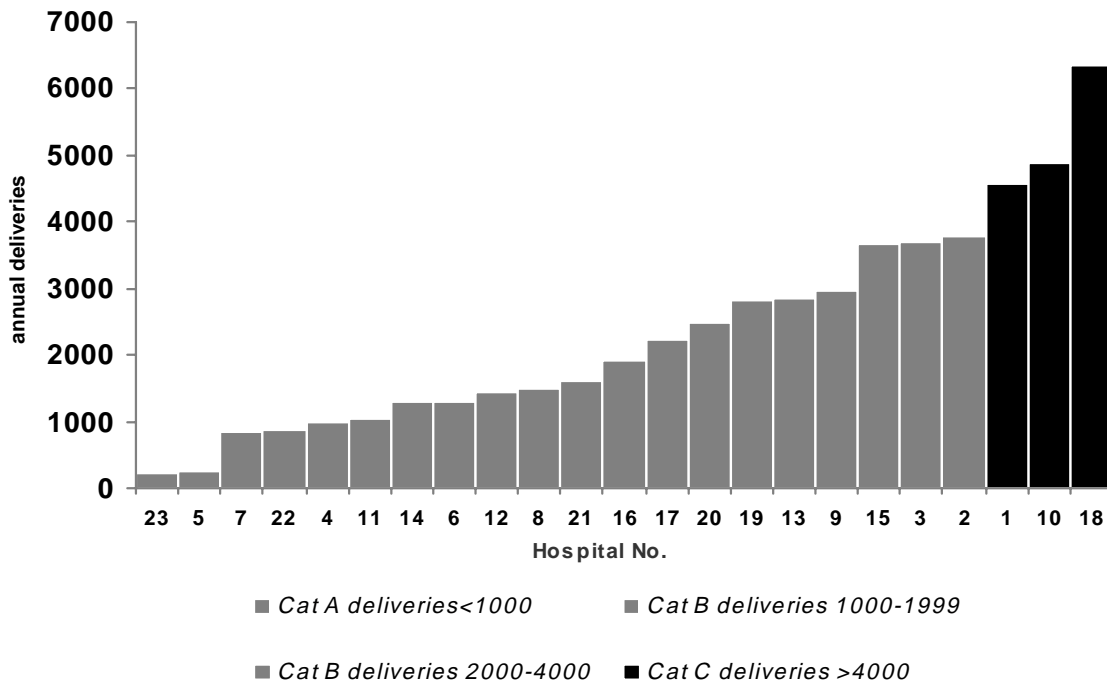


Table 6 Obstetric staffing complement in Scotlands 23 consultant-led maternity units grouped by size category

Unit	Obstetric Complement						
	Consultant	Associate specialist	Staff grade	SpR4-5	SpR 1-3	SHO3	SHO
	Available <1000 deliveries/year						
4	4	1			2	1	4
5	3						
7	3	1					4
22	3		2			3	4
23	2						1
	Supervisory 1000-1999 deliveries/year						
6	5	1	1		3		5
8	4	1			1	3	4
11	3	1	1		1	2	4
12	4		2			3	3
14	3 + 1 nights		1		2		4
16	5	1	1		2	1	5
21	4		1		1	3	4
	Supervisory 2000 - 2999 deliveries/year						
9	8	1			1	7	9
13	9		1	4	3	3	6
17	5		1		2	3	7
19	9		1	2	3	8	15
20	5		1		2	2	4
	Supervisory 3000 - 3999 deliveries/year						
2	9	1	2	1	2	3	12
3	7 + 1 pt			2 post ccst	2	5	7
15	7			2	3	5	8
	Supervisory (Full Cover) >4000 deliveries/year						
1	13			5	5	3	7
10	13.5			2.5	7	7	16
18	12	0.5		6.5	5	2	16

Table 7 Obstetric cover Monday-Friday 9am-5pm

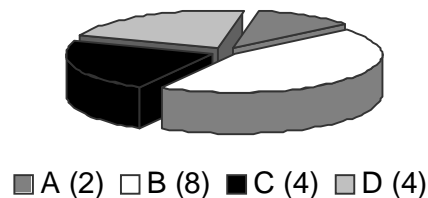
(For each grade of staff, **tick** indicates their clinical responsibilities. 'P' indicates that an obstetrician of that grade is available exclusively for labour ward cover for only **part of** the 10-session week)

Obstetric cover Monday to Friday 9am - 5pm

Weekday cover Unit	Consultant			Middle grade/s			SHO		
	LW	Plus gynae emergencies	Fixed commitments	LW	Plus gynae emergencies	Other resps.	LW	Plus gynae emergencies	Other resps.
Available <1000 deliveries/year									
4	P					✓		✓	
5			✓						
7	P			P			P		
22			✓		✓		✓		
23			✓					✓	
Supervisory 1000 - 1999 deliveries/year									
6			✓		✓			✓	
8			✓	✓					✓
11	P				✓		✓		
12		✓			✓				✓
14	P				✓			✓	
16	P					✓		✓	
21			✓		✓	✓			✓
Supervisory 2000 - 4000 deliveries/year									
2		✓			✓		✓		
3	P			✓			✓		
9		✓		✓			✓		
13			✓		✓		✓		
15		✓		✓			✓		
17		✓			✓		✓		
19		✓		SpR 1-2 or SHO3	SpR 4-5		✓		
20		✓			✓			✓	
Supervisory (Full Cover) >4000 deliveries/year									
1		✓		SpR 1-2 or SHO3	SpR 4-5		✓		
10	✓			✓			✓		
18	✓			SpR 1-2 or SHO3	SpR 4-5		✓		

18 units fell into categories 'A' or 'B' (as shown in Figure 2) in 1999, with deliveries >1000/year. To meet *Towards Safer Childbirth* standards, all these units should have a consultant, with no other commitments, covering the labour ward during the 40-hour working week. The achievements of units towards meeting this standard are summarised in Figure 3.

Figure 3 Labour ward consultant cover achieved during 40-hour working week in 18 units with >1000 deliveries/year



- A Units that met the recommendations for consultant cover of the labour ward, of 40 hours per week with no other commitments
- B Units where consultants are also responsible for gynaecological emergencies
- C Units where consultants also have fixed commitments (this could include antenatal clinics and theatre lists)
- D Units where the labour ward is covered by a consultant with no other commitments for much (but not all) of the 40 hour week

Audit Standard 5

The consultant covering the labour ward should conduct labour ward rounds at least twice during the day, with a telephone or physical round during the evening.

Information on patterns of consultant rounds in the labour ward, as reported at the group structured interviews, is summarised below:

- Five units met the recommendation of two ward rounds during the day with a telephone or physical round in the evening
- Seven units routinely have two of the three recommended rounds a day
- Four units routinely have only one formal ward round a day
- The remaining seven units reported *ad hoc* arrangements, and in some cases rounds were not consistently consultant led

A number of units stated that although they did not have formal arrangements, consultants were often present on labour ward more often than twice a day. In two units the consultants' office was adjacent to labour ward.

Table 8 Ward round arrangements in all 23 labour wards, grouped by size category

Unit	9am round	5pm round	Telephone round	Additional rounds
'A' <1000 deliveries per year				
4	Ad hoc	Ad hoc		
5	✓	✓	At night	
7	Ad hoc	Ad hoc	At night	
22	Ad hoc	Ad hoc		
23	✓			
'B' 1000-1999 deliveries per year				
6	✓	Ad hoc		
8	✓	✓	At night	
11	By registrar	Ad hoc	At night	
12	Ad hoc	Ad hoc		
14	✓	✓	At night	
16	✓	Ad hoc visit/phone call	At night	
21	✓	✓		
'B' 2000-4000 deliveries per year				
2	4/9 cons	4/9 cons	Most cons at night	
3	✓	✓	Some consultants	
9	✓	✓	At night	Afternoon round
13	✓	Informal visit/phone call	Some cons phone at night	
15	✓	Informal		
17	✓	Informal visit/phone call	At night	
19	✓	Ad hoc	At night	9pm round by SpR and SHOs
20	✓	✓		Afternoon round cons
'C' >4000 deliveries per year				
1	✓	✓	At night	
10	✓ (not always consultant)	✓ (not always consultant)		
18	✓	✓		

Documentation of a consultant ward round

20 units said they had no formal mechanism for recording a consultant's presence at a ward round. The only record would be if a consultant had seen a woman and had recorded the visit and/ or management plan in the notes.

1 unit was shortly to introduce a formal record of consultant ward rounds.

1 unit has documentation and is currently auditing it.

1 unit had kept a record for audit purposes but discontinued it once the audit had finished.

Two consultants commented that even if they had changed the management plan they might not necessarily document it in the notes.

Supplementary information on obstetric staffing from CSO-funded study, *Staffing, Workload and Quality of Care in Scottish Labour Wards*

Data collection for the *Staffing, Workload and Quality of Care* study involved a total of 2576 observation periods (each comprising a six-hour period in an individual labour ward). The following results on consultant presence in the labour ward relate only to 1221 observation periods - comprising daytime periods (06.00 to 12.00 and 12.00 to 18.00) and excluding periods when there were no patients in the labour ward (10% of the total).

Overall, a consultant was present in the labour ward during 68% (830) of these 1221 daytime periods and a formal ward round took place during 50% (612). The frequency of 'consultant presence' and of formal ward rounds increased with increasing size of unit. For units with <1000 deliveries/year, a consultant was present in the labour ward during 61% of relevant observation periods and there was a formal ward round during 44% of periods. For units with 1000-4000 deliveries, the corresponding figures were 67% and 49% and for units with >4000 deliveries, 83% and 63%. Information on consultant presence in the labour ward for individual units is summarised in Table 9.

The *Staffing, Workload and Quality of Care* study covered 28 days in 23 labour wards, i.e. 644 days of observation. At least one patient was present in the labour ward on 604 of those observation days. Two or more consultant ward rounds took place on 186 (31%) of those days. Table 9 includes information for individual units on the percentage of days with patients in the labour ward when two or more rounds took place.

Table 9 Consultant presence and formal ward rounds during 1221 six-hour observation periods in Scottish labour wards

Unit	% of 6-hr. observation periods (daytime when patient(s) in LW) when consultant present	% of 6-hr. observation periods (daytime when patient(s) in LW) with consultant ward round	% of days (with patient(s) in LW) when >=2 ward rounds occurred
1	95	89	82
2	79	45	33
3	71	49	32
4	76	41	23
5	73	66	43
6	67	43	21
7	50	34	4
8	60	47	29
9	93	84	71
10	69	40	14
11	85	84	64
12	9	7	0
13	87	77	64
14	74	68	33
15	62	37	27
16	81	60	36
17	76	49	25
18	86	61	35
19	63	48	8
20	33	4	0
21	62	34	14
22	79	61	25
23	9	3	0

Midwifery staffing levels should provide 1.15 midwives per woman in normal labour.

Towards Safer Childbirth endorsed the good practice standard set by the Audit Commission in their report, *First Class Delivery*,¹⁵ of 1.15 midwives to one woman in labour. It is suggested that this level of staffing should be met on at least 60% of occasions. The *Framework for Maternity Services in Scotland*¹⁰ includes one-to-one midwifery care in labour among its principles.

Compliance with this standard was difficult to ascertain from the structured interviews. All units saw one-to-one midwifery care in labour as the goal but some units (invariably units delivering over >4000 babies a year) found it difficult to achieve this in practice, given the peaks and troughs of workload and the diversity of case mix.

The structured interviews ascertained, in broad terms, the pattern of midwifery staffing for each of the 23 consultant-led labour wards. Units can be broken down into four styles of midwifery cover:

- *Unit-based cover*

Where the labour ward is an integral part of the whole maternity unit, (i.e. not separately staffed) with the shift allocation based on total unit work-load. Midwives are therefore working throughout the unit. This type of service delivery applied in three units with <1000 deliveries. (nos. 5, 7, 23)

- *Traditional*

Labour ward complement of staff work only in labour ward for an allotted period of time. Staff may consist of permanent members of labour ward staff and/or staff rotating into labour ward for a specified period of time of between 3 months to 2 years. (nos. 1, 2, 3, 4, 9, 10, 11, 12, 15, 18, 20, 21, 22)

- *Team midwifery (integrated hospital and community)*

Labour ward staffed by core, experienced midwives who are there to support and facilitate team midwives who give full midwifery care to women within both the hospital and the community. (nos. 6, 8, 14, 17, 19)

- *Team-midwifery (hospital only)*

Labour ward staffed by a permanent core of midwives (or experienced midwives on a very long rotation) plus rotating midwives who work between the labour ward and other areas of the hospital within a team concept. (nos. 3 and 16)

Supplementary information on midwifery staffing from CSO-funded study, *Staffing, Workload and Quality of Care in Scottish Labour Wards*

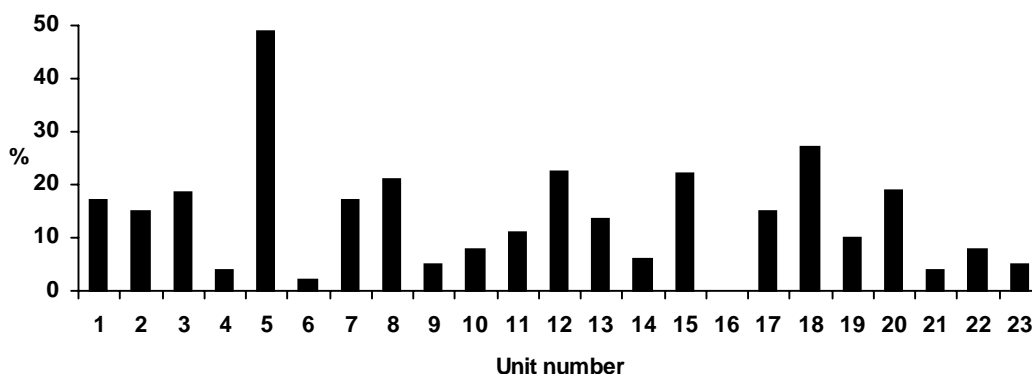
The detailed information collected through this study permits assessment of the relationships between labour ward workload and midwifery staffing levels during the month of September 2000. Of the 2576 observation periods (each representing a six-hour period in a single labour ward) covered by the study, there were 2279 periods when there was at least one patient in the labour ward. Results presented in this section relate to these observation periods.

- **One-to-one care**

At the simplest level, units aspire to one-to-one midwifery care, i.e. a ratio of one midwife to one woman in the labour ward. This standard is reiterated in the *Framework for Maternity Services in Scotland*.¹⁰ Overall, a staffing ratio of \geq one midwife per patient was achieved in 85% (1945/2279) of observation periods. There was little difference between units of different sizes, those with <1000 deliveries/year achieved a ratio of \geq 1:1 during 79% of observations. The corresponding percentages for units with 1000-4000 and >4000 deliveries were 87% and 83% respectively.

Figure 4 summarises, for each unit, the percentage of observation periods when the overall ratio of midwives:patients fell below one. Only one unit (no.16) never had an overall ratio of less than 1:1. Twenty one of the 23 units had an overall ratio of better than 1:1 in more than 50% of observation periods.

Figure 4 Percentage of observation periods in which staffing ratio was less than one midwife to one woman



- **Ratio of 1.15 midwives to each woman in normal labour**

The SAPMEL audit standard, based on a *Towards Safer Childbirth* recommendation is more specific than the simple target of one-to-one midwifery care. The *Staffing, Workload and Quality of Care* study categorised women in the labour ward according to their dependency level, permitting ‘women in normal labour’ to be identified. For the purposes of calculating the percentage of observation periods when the target of ‘1.15 midwives per woman in normal labour’ was met, it has been assumed that a woman categorised as ‘high dependency’ requires 1.5 midwives and that a woman categorised as ‘other’ or ‘awaiting transfer’ requires 0.25 midwives. Results in this section relate to 1137 of the total of 2576 observation periods (periods where there was at least one woman in the ‘normal labour’ category in the labour ward).

After allocating midwives to ‘high dependency’ and ‘other’ women, the requirement for 1.15 midwives per woman in normal labour was met in 68% of valid observation periods. In 13% of observation periods, there were insufficient midwives even to meet the requirements for ‘high dependency’ and ‘other’ women. Figure 5 shows all 23 maternity units, arranged according to size and summarises the percentage of observation periods in which the ratio of ‘observed to required midwives for normally labouring women’ was >1 and ≤1. Figure 6 summarises the differences between units of different sizes in their ability to meet their midwifery requirement as calculated on this basis. Medium-sized units were more often able to meet their midwifery staffing requirement compared with small and large units. (p=0.003)

Figure 5 Ratio of available to required midwives (accounting for casemix): proportion of observation periods when ratio >1 and <=1

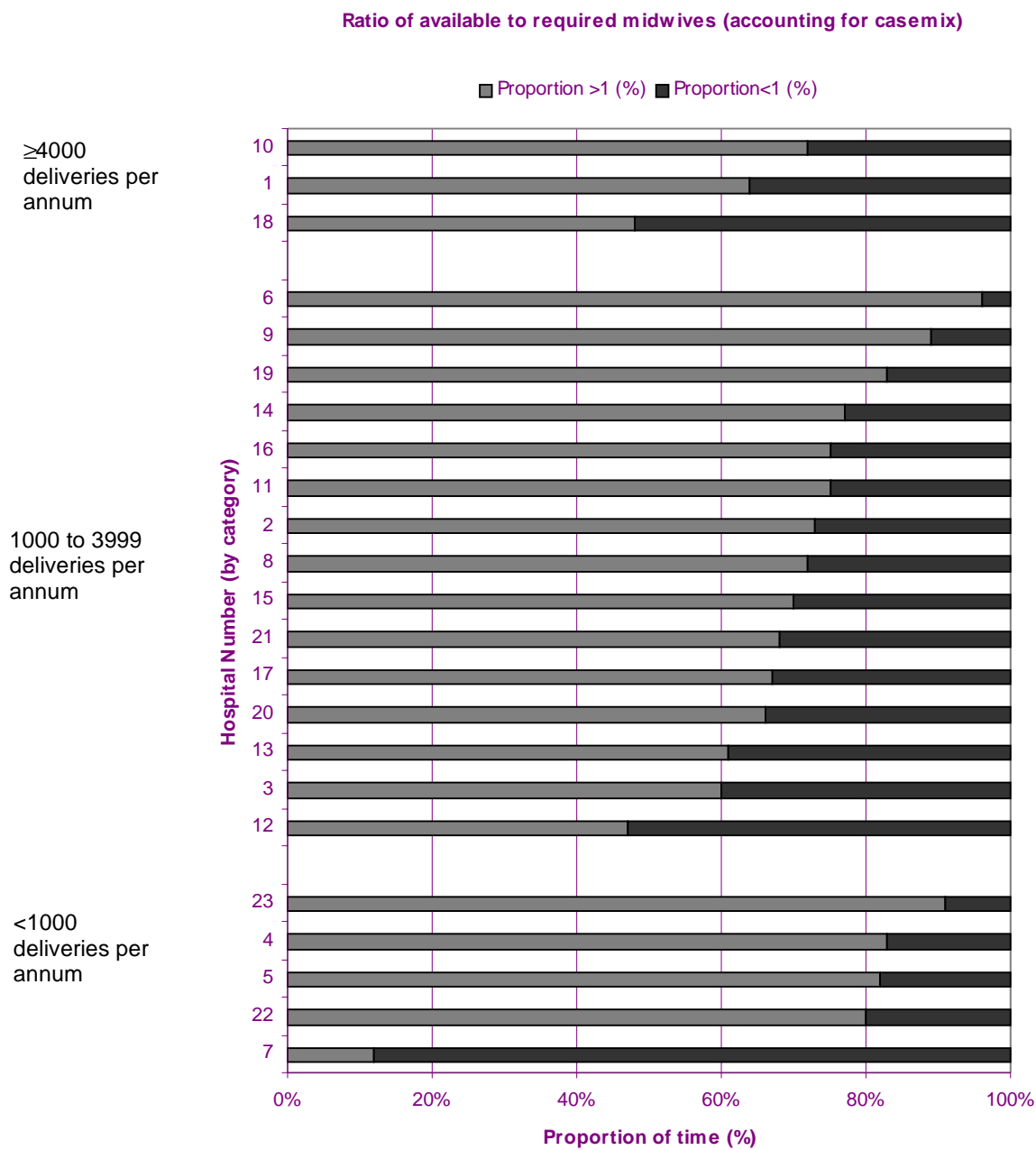
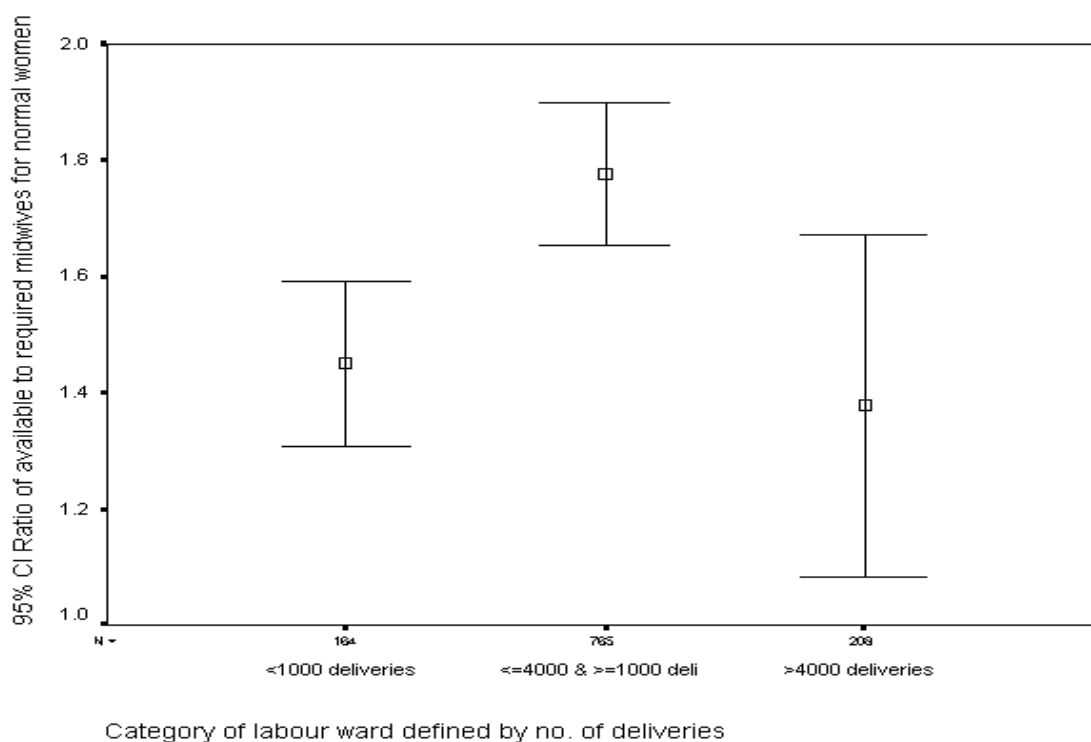


Figure 6 Mean and 95% CI of ratio of available to required midwives (accounting for casemix) for units in different size categories. Numbers on the x axis represent the total number of observation periods contribution to each mean value.



As indicated above, assessment of the percentage of time in which units meet target staffing levels has been based on an allocation of 1.5 midwives per 'high dependency' woman, 0.25 midwives per 'other' woman and 1.15 midwives per 'normally labouring' woman. These allocations are, of course, arbitrary. Table 10 summarises a range of workload allocations based on *Birthrate Plus* and shows for each, the percentage of valid observation periods where the calculated midwifery requirement was not met. Overall, and depending on the workload assumptions used, labour wards had too few midwives to meet their requirements between 15% and 38% of the time.

Table 10 Proportion of all observation periods in which midwifery staffing requirement was not met based on a variety of different staffing allocations

Workload Allocation	%
1-to-1 care (1midwife to 1 woman in labour ward)	33
1 core midwife to 1 high dependency woman	22
1 mw to 1 woman in established labour; 1.5 mw to 1 high dependency woman; 0.5 mw to 1 'other' woman	23
1 mw to 1 woman in established labour; 2.3 mw to 1 woman classified as 'high dependencyA'; 1.5 mw to 1 woman classified as 'high dependencyB'; 0.5 mw to 1'other' woman	38
As above but only 0.25 mw to 1'other' woman	35
1.15 mw to 1 woman in established labour or high dependency; 0.5 mw to 1'other' woman	16
As above but only 0.25 mw to 1'other' woman	15
1.15 mw to 1 woman in established labour; 1.5 mw to 1 high dependency woman; 0.25 mw to 1'other' woman	32

There should be a clinical midwife leader (experienced midwife) available on each shift.

In the majority of units, the named midwife co-ordinator is of 'G' or equivalent grade, (Table 11). In six units an 'F' grade midwife may be in charge. However, in two of these six units this is for professional development and a 'G' grade midwife would be available for support. Two units (nos. 6 and 8), have developed a new grading structure consisting of 'team lead' and 'midwife practitioner'.

Some maternity units incorporate midwife-led delivery areas, within the hospital but physically separate from the main labour ward. Some of these units have separate staffing for the midwife-led delivery area (nos. 9, 10, and 18). Other units have shared staffing between the main labour ward and midwife-led delivery area (nos. 1, 2, and 15).

In some labour wards, staff also have responsibility for a high dependency unit (HDU) or room/s used for women requiring close observation (eg theatre/s and admission room/s). Within the theatres, some units provide midwives as scrub nurses or anaesthetic assistants, for receiving the baby and for recovery. As *Towards Safer Childbirth* highlights, the provision of additional responsibilities must be reflected in the staffing complement.

Table 11 Provision of a named midwife co-ordinator on each shift and level of professional support available

Unit	Named co-ordinator	Grade	Covers LW or whole unit	Formal rota for Supervisor of Midwives	Informal
1	✓	G	LW		✓
2	✓	G	LW	✓	
3	✓	G	LW	✓	
4	✓	G	LW		✓
5	✓	F	Unit		✓
6	✓	Team leader/clinical midwife specialist	LW	✓	
7	✓	G day F night	Unit		✓
8	✓	Team leader	LW		✓
9	✓	G	LW	✓	
10	✓	G	LW	✓	
11	✓	G	LW		✓
12	✓	G	LW		✓
13	✓	G	LW		✓
14	✓	G	LW	✓	
15	✓	G	LW	✓	
16	✓	G	Unit		✓
17	✓	G	LW	✓	
18	✓	F	LW	✓	
19	✓	G	LW	✓	
20	✓	G/F for PD	LW	✓	
21	✓	G, F sometimes	LW		✓
22	✓	G	LW		✓
23	✓	F	Unit	✓	

Units should use a workload analysis tool to determine the required midwifery staffing level and skill mix in relationship to the workload activity case mix and service provision.

During the group structured interviews, staff were asked what workload tool the unit used. Responses are summarised in Table 12. Eight units did not report the use of a workload analysis tool.

Table 12 Workload analysis tools used in planning midwifery staffing

Unit	Workload tool used by unit
1	
2	Birth-rate and Birth rate plus
3	Birth-rate plus
4	
5	
6	Birth-rate
7	
8	GRASP formula
9	Mixture of tools Telford, birth-rate etc
10	
11	NWRHA "teamwork" staffing model + Telford
12	Birth-rate plus
13	
14	Birth -rate generated by PROTOS
15	Birth-rate plus
16	Birth-rate and MAT
17	MAT
18	Birth-rate
19	
20	Combination Telford and Birth-rate
21	Telford
22	Birth-rate
23	

Anaesthetic staffing

At least one consultant anaesthetist should have a major interest in obstetric anaesthesia and intensive care of the pregnant woman and devote a large part of the working week to obstetrics

There should be one consultant anaesthetist (notional half day) per 500 deliveries for units <3000 deliveries/year and full cover for larger units to assist teaching the trainees and provide support for them

Anaesthetic cover must be immediately available throughout the 24 hours and the anaesthetist involved must have more than one year of experience in anaesthesia

Women should have available an epidural pain relief service and both regional and general anaesthesia for operative delivery

Women undergoing elective procedures should be seen by the anaesthetist prior to surgery

Anaesthetic staffing issues were discussed during the group structured interviews. Nineteen units named a designated lead consultant anaesthetist for obstetrics. Of the remaining four units, two named two lead consultants and two reported an 'informal arrangement' among the consultants.

All units were able to provide 24-hour anaesthetic cover. In four small units (nos. 5, 6, 7 and 23) 'out of hours' cover was provided by a non-resident consultant. In all other units, a trainee was resident on-site during 'out of hours' periods. All units reported a policy that the resident trainee would have at least a year of anaesthetic experience plus a period of supervision.

Two small units (nos. 6 and 12) do not offer an epidural service and five further units offer a 'partial' service only (nos. 4, 5, 7, 11 and 23). All units with >1500 deliveries/year offer a full epidural service.

All units stated that it was common practice for women to be seen by an anaesthetist prior to surgery. In many units it was the norm for women having elective procedures to be seen the night before.

A summary of anaesthetic arrangements by size of unit follows:

Units with <1000 deliveries (5 units)

- Only 1/5 units has no formal lead consultant.
- In all units of this size, the anaesthetist has responsibility for the main hospital as well as the maternity unit, which would include main theatres and ITU/HDU. The maternity units are all physically located within the main hospital
- One unit has full 24hr epidural service, the others offer a restricted out of hours service.

Units with 1000-2000 deliveries (7 units)

- 6/7 units have a nominated lead consultant.
- All units bar one (no. 8) have designated LW-only sessions, ranging between two to five sessions a week.
- Two units have no epidural service at present and one offers a partial service.
- All units can call a 2nd anaesthetist, but in two units this is an informal arrangement.

Units with 2000-4000 deliveries (8 units)

- All units have a named lead consultant.
- All but one unit has 9am - 5pm consultant cover of LW. In one unit (no. 20), the consultant has five sessions in LW. The rest of the time, is responsible for other areas within the main hospital.
- All could call a second anaesthetist. However two units (nos. 9, 15) said there was a potential problem as, out of hours, the consultants are on call for a split site.
- All units have a full epidural service.
- All units provide 24hr on-site cover of LW. Out of hours and weekends are covered on site by a trainee anaesthetist with at least one year's experience. In one unit, (no. 20) this anaesthetist is also responsible for providing cover to other parts of the main hospital.

Units with >4000 deliveries (3 units)

- All three units have a named lead consultant.
- All can call a second anaesthetist if required.
- All offer a full epidural service.
- All units provide on-site cover out of hours and at weekends by a trainee anaesthetist with at least one year's experience.
- Two units provide full 9am - 5pm consultant cover exclusively for LW. Unit 10 provides five consultant sessions a week exclusively for LW with the other five sessions based elsewhere within the maternity unit.

Six-monthly multidisciplinary in-service education/training sessions on the management of 'high risk' labours and CTG interpretation should be attended by all clinicians. A logbook of attendances should be kept.

Training and education in the management of high risk labours and CTG interpretation in the majority of units can be broken down in to four main types:

- Half day training sessions for SHOs and registrars. Primarily aimed at obstetric staff though midwives are welcome to attend.
- Midwifery professional development programmes. May be mandatory in some units. Specifically for midwives.
- Jointly run training courses. May be timetabled within the ½ day training session for medical staff but are designed to be multidisciplinary and midwives are scheduled to attend.
- Basic and advanced life support courses eg ALSO. Either taught within the unit or held outwith the unit

High Risk Labour

Not all units ran specific courses on the management of high-risk labours but all units had education/training sessions for junior obstetric staff and midwives, however there was variation as to the form they took. Thirteen units ran multidisciplinary sessions and ten had separate midwifery and obstetric sessions. In the ten units that had separate training sessions for medical staff, these were incorporated into ½ day training sessions for SHOs and registrars. These half days were a common feature of all maternity units and combine a number of topic issues. Some medical staff had also attended ALSO courses and in a number of cases were instructors.

Midwifery staff-only sessions were in the form of tutorials and attendance at ALSO courses. In three units the sessions were part of a formal programme (nos. 4, 16, 22). In the other units, the teaching was *ad hoc*. Midwife- only teaching was primarily fortuitous, dependent on workload and skill mix. Organisational constraints as a barrier for midwives attending joint sessions were mentioned by a number of units. Unlike medical staff, whose ½ day sessions are protected, midwives can only attend (in many units) if the labour ward is quiet, or while not on duty.

The recommendation states that sessions on the management of high-risk labour should be every 6 months. In units that ran multidisciplinary sessions, only three had a frequency of every 6 months. Of those units all had a method of recording attendance for both midwives and medical staff. Arrangements for training sessions on high risk labour are summarised in Table 13.

Table 13 Summary of education/training sessions on management of "high risk labour"

Unit	Run Courses	Multidisciplinary
1	✓	✓
2	✓	✓
3	✓	✓
4	✓	
5	✓	
6	✓	✓
7		
8		
9		
10	✓	✓
11		
12	✓	✓
13	✓	
14	✓	✓
15	✓	✓
16	✓	
17	✓	✓
18	✓	
19	✓	✓
20	✓	✓
21	✓	✓
22	✓	✓
23	✓	

CTG Interpretation

A unit-level summary of CTG training is provided in Table 14. Eleven units ran multidisciplinary sessions using a combination of approaches. Eight units had separate sessions for midwives and obstetricians. Midwifery-only sessions consisted of CPD courses, study days, workshops and *ad hoc* teaching sessions on labour ward. Junior medical staff-only sessions were included within the ½ day training sessions and may also be part of an induction programme.

Four units said they did not run sessions but, on closer questioning, they in fact covered CTG interpretation within their ½ day SHO/registrar training sessions (nos. 9, 12, and 13). Four units were preparing to instigate multidisciplinary study days/courses (nos. 1, 9, 13, and 23)

Most units used real recent CTG traces as the basis for training. Others used commercially available training packages, principally the 'Crimson File' and the 'K2 Programme'

As with the management of high risk labours, *Towards Safer Childbirth* recommends 6-monthly updates and records of attendance for CTG training. Few units reported a formal arrangement for updating at frequencies of <= 6 months. Ten units reported a formal mechanism for recording the attendance of medical staff at training sessions. Twelve reported similar arrangements for recording the attendance of midwifery staff.

Table 14 Summary of information on frequency and recording of attendance at training sessions on CTG interpretation

Unit	Run sessions	Multidisciplinary
1	✓	
2	✓	
3	✓	✓
4	✓	✓
5	✓	
6	✓	✓
7	✓	
8	✓	✓
9		
10	✓	✓
11	✓	
12		
13		
14	✓	✓
15	✓	✓
16	✓	✓
17	✓	✓
18	✓	
19	✓	✓
20	✓	✓
21	✓	
22	✓	
23		

Midwives have an increasing role in teaching and mentoring junior doctors.

There is a suggestion within *Towards Safer Childbirth* that the majority of practical training for SHOs and medical students comes from midwives. *'In addition to being mentors for student midwives, midwives have an increasing role in teaching and mentoring junior doctors and medical students'* and *'Inexperienced SHOs are likely to get their best instruction from midwife colleagues.'*

The SAPMEL Steering Group were interested to see how far this concept has reached "grass roots" practice within the Scottish maternity service. To that end, the following question was incorporated into the structured interview for discussion: *Towards Safer Childbirth acknowledges that "inexperienced SHOs get their best instruction from midwives and that midwives have an increasing role as teachers and mentors to junior doctors and medical students."* How do you regard this development?

The majority of units broadly agreed with the statement (17 units), with midwives in 6 units specifically stating that they saw this as part of their role. Those interviewed expanded on this concept to say that the midwife was the best professional to teach 'normal labour and delivery'. Midwives in the majority of units were involved, either formally, through input into medical student and SHO teaching programmes, or informally, through practical sessions on labour ward.

Units acknowledged that, as the midwife's role is extended, for example in suturing and cannulation, the position of the career SHO within the labour ward is challenged. In one unit (12), for four nights a week between 9pm and 9am there is no SHO and a midwife, who has received additional training, assumes the responsibilities of an SHO.

Comments from staff on this topic included:

'Throws up issue of role of SHOs especially GP trainees. How do they fit into labour ward?'

'The ones who are keen to learn will get very good teaching'

'No funding for midwives to train medical students or SHOs.'

'Valuable teaching also comes from registrars and consultants'

All units should have three monthly obstetric emergency "practice runs", covering decision to delivery interval, patient collapse and major haemorrhage.

SAPMEL defined a 'fire drill' as when a near-to-life emergency is created using real people and where staff are not forewarned.

- Five out of 23 units have run a 'fire drill' (nos. 1, 3, 13, 18 and 19). Of those, four were multidisciplinary, two involved ancillary services (eg portering) but only one was run six-monthly.
- Five units ran similar sessions that were not 'fire drills' in the true sense of the word, but covered the same types of emergencies through interactive workshops, the use of dummies and or simulators.
- 10 units said they were thinking of instigating 'fire drills'.

Sixteen defined outcome measures should be adopted and audited annually.

Towards Safer Childbirth includes, among its auditable standards, a list of 16 outcomes that it suggests should be recorded at unit level. This list was modified slightly by the SAPMEL Steering Committee as some of the *Towards Safer Childbirth* outcomes (eg breast feeding rates) were not felt to be directly relevant to emergency labour ward care. The extent to which a revised list of 16 outcome measures are collated and made available in each unit is summarised in Table 15.

Table 15 Summary of unit-level availability of 16 defined outcome measures

Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Total Deliveries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2. DOMINOs	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓
3. Intrapartum stillbirths	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
4. Instrumental deliveries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5. Total No. C/S	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6. Total No. C/S by indication		✓	✓	A	✓	✓	A	A		A	A		✓	✓	A	✓	✓	A	
7. Epidural rate	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8. Inductions by indication		✓	✓	A	✓	A	A	A	A		A	A	✓	A	A	✓			
Inductions by outcome		A	✓	A		A	✓	A	A	A	A	A	A	A	A		✓	A	
Incidence of PPH	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	A	✓	✓	✓	✓	A
Incidence of PPH by EBL	A	✓		✓	✓	✓	✓	A	A	✓	✓	A	✓	A	✓	✓	✓	✓	A
% of labours lasting longer than 18 hrs		✓		A		A	A	A			A		A	A	A				A
Apgar scores <7 at 5 mins		✓	✓	A	✓	A	✓	✓		A	✓	A	A	A	A	✓	A	A	A
Need for neonatal resuscitation	✓	✓		✓			✓	A		A	A	A	A	A	A				A
Admission to SCBU >2.5kg	✓	✓	✓	✓	✓	A	A	✓	✓	A	A	A	✓	A	A	A	✓	A	✓
% of complicated deliveries attended by consultant					✓		✓	✓			A		A	A	A	A			

✓ = routinely collated

A = information not routinely collated but could be accessed if required

Equipment

Audit Standard 18

Between two and four fetal heart rate monitors per 1000 deliveries a year is considered appropriate. This would include at least one instrument capable of monitoring twins.

Audit Standard 19

The ability to assess fetal blood gases by modern, easily-used equipment should be available in any unit undertaking continuous fetal heart rate monitoring. Ideally the blood gas analyser should be able to measure pH, pO₂, pCO₂.

The availability and location of fetal heart rate monitors and of blood gas analysers was determined during the site visits to all 23 labour wards. All units have the required number of monitors, however not all units have blood gas analysers. Three units did not have, or never used, analysers (nos. 5, 12, 23). Results are summarised in Table 16.

Table 16 Availability and location of fetal heart rate monitors and blood gas analysers

Hospital	Blood gases	pH analyser	CTG monitor	Twin monitor
1	Yes	Yes	13	10
2	In SCBU	Only	12	4
3	Yes *	Yes in lab	12	2
4	Yes **	Yes	5	1
5	No	No	4	3
6	In SCBU	In LW	6	3
7	Yes	Yes	5	1
8	Yes	Yes	7	2
9	Yes	Yes	10	6
10	Yes	Yes	10	10
11	Yes	Yes	6	3
12	No	No	6	5
13	Yes	Yes	10	2
14	Yes	Yes	4	2
15	Yes	Yes	16	2
16	In SCBU	In SCBU	5	1
17	Yes	Yes	8	8
18	Yes	Yes	20	2
19	Yes	Yes	9	1
20	Yes**	Yes	6	6
21	Yes	Yes	8	2
22	Yes	Yes	4	4
23	No	No	2	2

* used by lab staff only

** not in labour ward

2.2. Appraisal of local protocols / guidelines

2.2.1. Availability of protocols for key topics

During the site visits to Scotland's 23 consultant-led labour wards, available local protocols or guidelines were reviewed against this checklist of topics, as agreed by the SAPMEL Steering Group.

- 1 Induction and augmentation of labour
- 2 Cord prolapse
- 3 Neonatal resuscitation
- 4 Adult resuscitation
- 5 Previous Caesarean section
- 6 Management of fetal heart rate abnormalities
- 7 Indications for fetal heart rate monitoring
- 8 Shoulder dystocia
- 9 Documentation of risk factors identified antenatally
- 10 Genital tract sepsis
- 11 Women who decline blood products
- 12 Thromboprophylaxis
- 13 Antibiotics for Caesarean section
- 14 Obstetric haemorrhage
- 15 Pre-eclampsia and eclampsia

Three questions were asked of the labour ward team in relation to each of the protocol topics:

- Do they have a protocol for the topic in question?
- Is the date of compilation recorded?
- Is the date for next review recorded?

The availability of protocols for each of the 15 topics at unit level is summarised in Figure 9 and Table 17. Some of the protocols available (eg for adult and neonatal resuscitation) are national or trust-wide protocols and have not been developed specifically for local labour ward use. Some topics for which no specific protocol was available (eg genital tract sepsis and previous Caesarean section) were often included within protocols for other topics.

Figure 9 Number of units having local protocols for each of 15 agreed topics

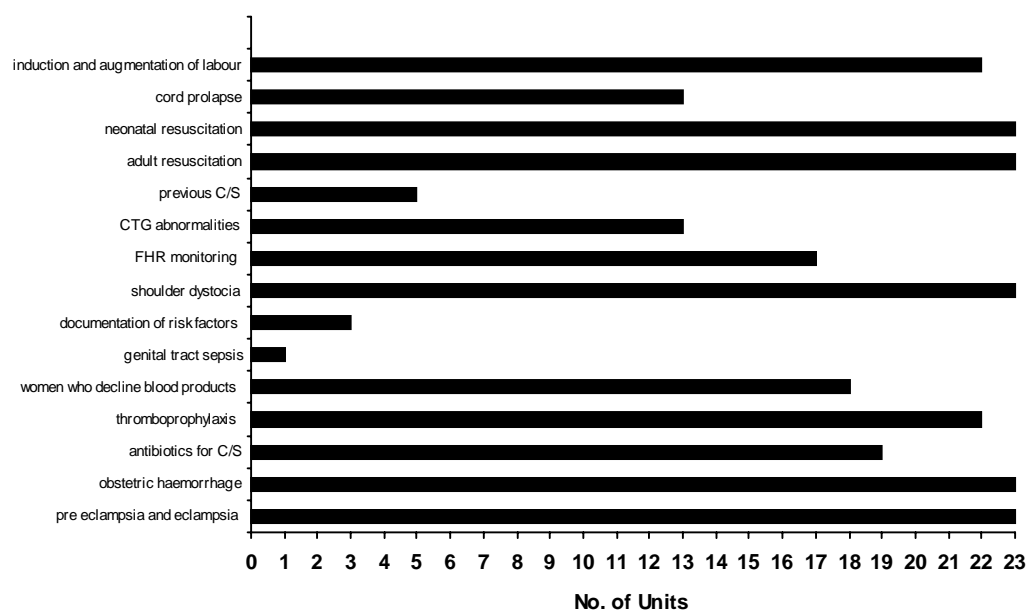


Table 17 Availability of local protocols and guidelines

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	2	
Management of eclampsia and pre eclampsia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Management of obstetric haemorrhage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Use of antibiotics for C/S	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Use of thromboprophylaxis	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Management of women declining blood products	✓	✓	✓				✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Management of genital tract sepsis	✓																✓				✓	
Documentation of risk factors identified antenatally											✓				✓		✓					
Management of shoulder dystocia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Guidelines for heart rate monitoring during labour	✓			✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓	✓
Guidelines for management of CTG abnormalities	✓					✓	✓			✓	✓		✓	✓	✓	✓				✓	✓	✓
Management of women with previous C/S				✓			✓		✓						✓							✓
Adult resuscitation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Neonatal resuscitation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cord prolapse	✓		✓	✓		✓	✓	✓	✓		✓	✓	✓	✓					✓		✓	
Management of induction /augmentation of labour	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

All units had protocols on:

- Management of pre eclampsia and eclampsia
- Management of obstetric haemorrhage
- Management of shoulder dystocia
- Adult resuscitation (trust or national guidelines)
- Neonatal resuscitation (unit, trust or national guidelines)

2.2.2. Dating of protocols for key topics

Towards Safer Childbirth recommends that protocols/guidelines should be dated, signed and reviewed on a regular basis, every one to three years.

- 19 of 23 unit had the date of compilation on all of their local protocols.
- The remaining four units had over 50% of their protocols dated.
- 16 of the 23 units had a rolling programme for review ranging between every year to every three years
- Two units were currently updating all their protocols
- Five units had no date for review on any of their protocols

2.2.3. Quality of the content of two local protocols

A detailed analysis of the quality of local protocols for two key topics was undertaken. Postpartum haemorrhage protocols were assessed against the Scottish Obstetric Guidelines and Audit Project (SOGAP) Guideline on *The Management of Post Partum Haemorrhage*.¹¹ Eclampsia protocols were assessed against the RCOG 'greentop' guideline No. 10, *Management of Eclampsia*.¹²

For each topic, the national guideline was divided into key topic areas, each containing a number of recommendations. The recommendations in the national guidelines were each graded by a small panel of clinicians as either 'essential' for inclusion into a local protocol or 'desirable'. For each local protocol, a checklist of the recommendations in the relevant national guideline was completed, allowing a 'score' to be allocated.

(All local protocols were scored against the 'national checklist' by the same SP CERH researcher. Points were allocated only when recommendations in local protocols closely matched, in detail, the recommendations in the national guideline. Local protocols have therefore been scored on a consistent basis, though the scores allocated may underestimate the quality of protocols where the detailed recommendations, whilst appropriate, differ from the national guideline.)

Postpartum Haemorrhage

Seven topic areas were included in the national, SOGAP guideline:

- Definition of PPH
- Communication
- Resuscitation
- Fluid therapy
- Monitoring and investigation
- Arresting the bleeding
- Surgical haemostasis

Two local protocols did not include recommendations relating to the definition of PPH. Otherwise, all topic areas were addressed in all local protocols. Within the seven topic areas, the national guideline contained a total of 56 separate recommendations. Of these, 40 were graded as 'essential' by the SAPMEL clinician panel.

Table 18 summarises the quality of all 23 local PPH protocols in terms of:

- Inclusion of topic areas
- Inclusion of **all** national recommendations within each topic area
- A score representing the percentage of the 40 'essential' recommendations included

Table 18 Summary of quality of local protocols for postpartum haemorrhage as assessed against the recommendations in the SOGAP guideline *The Management of Postpartum Haemorrhage* (1998)

Unit	TOPIC AREA OF NATIONAL GUIDELINE							Score
	Definition	Communication	Resuscitation	Fluid therapy	Investigations	Haemostasis	Surgery	
1	**	**	*	*	*	*	*	80
2	**	*	*	*	*	*	*	63
3	**	**	**	*	**	*	*	88
4	*	*	*	*	*	*	*	58
5	**	*	**	*	**	**	**	80
6	**	*	**	**	**	*	*	95
7	**	*	*	*	*	*	*	78
8	**	**	**	*	**	*	*	90
9	**	**	*	*	*	*	*	80
10	**	*	*	*	*	*	*	68
11	**	**	*	*	**	**	*	95
12	**	**	**	*	**	*	*	88
13	*	*	*	*	**	*	*	80
14	*	*	*	*	**	*	*	80
15		*	*	*	*	*	*	68
16	**	**	**	*	*	*	*	95
17	**	*	*	*	*	*	*	70
18	**	**	**	*	**	*	*	90
19	**	*	**	*	**	*	*	83
20	**	*	*	*	*	*	*	65
21		*	*	*	*	*	*	55
22	**	**	**	*	*	*	**	95
23	**	*	*	*	*	*	*	75
Total 1	21	23	23	23	23	23	23	
Total 2	18	9	9	1	10	2	2	

* protocol made reference to topic area
 ** protocol included all recommendations in topic area
 score represents % of national recommendations graded as 'essential' included in local protocol
 Total 1 number of local protocols making reference to topic area
 Total 2 number of local protocols including all recommendations in topic area

Management of eclampsia

Ten topic areas were included in the national, RCOG guideline:

- Acute management of the eclamptic fit
- Treatment and prophylaxis of seizures
- Monitoring
- Management of magnesium toxicity
- Management of recurrent seizures
- Treatment of hypertension
- Fluid therapy
- Investigations
- Delivery options
- Personnel and place for management

Only five local protocols addressed all ten topic areas. Within the ten areas, the national guideline contained a total of 60 separate recommendations. Of these, 53 were graded as 'essential' by the SAPMEL clinician panel.

Table 19 summarises the quality of all 23 local eclampsia protocols in terms of:

- Inclusion of topic areas
- Inclusion of **all** national recommendations within each topic area
- A score representing the percentage of the 53 'essential' recommendations included

Table 19 Quality of local protocols for eclampsia (assessed against content of national, RCOG Guideline, *Management of Eclampsia*, 1996)

Unit	TOPIC AREA OF NATIONAL GUIDELINE										Score
	1	2	3	4	5	6	7	8	9	10	
	Acute	Treatment	Monitor	Mg. Toxic.	Recurrent	Hypertension	Fluids	Investigations	Delivery	Personnel	
1	**	*	*	**		*	*	*	*	*	51
2	**	*	*	*	*	*	**	*		*	73
3	**	*	*	*	*		*		*	*	32
4		*	*	*		*	*	*		*	43
5	**	*	*	*		*	*	*	*	*	42
6	*	*	*	*	*						30
7	**	*	*	*		*		*	*	*	51
8	**	**	*	**		*		*	*	*	70
9	**	*	*	*	**	*	*	**	*	*	64
10	**	*	*	*	*	*	*	**	*	*	74
11	**	*	*	*		*	*		*	*	40
12	**	*	*	**	*		*		*	*	30
13	**	*	*	*	*	*	*	*	*	*	57
14	**	*	*	*	*	*	*	*	*	*	55
15	**	**	*	*	*	*	*	*	*	*	62
16	**	**	*	*		*	*	*	*	*	57
17		*	*	*	*	*	*	*	*	*	60
18	**	*	*	*		*	*	*	*	*	51
19		*	*	*	*	*	**	*	*	*	58
20	**	*	*	*		*	*	*	*	*	47
21	**	*	*	*		*	*	*	*	*	60
22	*	*	*	*		*	*	*	*	*	49
23		*	*			*	*	*		*	28
Total 1	19	23	23	22	11	20	20	19	19	22	
Total 2	17	3	0	3	1	0	2	2	0	0	

* protocol made reference to topic area

** protocol included all recommendations in topic area

score represents % of national recommendations graded as 'essential' included in local protocol

Total 1 number of local protocols making reference to topic area

Total 2 number of local protocols including all recommendations in topic area

2.3 Assessing the management of women with selected emergencies in labour

The care received by individual women was assessed by means of case note review. Two emergency situations were selected for this component of the audit in order to reflect risks to the two patients involved in every labour – the mother and the infant.

2.3.1. Management of severe postpartum haemorrhage (PPH)

This emergency was chosen as representing a labour ward situation where the life of the mother is at risk. The care of women with severe primary PPH presenting during a one year period (1.9.99 - 31.8.00) was assessed against standards derived from the SOGAP guideline, *The Management of Postpartum Haemorrhage*.¹¹

Audit midwives in all 23 consultant-led maternity units attempted to identify all women with a primary PPH of ≥ 1500 ml estimated blood loss (EBL) from their labour ward registers. Local data sources were adequate for reasonably reliable case ascertainment in 21 of the 23 consultant-led units. Two units (nos. 3 and 12) had no mechanism for retrieving information on estimated blood loss and were unable to participate (although unit 3 contributed two cases identified on the basis of personal knowledge). One very small unit (no. 23) had satisfactory data sources but identified no cases during the study time period. Information on case ascertainment is summarised in Table 20, below. Overall, 411 cases were identified. Based on cases identified in the 21 units with apparently reliable sources for case ascertainment, the overall rate of severe PPH was 409/38838 (8.4 per 1000 deliveries). Rates in individual units ranged from zero to 14 per 1000. This range suggests that differences in ascertainment between hospitals existed. It was not possible to explore the reasons for these differences.

Of the 411 identified cases, 216 (52%) had an EBL of 1500 – 1999ml, 169 (41%) had an EBL of 2000 – 3999ml and 26 (6%) had an EBL of ≥ 4000 ml. There were no maternal deaths among the cases studied.

Table 20 Primary PPH >1500 ml: case ascertainment in 23 maternity units. Cases during year 1.9.99 to 31.8.00

Unit	Deliveries 1999*	% of total deliveries	No. PPH	% of total PPH	PPH rate (per 1000 deliveries)
1	4562	8.5	38	9.2	8.3
2	3806	7	52	12.7	14
3	3482	6.5	2		
4	941	1.7	10	2.4	11
5	241	0.4	2	0.5	8.2
6	1313	2.4	12	2.9	9.1
7	922	1.7	5	1.2	5.4
8	1619	3	8	1.9	4.9
9	3103	5.8	30	7.3	9.6
10	4713	8.8	37	9	7.8
11	1075	2	5	1.2	4.6
12	1467	2.7	0		
13	3003	5.6	21	5.2	6.9
14	1244	2.3	10	2.4	8
15	3595	6.7	21	5.1	5.8
16	2069	3.8	11	2.7	5.3
17	2229	4.2	14	3.4	6.2
18	6603	12.3	60	14.6	9
19	2675	5	43	10.5	16
20	2353	4.4	25	6.1	11
21	1654	3.1	1	0.2	0.6
22	895	1.7	4	1	4.4
23	223	0.4	0	0	0
Total (excl. units 3&12)	48838	100	409	100	8.4

*ISD figures for year ending March 1999

Of the 411 cases, 102 (25%) had a spontaneous vaginal delivery, 59 (14%) had an elective Caesarean section and 189 (40%) had an emergency Caesarean section. Comparable figures for mode of delivery for the total Scottish obstetric population are: 68%, spontaneous vertex; 7%, elective CS and 12%, emergency CS. Thus, these audit data confirm the well-recognised association between Caesarean section (especially emergency Caesarean section) and PPH.

The SOGAP guideline on *The Management of Postpartum Haemorrhage* included recommendations relating to four key elements of management:

- Communication
- Resuscitation
- Monitoring and investigations
- Arresting the bleeding

The findings of the case note review are described in relation to these same four elements.

Communication

	Guideline points
<ul style="list-style-type: none"> • Call experienced midwife • Call obstetric registrar and alert consultant • Call anaesthetic registrar and alert consultant • Alert haematologist • Alert blood transfusion service 	

According to the case records of the 411 cases studied, the most senior midwife involved in management of the PPH was:

• Senior (a midwife who frequently acts as LW co-ordinator)	222	(54%)
• Experienced (a midwife experienced in LW but who does not act as co-ordinator)	120	(29%)
• Less experienced midwife, or grade unknown	69	(17%)

A consultant obstetrician was **alerted** to the PPH in 234 (56.9%) cases. A consultant anaesthetist was alerted in 141 (34.3%) cases.

The most senior obstetrician involved in the 'hands-on' management of the PPH was:

• Consultant	185	(45%)
• Registrar / staff grade / assoc. specialist	162	(39%)
• Senior House Officer	56	(14%)
• No obstetric involvement, or grade not known	8	(2%)

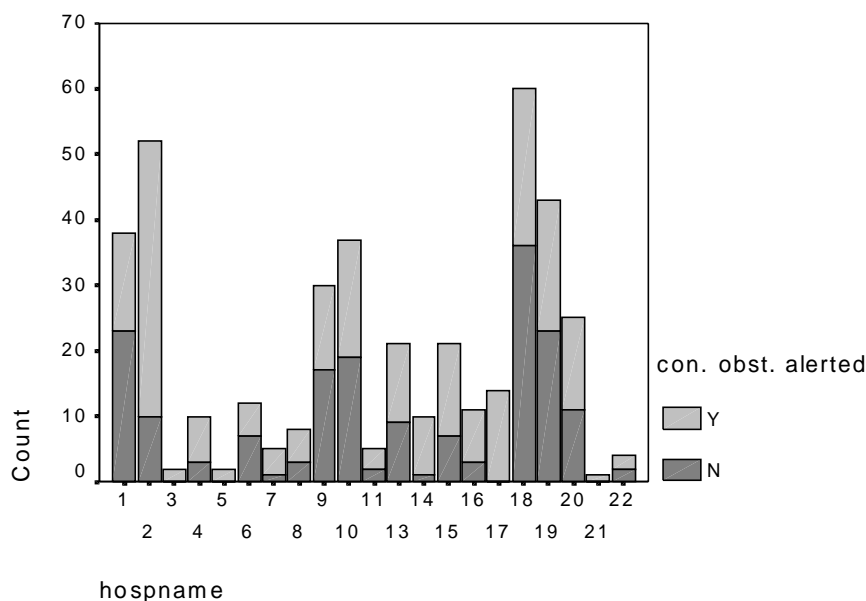
The most senior anaesthetist involved in the management of the PPH was:

• Consultant	132	(32%)
• Registrar / staff grade / assoc. specialist	108	(26%)
• Senior House Officer	66	(16%)
• No anaesthetic involvement or grade not known	105	(26%)

A blood transfusion consultant was alerted or involved in only 30 (7.3%) cases and a consultant haematologist in only 34 (8.3%).

It is reassuring that where a senior house officer was the most senior obstetrician involved, this individual was an 'SHO3', rather than a junior SHO, in all but one case. Figure 10 shows, for each unit, the proportion of all cases of PPH where a consultant obstetrician was alerted to the problem.

Figure 10 Proportion of all cases of severe PPH where a consultant was alerted by individual maternity unit



Resuscitation

Guideline points

- IV access with 14G cannula X 2
- Transfuse cross-matched blood as soon as possible
- If no cross-matched blood available once 3.5L of clear fluid infused, give 'O' neg or uncross-matched own group blood, as available

Intravenous access was achieved in all 411 cases. One line was sited in 165 (40%) cases, two lines in 214 (52%) cases, and more than two lines in 15 (3.6%) cases. In 17 (4.1%) cases the number of lines sited was not documented.

A total of 303 (73.8%) cases received a blood transfusion during their acute management, while 108 (26.3%) did not. Of the 108 cases not transfused, 86 had an EBL of 1500 – 1999ml, and 22 had an EBL of 2000 - 3000ml. All cases with an EBL of >3000ml were transfused. Emergency supplies of 'O' neg blood were used in only eight cases and 13 cases received uncross-matched, own group blood.

Among the 303 women transfused, 112 (37%) received only two units; 163 (54%) received between three and six units and 27 (9%) received greater quantities – the maximum being 29 units.

A total of 99 women (24%) received >3.5L of clear fluid before receiving blood. Of these, 60 subsequently received blood as part of their acute management and 39 did not. Thus, in relation to the guideline recommendation, blood transfusion was unduly delayed while infusion of clear fluids continued in almost a quarter of cases.

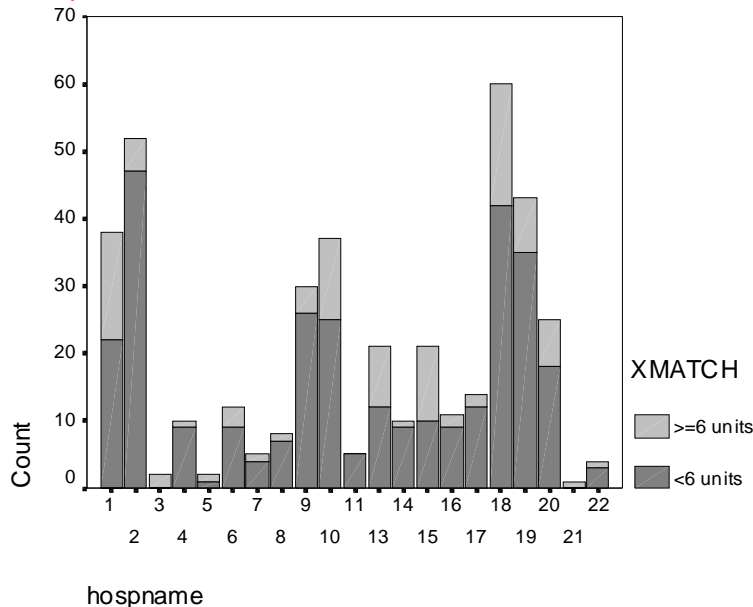
Monitoring and Investigations

Guideline points

- Cross-match 6 units
- Take blood for FBC and clotting screen prior to transfusion
- Monitor pulse and blood pressure continuously
- Indwelling Foley catheter for measurement of urine output
- Central venous pressure monitoring once appropriate staff available
- Discuss transfer to ITU

It was documented in the notes that blood was taken for cross-matching in 335 (81.5%) cases. However SOGAP recommended that 6 units of blood should be cross-matched. Six units or more were cross-matched in 106 (26%) cases. Most commonly (136 cases, 33%), women were cross-matched four units, suggesting that this is the policy in many units. The notes of 2 cases indicated that no blood was cross-matched and data were missing for a further 56 cases. Figure 11 shows, for each unit, the proportion of all cases that were documented as cross-matched six units or more.

Figure 11 Proportion of all cases of severe PPH cross-matched for ≥ 6 units of blood by individual maternity unit



Blood was taken prior to transfusion for full blood count in 274 (67%) cases, and for a clotting screen in 221 (54%) cases. Continuous pulse and blood pressure monitoring was used in 247 (60%) cases, oximeter being used in 291 (71%) cases. Continuous ECG monitoring was used in 110 (27%) cases. Use of a Foley catheter to monitor urine output was documented in 380 (92%) cases, and in 299 (73%) cases output was documented at least every hour. CVP monitoring was used in only 25 (6%) cases. Of 26 women with an EBL of $>4000\text{ml}$, only 17 underwent CVP monitoring.

Of the 411 women studied, 373 (91%) were managed in a high dependency area of the labour ward. Only eight women were transferred to a high dependency unit, outwith labour ward, and only 10 were transferred to an intensive therapy unit (ITU). The women managed in ITU delivered in 8 different units (1,3,13,15,17,18,19,20), and had estimated blood losses ranging from 2200ml to 17,500ml. All but two cases had an EBL of $>4000\text{ml}$.

The low utilisation of invasive monitoring (CVP) and of ITU care in this series of women may reflect the low rate of involvement of senior anaesthetic staff.

Oxytocic drugs were documented as being used as third stage prophylaxis in 390 of the 411 women (95%). The most commonly used agent was syntocinon (10 units) in 261 (63%) women. Syntometrine (1ml) was used in 11 (27%) women. Oxytocic drugs, in addition to those used for third stage prophylaxis, were used during the management of the PPH in 358 (87%) women. Syntocinon by infusion was the most widely used agent, administered to 318 (74%) women. The overall use of various oxytocic agents in the management of haemorrhage is summarised in Figure 12. Figure 13 shows, for each unit, the proportion of all cases managed where no oxytocics were used for management of the haemorrhage.

Figure 12 Overall use of oxytocic agents in the management of PPH

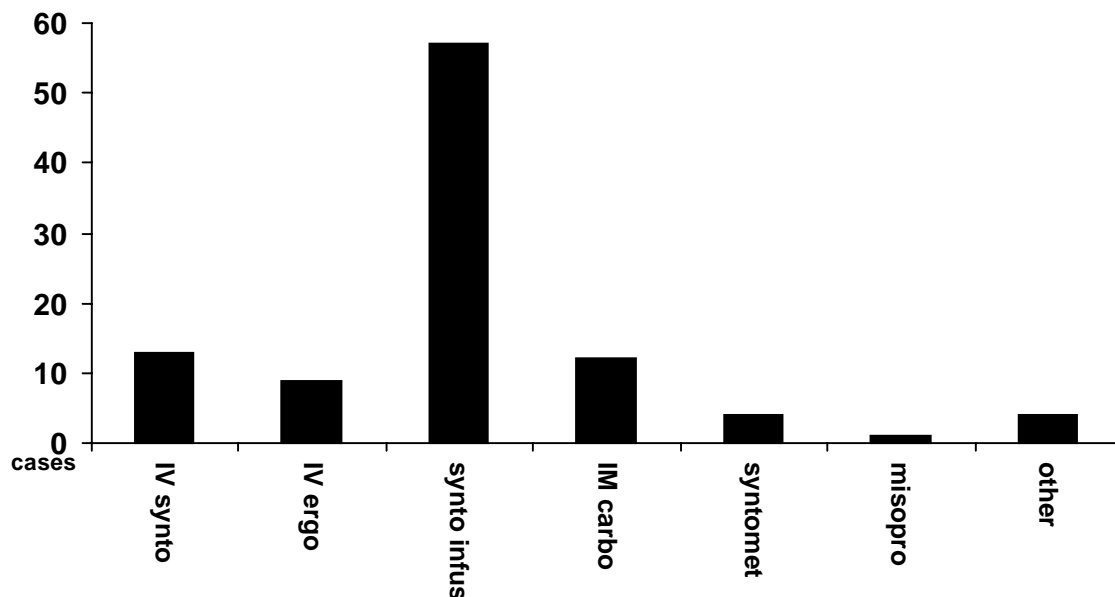
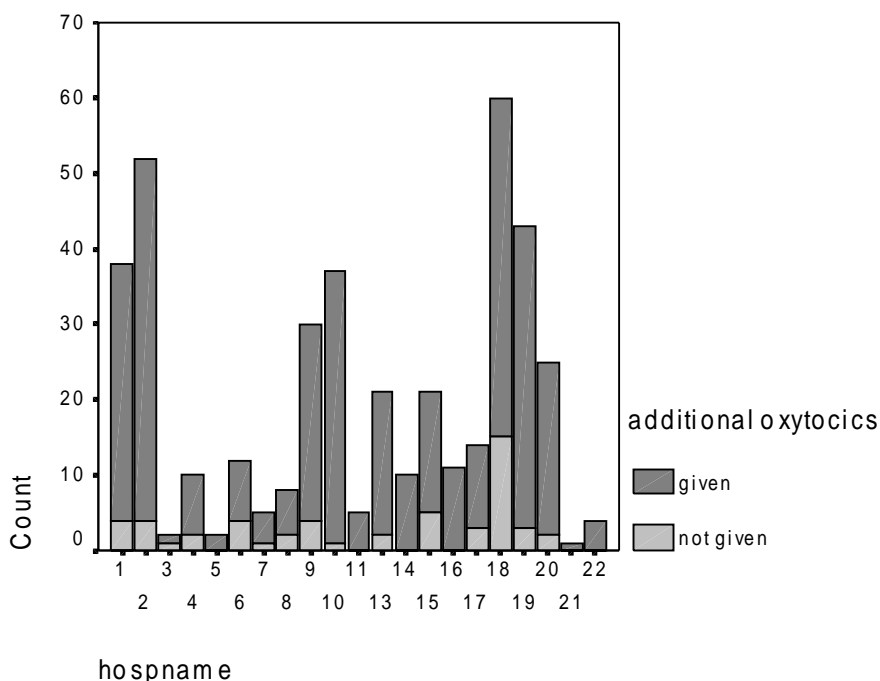


Figure 13 Proportion of all cases of severe PPH where no oxytocics were used in acute management by individual maternity unit



Surgical interventions were rarely used in the management of PPH. Intramyometrial carboprost was used in 22 cases, distributed among 11 different units. A total of eight women had a hysterectomy and eight underwent ligation of the internal iliac arteries. Only one patient underwent internal iliac ligation without hysterectomy.

Overall compliance with SOGAP guideline

In order to provide a measure of the extent to which overall patient management complied with the recommendations in the SOGAP guideline, 12 'key criteria' for patient care were selected from among the guideline recommendations:

- 1 Consultant obstetrician should be alerted to the emergency
- 2 Consultant anaesthetist should be alerted to the emergency
- 3 A senior midwife should be involved in the care of the woman
- 4 An obstetrician of SpR 1-3 or above should be involved in the management of the woman
- 5 An anaesthetist of SpR 1-3 or above should be involved in the management of the woman
- 6 IV access should be achieved with two lines
- 7 No more than 3.5L of clear fluids should be transfused before the 1st unit of blood is transfused
- 8 Blood transfusion should occur
- 9 BP should be monitored continuously
- 10 Pulse should be monitored continuously
- 11 A Foley catheter should be insitu
- 12 Women should be managed in an HDU or ITU setting.

The case of each of the 411 cases was assessed according to how many of these key criteria were met. The care of each woman was categorised as 'A', 'B', 'C' or 'D' as follows:

- A = Met all 12 key criteria
- B = Met 10 – 11 key criteria
- C = Met 6 – 9 criteria
- D = Met <5 criteria

The distribution of cases among the different 'compliance categories' is summarised for individual maternity units in Table 21.

Table 21 Degree of compliance with national guideline: 'compliance category' of management of 411 cases of severe PPH

Unit	Degree of Compliance				Total No. cases
	A No. cases	B No. cases	C No. cases	D No. cases	
1	3	12	21	2	38
2		9	33	10	52
3		2			2
4		6	4		10
5	1	1			2
6		3	9		12
7	1	2	1	1	5
8		2	3	3	8
9	1	5	22	2	30
10	4	8	23	2	37
11			5		5
13	3	8	9	1	21
14		2	8		10
15	5	7	7	2	21
16		2	7	2	11
17	2	5	7		14
18	2	13	41	4	60
19	1	3	29	10	43
20	1	7	14	3	25
21		1			1
22		2	1	1	4
Total	24	100	244	43	411

Management of severe postpartum haemorrhage Illustrative cases

Case 278

A 16 year old primigravida delivered spontaneously at 21.17hrs. She had received 10 units of syntocinon for third stage prophylaxis. Her recorded estimated blood loss at delivery was 3000ml. Venous access was achieved with two peripheral lines and a CVP line was used in the subsequent management. Cross-matching for six units of blood was undertaken and four units were transfused. However, the first unit was not commenced until 00.30hrs (more than three hours after delivery) by which time 4000ml of clear fluids had been infused.

Both a consultant obstetrician and a consultant anaesthetist had 'hands-on' involvement in the patient's care. A senior midwife, acting as labour ward co-ordinator was also directly involved. It is documented that a consultant haematologist was also involved in care.

During management, pulse and blood pressure were recorded automatically at 15 minute intervals and pulse oximetry was used. However, the case records suggest that blood was not taken for either full blood count or clotting screen prior to transfusion. An indwelling catheter was *in situ* during management with hourly urine output documented.

Treatment involved intravenous ergometrine, syntocinon infusion and intramuscular carboprost. Platelets and FFP were also transfused. The final diagnosis was atony due to retained placental tissue plus a deep lateral vaginal wall tear. Placental tissue was manually removed and the tear repaired as a theatre procedure.

In most respects, this case was well managed in line with recommendations in the SOGAP guideline. However, the infusion of 4000ml of clear fluid before beginning blood transfusion is contrary to the guideline recommendations, as is the failure to obtain samples for full blood count and clotting screen prior to transfusion.

Case 34

A 34 year old para 3+1 woman was delivered by emergency Caesarean section at 13.48 hours. Syntocinon 10 units was given as routine prophylaxis during the procedure. The estimated blood loss was 3000ml. Venous access was achieved with two peripheral lines and a total of 5500ml of clear fluids (crystalloid and colloid) infused. There is no documentation that blood was cross-matched and no blood or blood products were transfused.

Both a consultant obstetrician and a consultant anaesthetist had 'hands-on' involvement in the patient's care. A senior midwife, acting as labour ward co-ordinator was also directly involved.

During management, pulse and blood pressure were recorded automatically at 5 minute intervals and pulse oximetry and ECG were used. Blood was taken for both full blood count and clotting screen during the acute management. An indwelling catheter was *in situ* during management with hourly urine output documented.

Treatment involved intravenous syntocinon by bolus injection and infusion. The diagnosis was bilateral extension of the lower uterine incision, managed by insertion of figure of eight sutures.

Again, in most respects this case was well managed, with involvement of staff of appropriate seniority. However, the national guideline suggests that blood should have been transfused rather than continuing infusion of clear fluids up to a total of 5500ml.

2.3.2. Continuous electronic fetal monitoring in labour (CEFM)

This emergency was chosen to represent a labour ward situation where the infant is at risk. The aim was to assess the use of continuous electronic fetal monitoring (CEFM) by means of cardiotocography (CTG) against standards derived from published guidance from FIGO¹³ and the RCOG.¹⁴ After completion of the audit, the RCOG published an evidence-based guideline on *The Use of Electronic Fetal Monitoring*.¹⁶ The guideline recommendations regarding selection of women for CEFM and about actions to be taken when an abnormal trace is observed are broadly similar to the standards adopted for the audit.

This component of the audit addressed two key questions:

- Are women appropriately selected for CEFM?
- Are abnormalities that arise during CEFM appropriately managed?

A prospective casenote review was undertaken of all women (excluding elective Caesarean section, multiple birth and antepartum stillbirth) who delivered in the 23 consultant-led labour wards (excluding attached midwifery-led units) during a two-week period from 11th to 24th September 2000 inclusive. Completed casenote review forms were received from 22 of the 23 units in Scotland. Table 22, below, summarises the numbers of forms received from each unit. In general, numbers of cases returned were proportional to total annual deliveries in the unit, suggesting that there were no major problems in case ascertainment.

Table 22 All eligible deliveries and study cases received from consultant-led labour wards of Scottish maternity units

Unit	Deliveries 1999	% of total deliveries	study cases	% of study cases	Study cases with 'severe' CTG abnormalities
1	4562	8.5	139	8.9	31
2	3806	7.1	101	6.5	8
3	3482	6.5	109	7	42
4	941	1.7	28	1.8	7
5	241	0.4	6	0.4	0
6	1313	2.4	43	2.8	4
7	992	1.8	25	1.6	1
8	1619	3	58	3.7	2
9	3103	5.8	61	3.9	7
10	4713	8.8	138	8.8	42
11	1075	2	37	2.4	5
12	1467	2.7	0	0	0
13	3003	5.6	108	6.9	27
14	1244	2.3	38	2.4	5
15	3595	6.7	121	7.8	24
16	2069	3.8	69	4.4	11
17	2229	4.1	60	3.8	8
18	6603	12.2	174	11.1	38
19	2675	5	78	5	11
20	2353	4.4	67	4.3	13
21	1654	3.1	58	3.7	4
22	895	1.7	38	2.4	7
23	223	0.4	5	0.3	2
Totals	53787	100	1561	100	299

Are women appropriately selected for Continuous Electronic Fetal Monitoring (CEFM)?

Based on the published RCOG and FIGO guidance, a list of 11 antenatal and 5 intrapartum risk factors were identified that might warrant CEFM during labour. This list was approved by the SAPMEL Steering Committee:

Antenatal risk factors

- 1 Fetal heart rate anomaly detected before the onset of labour
- 2 Pre eclampsia
- 3 Diabetes
- 4 Suspected IUGR
- 5 Gestation greater than 42 weeks
- 6 Suspected abruption
- 7 Previous Caesarean Section
- 8 Breech presentation
- 9 Reduced or no liquor
- 10 Pre-term labour
- 11 Poor obstetric history

Intrapartum risk factors

- 1 Meconium stained liquor
- 2 Administration of oxytocin to induce labour
- 3 Oxytocin to accelerate labour
- 4 Epidural
- 5 Any fetal heart rate abnormality detected by intermittent auscultation or 'admission CTG'

In total, 1561 case note review forms were returned. Of these, 403 cases (26%) were documented as having antenatal risk factors and 840 (54%) as having intrapartum risk factors. In all, 1017 cases (65%) had at least one risk factor (antenatal and/or intrapartum) and 544 (35%) had no risk factors. The most common antepartum risk factors were 'pre-eclampsia', 99 women and 'previous Caesarean section', 84 women. The most common intrapartum risk factors were 'epidural', 423 women and 'oxytocin to accelerate labour', 392 women.

Thus, 1017 cases had risk factors which might warrant CEFM in labour. Of these, 924 (91%) received CEFM and 93 received intermittent auscultation (IA). The remaining 544 women had no documented risk factors and it may be considered that, for them, CEFM was unnecessary. Of these, 300 (55%) were monitored intermittently and 244 (45%) received CEFM.

On the basis that women with defined risk factors warrant CEFM and those without such risk factors do not, 1224 of the total of 1561 women (78%) received appropriate monitoring during their labour.

Are abnormalities, which arise during CEFM appropriately managed?

This component of the audit addressed three principal questions:

- Were appropriate grades of staff involved in care?
- Were they involved at an appropriate time?
- Were appropriate actions taken?

A total of 1168 women received CEFM during labour, of which 881 (75%) had at least one CTG abnormality documented in the clinical notes. A subset of women who experienced 'severe' CTG abnormalities, as defined by FIGO, were selected for further analysis. The selected 'severe' CTG abnormalities were as follows:

- Tachycardia: Baseline heart rate above 170 beats/min
- Bradycardia: Baseline heart rate below 100 beats/min
- Reduced variability: Persistence of heart rate variability of less than 5 beats/min for more than 40 minutes

- Variable decelerations: Repetitive
- Late decelerations: Repetitive
- Prolonged decelerations: Repetitive
- Sinusoidal pattern: lasting longer than 40 minutes

299 women (26% of those undergoing CEFM) had at least one episode of one of these 'severe' abnormalities documented in the clinical notes. The distribution of these women among individual maternity units is shown in Table 22. Most of these women (255, 85%) developed only one 'severe' abnormality. The maximum number of 'severe' abnormalities documented in an individual labour was five. The commonest 'severe' abnormalities were prolonged decelerations, documented in 127 labours, and bradycardia, in 77 labours. Table 23 summarises the frequencies of the 'severe' abnormalities.

Table 23 Distribution of 'severe' fetal heart rate abnormalities in 299 labours with one or more such abnormality

Abnormality	Number of severe abnormalities occurring in labour					Total cases
	1	2	3	4	5	
Tachycardia	25	6	2	0	1	34
Bradycardia	61	14	1	1	0	77
Reduced variability	15	3	2	1	1	22
Variable decelerations	33	17	3	0	1	54
Late decelerations	24	9	2	1	1	37
Prolonged decelerations	97	26	2	1	1	127
Sinusoidal pattern	0	1	0	0	0	1

Grades of staff involved in care

The RCOG guideline on *The Use of Electronic Fetal Monitoring* includes the recommendation: 'Trusts should ensure that there are clear lines of communication between carers, and consistent terminology is used to convey urgency or concern regarding fetal wellbeing'. This part of the audit aimed to determine the lines of communication between junior and senior midwives and between midwives and obstetricians that currently operate in response to CTG abnormalities in Scottish labour wards.

Midwife-to-midwife referral

Among the 299 women with 'severe' CTG abnormalities, 38 (13%) had a **senior** midwife (defined as a midwife who frequently or always acts as labour ward co-ordinator) as the 'primary caregiver'. One hundred and thirty eight women (46%) had an **experienced** midwife (defined as a midwife with extensive labour ward experience but who does not act as co-ordinator) as the primary caregiver. The remaining 122 women (41%) had a **less experienced midwife** (rotational midwife still developing labour ward skills, 'caseload midwife' or community midwife updating her labour ward skills) as the primary caregiver.

Following documentation of a 'severe' CTG abnormality, midwife-to-midwife referral occurred in 166 (55%) cases. A senior or experienced midwife was the primary caregiver for 89 of the 128 cases where no midwife-to-midwife referral occurred – and in these cases direct referral to medical staff by the primary caregiver seems appropriate.

Midwife-to- medical staff referral

Among the 299 cases with 'severe' CTG abnormalities, there were 29 cases (10%) where there was no documentation of any medical staff being involved in care. In the remaining cases, between one and four

grades of obstetrician were involved (Table 24). A consultant obstetrician was involved in the management of 63 (21%) cases. Table 25 summarises the grades of the most senior obstetrician involved in each of the 299 cases. Figure 14 shows, for individual maternity units, the proportion of all cases with a 'severe' CTG abnormality where a consultant obstetrician was involved in subsequent management.

Table 24 Number of grades of obstetric staff involved in management of 299 women with 'severe' CTG abnormalities in labour

Number of grades of medical staff involved	Cases	Percent
No medical involvement	29	9.7
1 grade	151	50.5
2 grades	86	28.8
3 grades	29	9.7
4 grades	4	1.3
Total	299	100

Figure 14 Proportion of all cases with a documented 'severe' CTG abnormality where a consultant obstetrician was involved in care, by individual maternity unit

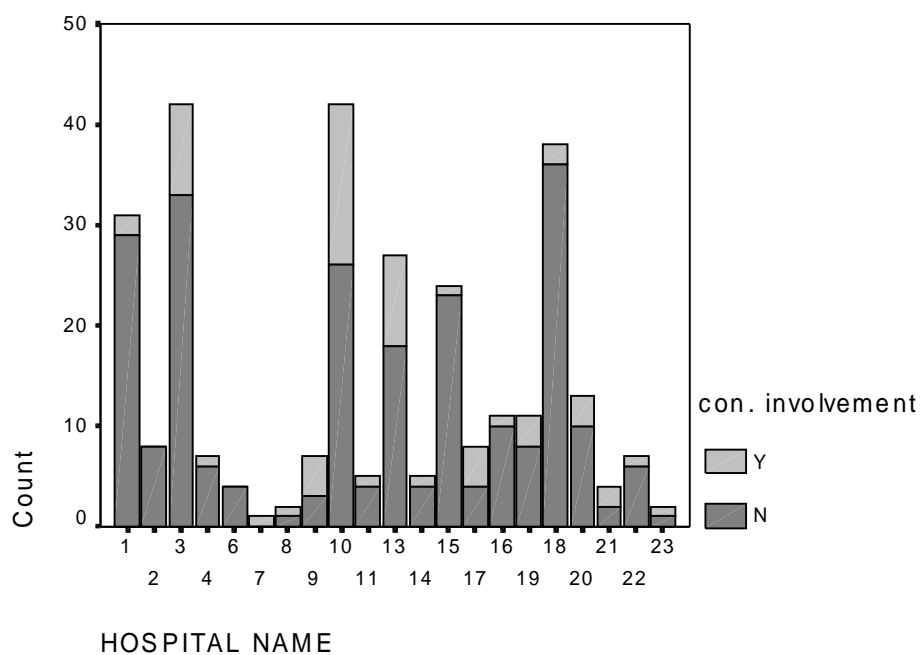


Table 25 Grade of most senior obstetrician involved in management of 299 women with 'severe' CTG abnormalities in labour

Grade	No. of cases	Percent
No obstetric involvement	29	9.7
SHO	2	0.6
SHO3	74	25
SpR 1-3	74	25
SpR 4-5	32	11
Staff grade assistant specialist	25	8.4
Consultant	63	21
Total	299	100

Timing of involvement of appropriate staff

The SAPMEL Steering Committee suggests that, ideally and reflecting a shift to a consultant-based service, a consultant obstetrician should be alerted to, and involved in the care of, all labours where severe CTG abnormalities arise. As a minimum, however, an obstetrician of SpR grade or above, should be involved promptly.

Of the 299 cases with 'severe' CTG abnormalities, 194 (65%) were documented as having been referred to an obstetrician of SpR grade, or above. In 83 of these cases, the referral to an obstetrician of this grade had occurred before the first 'severe' CTG abnormality arose. Among those cases where an SpR or more senior obstetrician was involved, this involvement was delayed more than two hours from the documentation of the first 'severe' abnormality in only 19 cases. Information on timing of involvement of a 'senior' obstetrician is summarised in Table 26.

It may be considered that timely involvement of an obstetrician of appropriate seniority was lacking in up to 138 (46%) of women with severe CTG abnormalities (those where no obstetrician of SpR grade or above was involved, or where such involvement was delayed by more than one hour).

Table 26 Timing of involvement of an obstetrician of SpR grade, or above, following the documentation of the first "severe" CTG abnormality (n=299 cases)

Delay between CTG abnormality and 'senior' obstetrician involvement	No. cases	%
'senior' obstetrician involved before severe abnormality arose	83	28
'senior' obstetrician involved within 30 minutes	63	21
'senior' obstetrician involved between 30 and 60 minutes	15	5
'senior' obstetrician involved between 60 and 120 minutes	14	5
'senior' obstetrician involved after >120 minutes	19	6
No involvement of SpR, or above	105	35
TOTAL	299	100

Towards Safer Childbirth suggests that 'inexperienced SHOs are likely to get their best instruction from midwife colleagues' but that 'SpRs in years 1-3 should have sufficient experience to perform basic decision-making on the labour ward'. These statements about professional roles reflect the status of the midwife as an autonomous practitioner and indicate that when a midwife seeks obstetric guidance for a problem in labour then this guidance should be sought from an obstetric colleague of above SHO status.

As indicated above, midwife-to-medical staff referral occurred in 270 of the 299 women with 'severe' CTG abnormalities. Information on the grade of obstetrician **first** involved in management is available for 262 of these cases and is summarised in Table 27, below. First referral was to a junior SHO in only 35 cases. Most commonly, first referral was to an obstetrician of SHO3 status. In Scottish labour wards, these experienced SHOs act as 'second on call' and it may be appropriate for midwives to refer to them in the first instance.

Table 27 Grade of first obstetrician involved in management of 299 women with 'severe' CTG abnormalities in labour

Grade of first obstetrician involved in management	No. cases	%
No obstetric involvement or missing data	37	12
Junior SHO (SHO1)	35	12
Experienced SHO (SHO3)	107	36
SpR 1-3	84	28
SpR 4-5	22	7
Consultant	14	5
TOTAL	299	100

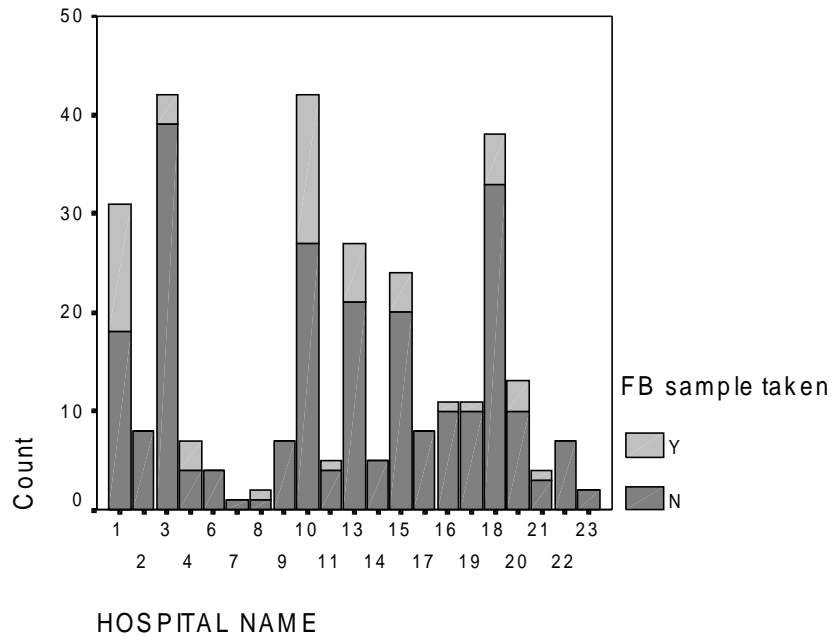
Actions taken

Towards Safer Childbirth states: 'The ability to assess fetal blood gases by modern, easily-used equipment should be available in any unit undertaking continuous fetal heart rate monitoring. The two should not be separated'.

Of the 299 cases where a 'severe' abnormality was recorded, a fetal blood sample (FBS) was taken in 57 (19%) cases. It is acknowledged that FBS may be clinically inappropriate or technically unfeasible in some cases. After excluding women where the cervical dilatation appeared to be less than three centimetres and those who progressed to delivery (vaginal or abdominal) within 30 minutes of the onset of a 'severe' CTG abnormality, 150 cases apparently warranting FBS remained. Of these, only 36 (24%) actually had an FBS taken.

Figure 15 shows, for individual maternity units, the proportion of all cases with 'severe' CTG abnormalities in which an FBS was taken.

Figure 15 Proportion of all cases with a documented 'severe' CTG abnormality where fetal blood sampling was undertaken, by individual maternity unit



Continuous electronic fetal monitoring Illustrative cases

Case 1313

A 31 year old para 1+0 woman was admitted to labour ward at 03.00 hours in active labour with a cervical dilatation in excess of three centimetres. Her previous delivery had been by Caesarean section. CEFM was commenced at 05.00 hours. The midwife acting as the woman's primary carer was described as a rotational midwife still developing her labour ward skills. At 05.40, it was documented that the CTG showed reduced variability and early decelerations. It is recorded that a junior SHO was involved in the woman's care at 07.05 hours and that a consultant obstetrician was involved at 08.35. Fetal blood sampling was undertaken by the junior SHO at this time and the pH noted to be 7.43. No specific management plan was documented following this sample.

At 09.00, an experienced midwife from the core labour ward staff took over as primary carer and it is documented that the midwife acting as labour ward co-ordinator became involved in care. A second fetal blood sample was taken by an SHO3 at 09.20 when the pH was 7.36. The documented management plan was to repeat the FBS in one hour.

The cervix was noted to be fully dilated at 09.30 hours, but it subsequently became clear that this was a misdiagnosis. At 09.55 a baseline tachycardia (>170 beats/min) was documented and at 10.05 it was recorded that reduced variability of <5 beats/min had persisted for >40 mins. A further FBS was undertaken by an SHO3 at 10.25 when the pH was 7.25. The documented management plan was to inform senior staff and to encourage active pushing for 30 mins.

A decision to deliver by Caesarean section was taken at 11.00 and the patient was delivered at 11.37 by Caesarean section undertaken by a consultant obstetrician with a consultant anaesthetist present. The recorded indication for section was failure to progress / previous CS. The infant had Apgar scores of 10 at one minute and 10 at five minutes, a cord pH of 7.32 and a base deficit of -5.0.

The use of CEFM was appropriate in this case, as previous CS is an acknowledged indication. Following the documentation of CTG abnormalities, lines of communication appear to have been appropriate with senior midwifery and obstetric staff involved before CTG abnormalities classified as 'severe' arose. In line with national recommendations, fetal blood sampling was undertaken prior to recourse to Caesarean section.

Case 10

A 27 year old para 1+0 woman was admitted to labour ward at 03.45 hours in the active phase of labour. Meconium staining of the liquor was noted on admission and CEFM commenced. The midwife acting as the woman's primary carer was an experienced midwife from the core labour ward staff.

At 04.35, baseline bradycardia (<100 beats/min) was documented. The midwife acting as labour ward co-ordinator was involved at 05.02. At 05.15 a baseline tachycardia (165 beats/min) was documented and by 05.30 the baseline rate had risen to >170 beats/min with continuous variable decelerations. An SHO3 was involved in management at 05.30. Examination at this time showed the cervix to be fully dilated and the infant was delivered by ventouse by the SHO3 at 06.02. The recorded indication for operative vaginal delivery was non-reassuring CTG, meconium and occipito-transverse position of the head.

The infant had Apgar scores of eight at one minute and 9 at five minutes. Cord pH or base deficit were not recorded.

Again, use of CEFM was appropriate in this case, as meconium stained liquor is an acknowledged indication. Lines of communication were appropriate with prompt involvement of the midwife co-ordinating labour ward following documentation of a CTG abnormality. Midwife-obstetrician referral was to a middle grade trainee (SHO3). However, in an evolving consultant-based service, the trainee might have discussed management with a consultant and fetal blood sampling might have contributed to decision making.

3. Recommendations for Consultant-led Labour Wards in Scotland

The following 10 recommendations are based on the findings of the SAPMEL audit and take account of the views expressed by over 100 representatives of Scottish maternity units at a feedback meeting held in Glasgow in June 2001. The SAPMEL audit team endorses the 12 recommendations made in Towards Safer Childbirth and the 27 principles outlined in the Framework for Maternity Services in Scotland. Only those where there is evidence of scope for substantial improvement in Scottish maternity services are re-iterated here. Our recommendations reflect the evolution of intrapartum care from a consultant-led to a consultant-based service. Increasingly, clinical leadership, diagnosis and opinion will require the experience of a consultant.

1 All labour wards with >1000 deliveries per year should aim to provide a consultant-based service with the '40 hour working week' covered by a consultant obstetrician with no other duties or commitments. In the light of current consultant numbers, it is recommended that, initially, this target should be met by units with >2000 deliveries per year. It is acceptable, though not ideal, for the labour ward consultant to provide cover for gynaecological emergencies on the same hospital site. It is also acceptable for some sessions of senior labour ward cover to be provided by an appropriately experienced career-grade obstetrician (eg staff grade or associate specialist) in units where such doctors are already in post.

2 Labour ward rounds, led by a consultant obstetrician, should routinely be undertaken at least twice during each working day, with a telephone or personal 'round' each evening. The style of labour ward round should be appropriate for the size and case-mix of the unit, but should always include

discussion with other members of the labour ward team and personal visits to those patients requiring obstetric care.

3 An increase in, and reorganisation of, midwifery staffing is required in order that all women in the labour ward have access to a level of midwifery care appropriate to their needs. The case-mix of the unit, particularly with regard to the proportion of high dependency patients, must be considered in planning staffing levels. Many patients in the labour ward require a level of midwifery care higher than the one-to-one care recommended for women in normal labour.

4 As a minimum, all units should be able to offer regional anaesthesia to women requiring operative delivery. Ideally, a full epidural service for women in labour should be available.

5 All units should institute formal, regular, mandatory, multi-professional training in interpretation of cardiotocograph tracings and in the management of high-risk labours. Training should include 'fire drills' – near-to-life simulated emergency situations, ideally provided on a six-monthly basis.

6 Local obstetric database systems should be improved so that a recommended range of outcome indicators can routinely be collated and reported. Units should work towards a common, national system of local data collection that permits linkage of maternal and neonatal information.

7 All units should adopt a 'rolling programme' of regular update and revision of local protocols for key topics. Protocols should be comprehensive, developed by multi-disciplinary groups and based on relevant national guidance, where available. The agreed local protocols should be used, in full, when managing obstetric emergencies including severe postpartum haemorrhage.

8 Local protocols for emergencies and potential emergencies should include guidance on lines of referral to senior colleagues that are appropriate for the staffing structure of the unit. Midwives caring for individual women should involve the midwifery labour ward co-ordinator. Midwife-to-obstetrician referral should usually be to a trainee of SpR-level experience. Increasingly and reflecting the move to a consultant-based service, the labour ward consultant should be alerted to all emergencies and potential emergencies, including severe postpartum haemorrhage and serious CTG abnormalities.

9 The obstetric anaesthetist is a key member of the labour ward team and should be involved early in emergency situations such as severe fetal distress and major PPH – where decisions about transfer to ITU or invasive monitoring may be required.

10 Continuous electronic fetal monitoring should be used selectively, rather than routinely, in labour. When appropriate, abnormal CTG tracings should be investigated by means of fetal blood sampling before recourse to operative delivery.

4. References

- 1 Maternity Care Matters. 1999. Aberdeen. SPCERH.
- 2 Provision of maternity services in Scotland: a policy review. 1993. Edinburgh, SOHHD.
- 3 CRAG/SCOTMEG Working Group on Maternity Services Final Report. 1996. Edinburgh, CRAG.
- 4 Towards Safer Childbirth: Minimum Standards for the Organisation of Labour Wards. 1999. London. Royal College of Obstetricians & Gynaecologists, 1-31.
- 5 CESDI. 4th Annual Report. 1997. London. Maternal & Child Health Research Consortium
- 6 CESDI 5th Annual Report. 1998. London. Maternal and Child Health Research Consortium
- 7 Report on Confidential Enquiries into Maternal Deaths in the United Kingdom 1991-1993. 1996. London. HMSO
- 8 Why Mothers Die. Report on Confidential Enquiries into Maternal Deaths in the United Kingdom 1994-1996. 1998. Norwich. HMSO.
- 9 A Working Party of the RCOG. Minimum standards of care in labour. 1994. London. Royal College of Obstetricians & Gynaecologists.
- 10 Scottish Executive. A framework for maternity services in Scotland. 2001. Edinburgh, Primary Care Unit, Scottish Executive Health Department.
- 11 Scottish Obstetric guidelines and Audit Project. The Management of Postpartum Haemorrhage. 1998.
- 12 Scientific advisory committee of RCOG. Management of Eclampsia. 10. 1996. London. Royal College of Obstetricians & Gynaecologists. RCOG 'Greentop' Guideline.
- 13 FIGO news: guidelines for the use of fetal monitoring. *Int.J.Obstet.Gynecol.* 1987;**25**:159-67.
- 14 Arulkumaran S, Symonds EM. Intrapartum fetal monitoring - basic knowledge. *The Obstetrician & Gynaecologist* 1999;**1**:18-21.
- 15 Garcia, J. and Redshaw, M. First Class Delivery. A national survey of women's views of maternity care. 1998. Bristol, Audit Commission and National Perinatal Epidemiology Unit.
- 16 Clinical Effectiveness Support Unit. The use of electronic fetal monitoring. 8. 2001. London, Royal College of Obstetricians & Gynaecologists. Evidence-based clinical guidelines.