Intrapartum Fetal Surveillance

Clinical Guidelines – Third Edition 2014

The Royal Australian and New Zealand College of Obstetricians and Gynaecologists

Disclaimer

This document is intended to provide general advice to Practitioners. It should never be relied on as a substitute for proper assessment with respect to the particular circumstances of each case and needs of each woman.

The document has been prepared having regard to general circumstances. It is the responsibility of each Practitioner to have regard to the particular circumstances of each case, and the application of these guidelines in each case. In particular, clinical management must always be responsive to the needs of the individual woman and the particular circumstances of each pregnancy.

The document has been prepared having regard to the information available at the time of its preparation, and each Practitioner must have regard to relevant information, research or material which may have been published or become available subsequently.

While RANZCOG endeavours to ensure that the document is accurate and current at the time of preparation, it takes no responsibility for matters arising from changed circumstances or information or material that may have become available after the issue date of the document.

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All members of the Guideline Review Group agreed to declare any interests or connections with relevant companies or other organisations prior to publication.

Endorsed by 

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Foreword

This is the third edition of the Intrapartum Fetal Surveillance (IFS) Clinical Guideline to be published by the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG). This Guideline was reviewed during 2012 by an expert multidisciplinary working party at the request of the RANZCOG Council. The review was undertaken to ensure the Guideline's currency and continued utility in the field of intrapartum fetal surveillance, a critical aspect of maternity care. In its decision to review this Guideline, RANZCOG noted requests from other interested parties, such as State Coroner's courts, that this Guideline be expanded to further emphasise interventions that may be required in some areas of practice. This included, for example, the diagnosis and emergency treatment of uterine hyperstimulation in labour to provide even safer care for women in labour.

Maternity care in Australia and New Zealand is provided by a large set of health professionals, including, but not limited to: obstetricians, general practitioners, midwives, obstetric physicians, ultrasonographers, social workers and other allied health professionals. Given this diversity of care providers, and the differing geography and health care resources of both countries, it is important that women and their families are able to have their care escalated if required and to get the care they need from the right person in the right place at the right time. Thus, a well-trained maternity care workforce is critical for safe care. The workforce providing intrapartum care needs to be appropriately trained, credentialed and re-credentialed in the appropriate use, and correct interpretation of, different aspects of IFS. Correct interpretation of variances in IFS is critical, as well as clear communication using consistent terminology between the differing care providers to ensure the highest quality of care is delivered to all women and their babies.

It was the intention of the Guideline Review Working Party that the Guideline should not undergo wholesale changes, or extensive re-design in its format. Previous editions of this Guideline have been used successfully and widely in Australia and New Zealand, and the Working Party believed that unnecessary changes could lead to confusion and decrease usage of the Guideline. Where new evidence has emerged, or where areas of practice have changed, these alterations have been incorporated into the text, maintaining a similar format to previous editions of this Guideline.

This third edition IFS Clinical Guideline provides recommendations for monitoring women in labour in the absence or presence of recognised risk factors. Monitoring modalities under consideration include: intermittent auscultation, cardiotocograph (CTG), fetal blood sampling and intrauterine pressure catheters. Other areas covered in the Guideline include: maintaining standards, suggestions for the management of fetal heart rate patterns suggestive of fetal compromise, routine paired umbilical cord blood gas analysis and several trialled techniques for fetal monitoring including fetal pulse oximetry and fetal electrocardiogram (ECG)-ST segment analysis. There is also now a dedicated section on the definition, diagnosis and emergency management of uterine hyperstimulation and new recommendations on amniotomy.

Prior editions of this IFS Clinical Guideline have used a modified system to grade recommendations, which was based on the UK's Royal College of Obstetricians and Gynaecologists Electronic Fetal Monitoring Guidelines.[1] The recommendations within this third edition IFS Clinical Guideline are strengthened by the use of an NHMRC grading system using a considered judgement process.[2, 3] The process to review the recommendations took into account the amount and quality of the available evidence, the generalisability and applicability of the evidence to the current Australian and New Zealand health care setting, and implementation considerations.

In critically assessing the available evidence to underpin the use of IFS in each clinical situation, the Working Party noted that Randomised Control Trial (RCT) evidence was desirable, but often lacking. In addition, RCT trials were often underpowered to detect important but rare outcomes such as cerebral palsy. Thus, sometimes lower level evidence was considered in framing recommendations.

To support implementation of best practice in IFS, RANZCOG runs a range of face-to-face education programs across Australia and New Zealand (www.fsep.edu.au) based on the IFS Clinical Guideline, and underpinned by a regularly updated online education program and a reliable assessment tool (http://ofsep.fsep.edu.au). It is RANZCOG's intention that these educational programs continue, whilst being updated to reflect the best available evidence within this third edition IFS Clinical Guideline.

Given the diversity of practice and the unique geography of Australia and New Zealand, RANZCOG is of the view that this IFS Clinical Guideline should be the preferred guideline to use when care is provided for women in labour, as they have been written with those considerations in mind. The Guideline recommendations should be interpreted in the context of each pregnant woman's clinical situation and proposed management.

RANZCOG is confident that this Guideline will be of great clinical use, and will prove to be a valuable aid in providing quality care for women and their babies.

The Guideline does not diminish the responsibility of health professionals to make considered judgements about intrapartum fetal surveillance, taking into account the risk assessment and preferences of the individual woman in labour.

Associate Professor Edward Weaver
Chair, Fetal Surveillance Guideline Review Working Party (2011–2013)

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Introduction

Australia and New Zealand are both safe places in which to give birth, or be born, and both countries compare favourably with other OECD countries.[4] Despite this, there is a continual challenge in maternity care to maintain and improve current perinatal outcomes, as the age of first time mothers increases. In addition, hospitals have to cope with an epidemic of diabetes and obesity which are both associated with a worsening in perinatal outcomes.[5, 6] There are also an increased number of choices of models of maternity care now available to women, performed by practitioners with different skill sets and training. It is important that safe care of women and their babies in labour is underpinned by consistent, evidence-based practice in IFS.

Clinical guidelines are an increasingly familiar part of clinical practice. Their principal aim is to improve the effectiveness and efficiency of clinical care through the identification of good clinical practice and desired clinical outcomes. The specific aim of this Guideline, in combination with continuing education, training and credentialing, is to reduce adverse perinatal outcomes related to inappropriate or inadequate intrapartum fetal surveillance.

Background

Development of the Guideline: 2000–2002

In September 2000, the Victorian Managed Insurance Authority (VMIA) provided RANZCOG with a confidential report into obstetric cases reported to the Authority between 1993 and 1998. The report identified cases in which the reviewers considered there were potentially avoidable factors resulting in an adverse outcome. Issues relating to the use and interpretation of cardiotocographs (CTGs) represented a high proportion of these cases. In response to this report, the RANZCOG Council endorsed a submission from its Practice Improvement and Medico-legal Committees to develop an evidence-informed clinical practice guideline in intrapartum fetal surveillance. This submission was approved for funding by VMIA.

In 2001, Professor Bruce Barraclough, Chair, Australian Council for Safety and Quality in Health Care at the launch of the National Action Plan 2001, argued that improving the quality and safety of patient care was the most important challenge facing health professionals; "we must stop blaming individuals and put much greater effort into making our systems of care safer and better".[7]

The Douglas Report: Inquiry into obstetric and gynaecological services at King Edward Memorial Hospital 1990–2000, published in November 2001, also highlights key clinical governance issues in obstetric and gynaecology services.[8] The report emphasises the importance of clinical risk management strategies based on the identification and analysis of risk in a framework that enables the establishment of processes to minimise risk. The development of clinical practice guidelines, along with strategies to ensure their implementation via an effective education and credentialing process, would provide a framework to support health professionals in the provision of safe, quality health care.

RANZCOG established a Guideline Development Group and contracted The Royal Women's Hospital Division of Research and Education to assist in the development of the first edition of this evidence-informed guideline in 2001. While this project was funded and developed in Victoria, there was an extensive consultation process across Australia and New Zealand when developing the original Guideline. A draft was circulated throughout Australia and New Zealand to Fellows, Diplomates, Midwives, the Royal Australian College of General Practitioners (RACGP), the Australian College of Rural and Remote Medicine (ACRRM) and consumers.

The initial phase of this project involved a search and critical appraisal of recent publications addressing the topic of intrapartum fetal surveillance. In view of the release in May 2001 of the United Kingdom of the Royal College of Obstetricians and

Gynaecologists (RCOG)/National Institute for Clinical Excellence (NICE) Guidelines on the use of electronic fetal monitoring[1] (which included a comprehensive bibliography and evaluation of the literature), it was agreed to restrict the literature search and appraisal to articles published from July 2000 onwards and to integrate new literature with the existing evidence to that date.

In the opinion of the Guideline Development Group, the environment in which obstetrics is practised in Australia and New Zealand differed sufficiently from that of the United Kingdom to require a guideline for use in the Australian and New Zealand setting. In particular, the health care system has a different public/private split and maternity care is provided in a range of facilities defined within a Hospital Capability Framework from 1-6 [9-11] and in New Zealand with District Health Boards, with varying degrees of obstetric expertise and back-up. In addition, rural and provincial practitioners often provide services in isolation both professionally and geographically. There was also concern that the numbers of health care professionals practising obstetrics and midwifery in Australia were diminishing[12, 13] and that local guidelines might have a role in mitigating this trend. Accordingly, the Guideline was produced in order to provide a foundation on which clinicians providing intrapartum care in Australia and New Zealand should base their practice.

In December 2002, the Clinical Guidelines for Intrapartum Fetal Surveillance (First Edition) were published with a planned revision in 2004. Copies of the Guideline were widely circulated and freely available on the College website (www.ranzcog.edu.au). Users of the Guideline were encouraged to provide feedback on any aspects that required clarification and any barriers or problems they expected or experienced in implementing the Guideline. The feedback from users was collated and held at College House.

Revision of the Guideline: 2004–2006

In 2004, a Guideline Review Group was convened to oversee the revision process of the Guideline. This process involved a number of distinct but related steps including the review of feedback from clinicians (both medical and midwifery), a further literature update appraisal (from 2002-2005), an expert panel workshop and further drafting. Following the revision, a workshop was convened where key stakeholders were invited to participate in multidisciplinary discussion of the revised Guideline (Second edition) prior to publication. Such external consultation facilitated dialogue to ensure the Guideline was relevant to the needs of clinicians and consumers throughout Australia and New Zealand.

Revision of Guideline: 2010–2014

In 2010, recognising that this Guideline had not been reviewed for four years, RANZCOG convened a new multidisciplinary Fetal Surveillance Guideline Review Working Party (Appendix A). The Working Party was brought together to consider new published evidence in the field of fetal surveillance in labour, and to recommend any required changes to the second edition of the Guideline.

RANZCOG commissioned the Royal Women's Hospital Clinical Practice Improvement Unit (Melbourne, Australia) to undertake a literature search and critical appraisal of publications addressing the topic of intrapartum fetal surveillance, published between September 2004 and March 2012. The outcome of this search was that 28 new citations were considered by the Guideline Review Working Party for this third edition IFS Clinical Guideline. An additional literature search specific for emergency treatment of uterine hyperstimulation carried out by the Evidence Synthesis Program, Monash Applied Research, Monash University yielded one relevant article for consideration.

The clinical question relating to risk factors associated with poor outcomes (antenatal and intrapartum) was not subject to a full systematic review of the literature as initial searches on this topic demonstrated a lack of Level I evidence in this area. Therefore, a more general literature search through Ovid MEDLINE was carried out on risk factors associated with poor outcomes (antenatal and intrapartum).

Following review of the new published literature, the Guideline Review Working Party met and drafted a new expanded third edition IFS Clinical Guideline. The Working Party took into account calls for changes to the Guideline that were made by relevant bodies, for example, the Victorian Coroner's court, and changes to the overall profile of women having babies in Australia and New Zealand (for example, older first time mothers and higher obesity rates among pregnant women).

The draft Guideline was sent to relevant stakeholders for consultation and amended accordingly following feedback.

The next revision of this Guideline is proposed to take place in 2017, or sooner if required, in the light of new published evidence.

Clinical need for this Guideline

The principal aim of intrapartum fetal surveillance is to prevent adverse perinatal outcomes arising from fetal metabolic acidosis/ cerebral hypoxia related to labour. However, many factors contribute to the development and severity of an asphyxial injury (e.g. tissue perfusion, tissue substrate availability, the duration and severity of the insult, the fetal condition prior to the insult) such that the relationship between metabolic acidosis and cerebral damage is complex. Therefore, the degree of tissue damage and subsequent injury does not necessarily relate directly to the extent of fetal metabolic acidosis arising during labour. Furthermore, it is clear that most often damage is actually sustained during pregnancy, prior to labour, rather than arising *de novo* during labour and delivery.

Nonetheless, the practice of fetal surveillance during labour would be expected to detect those fetuses at risk of compromise, allowing appropriate intervention and thereby increasing the likelihood of improved perinatal outcomes. Monitoring the health of the fetus during labour has therefore become a key component of modern maternity care. Traditionally, this was undertaken by simple regular auscultation of the fetal heart with a stethoscope. However, this approach was considered by many to be inadequate, particularly for high-risk pregnancies. Therefore, in an effort to reduce the incidence of intrapartum fetal mortality and morbidity, the use of intrapartum electronic fetal monitoring (EFM), particularly continuous CTG, has steadily increased over the last 35 years.

The use of CTG for intrapartum fetal surveillance has now become entrenched in practice without robust randomised controlled trial (RCT) evidence to support it. The RCTs of continuous CTG which have been undertaken have suggested that its use is not associated with statistically significant improvements in long-term neonatal outcomes such as cerebral palsy, but that it is associated with significantly increased rates of (unnecessary) operative delivery. Nonetheless, not surprisingly, concerns about maternal hazards and small or absent perinatal benefit have led some authorities to advise against the routine use of continuous CTG for low risk labours.[1, 14, 15]

However, the interpretation of the available evidence is more complex. Firstly, it is widely acknowledged that the accumulated evidence of RCTs, when subjected to meta-analysis, still does not have sufficient patient numbers to validly assess effects on a rare outcome such as cerebral palsy.[16] It is therefore quite possible that continuous CTG does confer important benefits on neonatal outcomes but that the potential benefits or risks have not been quantifiable by the trials undertaken to date. However, there is other evidence, both from RCTs and cohort studies, using surrogate end points that would support the routine use of continuous CTG.[17, 18] Secondly, it is now widely appreciated that the visual interpretation of continuously generated signals from the fetal heart, however derived, is subject to shortcomings in interpretation. Review of cases with poor outcomes repeatedly demonstrate that abnormal CTGs were misinterpreted and the resulting management inappropriate.[19, 20] This likely arises, at least in part, because health care professionals have not been supported by comprehensive ongoing education and credentialing programs.

It is therefore not surprising that the apparent inconsistencies in the currently available evidence and apparent inadequacies of professional training in the use of intrapartum fetal surveillance have resulted in differences in practice.[21] However, the avoidance of adverse outcomes from intrapartum insult remains the objective of intrapartum fetal surveillance. This objective should be the same

at all hospitals providing maternity services, regardless of their size or the case-mix of their population. How this objective is met may vary according to local resources and patient mix but it is more likely to be met, and met consistently, through the provision of clinical guidelines pertaining to the practice of intrapartum fetal surveillance, supported by continuing professional development in the application and interpretation of fetal monitoring. It is hoped that this Guideline assists in these processes.

Thus, this Guideline was produced in order to provide a foundation on which clinicians providing intrapartum care in Australia and New Zealand should base their practice.

This Guideline has been developed using the best available evidence. Where insufficient high-level evidence was available, recommendations have been developed based on expert opinion and consensus. This Guideline is written as a general guide, subject to the clinician's expert judgement in any particular clinical situation.

Guideline objectives

The specific aim of this Guideline is, in combination with continuing education and training of maternity care staff, to reduce adverse perinatal outcomes related to inappropriate or inadequate performance and/or interpretation of intrapartum fetal surveillance. This will be achieved by encouraging best practice in:

- decisions relating to the use and interpretation of intermittent auscultation (IA) or continuous CTG;
- appropriate antenatal and perinatal risk identification and management for each pregnant woman;
- decisions relating to the use of admission CTG; and
- management of suspected fetal compromise both pre labour and intrapartum.

Target audience for the Guideline

This Guideline is intended for use by health care professionals providing intrapartum care to pregnant women in established labour in Australia and New Zealand. Health care professionals providing intrapartum care may include: obstetricians (specialist or general practitioner), midwives, obstetric physicians, trainees and allied health professionals.

This Guideline also provides useful information for pregnant women and their partners, health policy makers, health regulators and those responsible for quality and safety of healthcare.

Scope of the Guideline

This Guideline provides recommendations on decisions relating to the use and interpretation of intrapartum fetal surveillance in pregnant women in established labour. The Guideline includes recommendations on the management of suspected fetal compromise in both the pre-labour phase and active phase of labour.

This guideline does not provide recommendations for fetal surveillance during the antenatal period.

Funding source for the update of this Guideline

The update of this guideline was funded by the Victorian Managed Insurance Authority (VMIA). The views or interests of the VMIA have not influenced the development of this document.

Revision of this Guideline

To maintain currency this Guideline will be reviewed for consideration of an update in 2017.

Evidence and recommendations

Developing recommendations

This section lists all the recommendations presented in this Guideline together with their grade and level of evidence on which they are based. Further details on the supporting evidence can be found in the relevant section of this Guideline. Each recommendation is given an overall grade based on National Health and Medical Research Council (NHMRC) Levels of Evidence and Grades for Recommendations for Developers of Guidelines.[3]

Where no robust evidence was available but there was sufficient consensus within the Fetal Surveillance Guideline Review Working Party, consensus-based recommendations were developed, and agreed to by the entire committee and are identifiable as such. Good Practice Notes are highlighted throughout this Guideline and provide practical guidance to facilitate implementation. These were also developed through consensus of the entire Working Party.

Grading of recommendations[3]

Recommendation category		Description
Evidence-based recommendation	A	Body of evidence can be trusted to guide practice
	B	Body of evidence can be trusted to guide practice in most situations
	C	Body of evidence provides some support for recommendation(s) but care should be taken in its application
	D	The body of evidence is weak and the recommendation(s) must be applied with caution
Consensus-based recommendation		Consensus-based recommendations based on expert opinion where the available evidence was inadequate or could not be applied in the Australian and NZ healthcare context
Good Practice Note		Practical advice and information based on expert opinion to aid in the implementation of the Guideline

Wording of recommendations

Where the words "use", "recommended" or "should" appear in recommendations in this Guideline, this Working Party judged that the benefits of the recommended approach clearly exceeded the harms, and that the evidence supporting the recommendation was trusted to guide practice.

Where the words "consider", "might" or "could" appear in recommendations in this Guideline, either the quality of evidence was insufficient to make a strong recommendation, or the available studies demonstrated little clear advantage of one approach over another, or the balance of benefits to harm was unclear.

Where the words "not recommended" appear in recommendations in this Guideline, there was either a lack of appropriate evidence, or the harms outweighed the benefits.

Summary of recommendations and good practice notes

Recommendations	
Antenatal and Intrapartum risk factors that increase risk of fetal compromise. Intrapartum cardiotocography is recommended.	
Antenatal risk factors • abnormal antenatal CTG • abnormal Doppler umbilical artery velocimetry • suspected or confirmed intrauterine growth restriction • oligohydramnios or polyhydramnios • prolonged pregnancy ≥ 42 weeks[22] • multiple pregnancy[23] • breech presentation[24, 25] • antepartum haemorrhage • prolonged rupture of membranes (≥ 24 hours)[24] • known fetal abnormality which requires monitoring • uterine scar (e.g. previous caesarean section) • essential hypertension or pre-eclampsia • diabetes where medication is indicated[26] or poorly controlled, or with fetal macrosomia • other current or previous obstetric or medical conditions which constitute a significant risk of fetal compromise (e.g. cholestasis, isoimmunisation, substance abuse) • decreased fetal movements[24, 25] • morbid obesity (BMI ≥ 40)[27, 28] • maternal age ≥ 42[29-31] • abnormalities of maternal serum screening associated with an increased risk of poor perinatal outcomes (e.g. low PAPP-A <0.4MoM)[32]	**Intrapartum risk factors** • induction of labour with prostaglandin/oxytocin • abnormal auscultation or CTG • oxytocin augmentation • regional anaesthesia (e.g. epidural or spinal)* and paracervical block • abnormal vaginal bleeding in labour • maternal pyrexia: ≥ 38°C[33] • meconium or blood stained liquor[34] • absent liquor following amniotomy • prolonged first stage as defined by referral guidelines • prolonged second stage as defined by referral guidelines • pre-term labour less than 37 completed weeks • tachysystole (more than five active labour contractions in ten minutes without fetal heart rate abnormalities) • uterine hypertonus (contractions lasting more than two minutes in duration or contractions occurring within 60 seconds of each other, without fetal heart rate abnormalities) • uterine hyperstimulation (either tachysystole or uterine hypertonus with fetal heart rate abnormalities)
*Following a decision to insert an epidural block, a CTG should be commenced to establish baseline features prior to the block's insertion.	

Conditions where intrapartum cardiotocography is not indicated when the condition occurs in isolation, but if multiple conditions are present, intrapartum cardiotocography should be considered	
Antenatal risk factors • pregnancy gestation 41.0 – 41.6 weeks' gestation[22, 29-31] • gestational hypertension[35] • gestational diabetes mellitus without complicating factors • obesity (BMI: 30-40) • maternal age: ≥ 40 and < 42 years	**Intrapartum risk factors** • maternal pyrexia: ≥ 37.8 and < 38 degrees[33]

Communication and Information	
Recommendation 1	Grade and supporting references
During pregnancy, women should be offered information on intrapartum fetal surveillance by those responsible for provision of maternity care.	Consensus-based recommendation [36-38] (Level IV)
Recommendation 2	Grade and supporting references
Health professionals who provide intrapartum care have a responsibility to ensure that they undertake that care with an understanding of the relevant maternal and fetal pathophysiology and understand the available fetal surveillance options.	B [39] (Level I)

Intrapartum Fetal Surveillance	
Recommendation 3	Grade and supporting references
Fetal surveillance in labour, whether by intermittent auscultation or by electronic fetal monitoring, should be discussed with and recommended to all women.	C [20, 38] (Level III-3)

Intrapartum Fetal Surveillance in the absence of recognised risk factors	
Admission CTG	
Recommendation 4	Grade and supporting references
Limitations in the randomised controlled trial evidence make it difficult to depend on that evidence to guide practice in the Australian and New Zealand context regarding the use of admission CTG in women. Admission CTG increases the rate of continuous electronic fetal monitoring use, may increase the rate of caesarean section but may identify a small number of previously unidentified at risk fetuses. Attending clinicians should decide whether or not to use admission CTG according to individual women's circumstances and decisions.	A [40] (Level I)
Good Practice Note	Grade and supporting references
Women should receive 1:1 midwifery intrapartum care. Cardiotocography should not be used as a substitute for adequate intrapartum midwifery staffing.	Good Practice Note (Consensus-based)

Admission CTG	
Good Practice Note	Grade and supporting references
It is important to identify the potentially unrecognised "at risk" fetus. Cardiotocography may be beneficial for women with risk factors for fetal compromise that on their own do not meet the criteria for recommending continuous cardiotocography (e.g. maternal age 40-41, BMI 35-39, assisted reproduction, gestational hypertension etc.) but do so where more than one such risk factor is present, as multiple factors are more likely to have a synergistic impact on fetal risk.	Good Practice Note (Consensus-based) [41]

Modality of Intrapartum Fetal Surveillance in the absence of recognised risk factors	
Recommendation 5	Grade and supporting references
Intermittent auscultation is an appropriate method of intrapartum fetal monitoring in women without recognised risk factors. Weighing the probable increase in operative birth against a possible fetal benefit in a very small number of labours, the use of cardiotocography in women without recognised risk factors for fetal compromise should be individualised after discussion with the woman.	B [42] (Level I)
Good Practice Note	Grade and supporting references
Regardless of the method of intrapartum monitoring, it is essential that an accurate record of fetal wellbeing is obtained. Fetal and maternal heart rates should be differentiated whatever the mode of monitoring used.	Good Practice Note (Consensus-based)

Method of auscultation	
Recommendation 6	Grade and supporting references
When using intermittent auscultation, it should be performed according to a standardised protocol:	
1. Intermittent auscultation must be performed with a technique that can accurately measure the fetal heart rate in the individual woman.	B [43] (Level II)
2. Each auscultation episode should commence toward the end of a contraction and be continued for at least 30-60 seconds after the contraction has finished.	Consensus-based recommendation
3. Auscultation in labour should be undertaken and documented: • Every 15-30 minutes in the active phase of the first stage of labour. • After each contraction or at least every five minutes in the active second stage of labour.	Consensus-based recommendation

Intrapartum Fetal Surveillance in the presence of, or with the emergence of fetal and/or maternal risk factors	
Recommendation 7	Grade and supporting references
Continuous CTG should be recommended when either risk factors for fetal compromise have been detected antenatally, are detected at the onset of labour or develop during labour.	B [42] (Level I)
Good Practice Notes	Grade and supporting references
Interruptions to fetal heart rate monitoring **Personal care** Where continuous electronic fetal monitoring is required, and if the electronic fetal monitoring to date is considered to be normal, monitoring may be interrupted for short periods of up to 15 minutes to allow personal care (e.g. shower, toilet). Such interruptions should be infrequent and not occur immediately after any intervention that might be expected to alter the fetal heart rate (e.g. amniotomy, epidural insertion or top-up etc.). Women's wellbeing is considered and their wishes are respected in relation to monitoring. Disturbances to the woman are also minimised e.g. monitoring volume low, upright positions/mobility, and use of water for pain relief. **Procedures** Consideration should be given to instituting electronic fetal monitoring prior to insertion of a regional anaesthetic or paracervical block to establish baseline fetal heart rate characteristics. Interruptions to fetal monitoring should be minimised given the potential for fetal vulnerability during these times. **Transfers** The fetal heart rate should be monitored by intermittent auscultation during unavoidable interruptions, at times of potential fetal vulnerability, with re-commencement of continuous CTG when feasible. Interruptions to fetal monitoring should be minimised during transfer to the operating theatre and prior to delivery of the fetus.	Good Practice Note (Consensus-based) Good Practice Note (Consensus-based) Good Practice Note (Consensus-based)

Management of fetal heart rate patterns considered suggestive of fetal compromise	
Recommendation 8	Grade and supporting references
In clinical situations where the fetal heart rate pattern is considered abnormal, immediate management should include: • identification of any reversible cause of the abnormality and initiation of appropriate action (e.g. maternal repositioning, correction of maternal hypotension, rehydration with intravenous fluid, cessation of oxytocin and/or tocolysis for excessive uterine activity) and initiation or maintenance of continuous CTG. • Consideration of further fetal evaluation or delivery if a significant abnormality persists. • Escalation of care if necessary to a more experienced practitioner.	A [42] (Level I)

Management of fetal heart rate patterns considered suggestive of fetal compromise	
Good Practice Notes	Grade and supporting references
The normal CTG is associated with a low probability of fetal compromise and has the following features: • Baseline rate 110-160 bpm. • Baseline variability of 6-25 bpm. • Accelerations of 15 bpm for 15 seconds. • No decelerations. All other CTGs are by this definition abnormal and require further evaluation taking into account the full clinical picture. **The following features are unlikely to be associated with fetal compromise when occurring in isolation:** • Baseline rate 100-109 bpm. • Absence of accelerations. • Early decelerations. • Variable decelerations without complicating features. **The following features may be associated with significant fetal compromise and require further action, such as described in Recommendation 8:** • Baseline fetal tachycardia >160 bpm. • Reduced or reducing baseline variability (3-5bpm). • Rising baseline fetal heart rate. • Complicated variable decelerations. • Late decelerations. • Prolonged decelerations. **The following features are likely to be associated with significant fetal compromise and require immediate management, which may include urgent delivery:** • Prolonged bradycardia (<100 bpm for >5 minutes). • Absent baseline variability (<3 bpm). • Sinusoidal pattern. • Complicated variable decelerations with reduced or absent baseline variability. • Late decelerations with reduced or absent baseline variability. See Appendix G for Definitions	Good Practice Notes (Consensus-based)

Uterine hyperstimulation	
Recommendation 9	Grade and supporting references
Excessive uterine activity in the absence of fetal heart rate abnormalities. In the presence of excessive uterine activity (defined as either): • tachysystole (more than five active labour contractions in ten minutes, without fetal heart rate abnormalities), or • uterine hypertonus (contractions lasting more than two minutes in duration or contractions occurring within 60 seconds of each other, without fetal heart rate abnormalities) Appropriate management of uterine hypertonus or tachysystole should include: • continuous cardiotocography; • consider reducing or ceasing oxytocin infusion; • maternity staff remaining with the woman until normal uterine activity is observed; • tocolysis may be considered.	Consensus-based recommendation
Recommendation 10	Grade and supporting references
Uterine hyperstimulation is defined as tachysystole or uterine hypertonus in the **presence** of fetal heart rate abnormalities. Appropriate management of uterine hyperstimulation should include: • continuous cardiotocography; • reducing or ceasing oxytocin infusion; • maternity staff remaining with the woman until normal uterine activity is observed; • consideration of tocolysis; or • consideration of urgent delivery. Maternity care providers should be familiar with and have a protocol for acute tocolysis (relevant to the level of service) in the event that uterine hyperstimulation occurs. Tocolytic regimens available may include: • Terbutaline, 250 micrograms intravenously or subcutaneously (Grade C) • Salbutamol, 100 micrograms intravenously • GTN spray, 400 micrograms sublingually	Consensus-based recommendation Terbutaline recommendation C [44] (Level II)
Good Practice Note	Grade and supporting references
Excessive uterine activity in the absence of evidence of fetal compromise is not in itself an indication for tocolysis.	Good Practice Note (Consensus-based)

Fetal blood sampling	
Recommendation 11	Grade and supporting references
Units employing electronic fetal monitoring are strongly encouraged to have access to fetal blood sampling facilities to assist in the management of labours where the fetus is demonstrating equivocal CTG changes.	Consensus-based recommendation
Recommendation 12	Grade and supporting references
If fetal blood sampling is indicated, the use of scalp lactate rather than pH measurement will provide an easier and more affordable adjunct to electronic fetal monitoring for some units.	A [45] (Level I)
Good Practice Note	Grade and supporting references
Thresholds for lactate may vary between institutions. Institutions should have local protocols for lactate thresholds.	Good Practice Note (Consensus-based)
Recommendation 13	Grade and supporting references
Delivery should be expedited where: • There is clear evidence of serious fetal compromise (FBS should not be undertaken). • CTG abnormalities are of a degree requiring further assessment, but FBS is contraindicated, clinically inappropriate or unavailable. • The decision to delivery interval may be prolonged by virtue of location, clinical staff availability, patient factors or access to clinical services.	Consensus-based recommendation
Good Practice Note	Grade and supporting references
If fetal blood sampling is undertaken, it is recommended that the woman be in the left-lateral position or lithotomy with a wedge in place to avoid inferior vena cava syndrome or supine hypotension syndrome. Contraindications to FBS include: • Evidence of serious, sustained fetal compromise. • Fetal bleeding disorders (e.g. suspected fetal thrombocytopenia, haemophilia). • Face or brow presentation. • Maternal infection* (e.g. HIV, hepatitis B, hepatitis C, herpes simplex virus and suspected intrauterine sepsis). *Group B Streptococcus carrier status does not preclude FBS.	Good Practice Note (Consensus-based)
Good Practice Note	Grade and supporting references
Fetal blood sampling is not generally recommended in pregnancies at less than 34 weeks of gestation because delivery may be inappropriately delayed in a premature "at risk" fetus that may sustain damage earlier than would be expected in a term fetus.	Good Practice Note (Consensus-based)

Fetal blood sampling	
Good Practice Note	Grade and supporting references
If a fetus is in a breech presentation during labour and is exhibiting signs of fetal compromise that are not readily remediable, it would be more appropriate to deliver that baby by caesarean section than to undertake fetal blood sampling.	Good Practice Note (Consensus-based)

Other techniques for Intrapartum Fetal Surveillance	
Fetal ECG/ST segment analysis, fetal pulse oximetry and intrauterine pressure catheters	
Recommendation 14	Grade and supporting references
There is insufficient evidence to recommend fetal ECG/ST segment analysis, or fetal pulse oximetry for use in intrapartum fetal surveillance.	A 46, 47, 48, 92-94 (Level I)
Recommendation 15	Grade and supporting references
If there is difficulty auscultating the fetal heart OR obtaining an adequate fetal heart rate tracing at any time in labour, the fetal heart rate should be monitored using a scalp electrode.	Consensus-based recommendation
Amnioinfusion	
Recommendation 16	Grade and supporting references
Amnioinfusion is not recommended for routine treatment of variable decelerations in labour. However, in a small number of cases where fetal blood sampling is not possible or contraindicated and caesarean section is relatively contraindicated, amnioinfusion may confer a small benefit.	B 49-51 (Level I)

Maintaining standards in Intrapartum Fetal Surveillance	
Standardisation	
Recommendation 17	Grade and supporting references
Settings on CTG machines should be standardised to enable a consistent approach to teaching and interpretation of CTG traces, particularly as many health professionals move between different institutions in Australia and New Zealand.	Consensus-based recommendation
Recommendation 18	Grade and supporting references
Until there is clear evidence that interpretation based on one paper speed is superior to the others, it is recommended that the paper speed of 1cm per minute be adopted universally.	Consensus-based recommendation

Good Practice Notes	Grade and supporting references
• Date and time settings on CTG machines should be validated whenever used. • CTGs should be labelled with the mother's name, hospital number, date and time of commencement and include the maternal observations. • Any intrapartum events that may affect the fetal heart rate (e.g. vaginal examination, obtaining a fetal blood sample (FBS), insertion/top-up of an epidural) should be noted contemporaneously including date, time and signature. • For women receiving continuous CTG, the trace should be reviewed at least every 15-30 minutes and should be acted upon. It should be regularly recorded, either by written or electronic entry, in the medical record that the CTG has been reviewed. • Health professionals should be aware that machines from different manufacturers use different vertical axis scales, and this can change the perception of fetal heart rate variability.	Good Practice Notes (Consensus-based)

Paired umbilical cord blood gas analysis	
Recommendation 19	Grade and supporting references
Paired umbilical cord blood gas or lactate analysis should be taken at delivery where any of the following are present: • Apgar score < 4 at 1 minute. • Apgar score < 7 at 5 minutes. • Fetal scalp sampling performed in labour. • Operative delivery undertaken for fetal compromise. Where paired umbilical cord blood gas or lactate analysis is taken at delivery as part of a clinical audit regimen, this process should not interfere with management of the third stage of labour.	C [52] (Level III-3)
Recommendation 20	Grade and supporting references
All health professionals involved in providing antenatal and intrapartum care should participate in regular multi-disciplinary clinical audits focussing on maternal and perinatal outcomes in relation to intrapartum fetal monitoring.	Consensus-based recommendation
Good Practice Note	Grade and supporting references
The following practices assist with clinical audit and education: • Regular CTG review meetings. • Review of the use of FBS where available.	Good Practice Note (Consensus-based)
Good Practice Note	Grade and supporting references
CTG traces should be stored in a manner that enables ready access for multidisciplinary clinical audit and clinical education.	Good Practice Note (Consensus-based)

Antenatal and Intrapartum risk factors that increase risk of fetal compromise

The likelihood of poor fetal outcomes is increased by well-recognised antenatal and intrapartum risk factors. However, there are few population-based studies on risk factors associated with poor outcomes.

This Working Party identified a number of risk factors listed below. Some were taken from previous editions of this Guideline, some were risk factors listed in other international intrapartum fetal surveillance guidelines[1, 53] and others were derived by consensus of the Working Party.

Although in isolation some of the risk factors may be considered minor, there is often a continuum of disease and the cumulative effects of multiple risk factors may be additive or synergistic.

Antenatal and Intrapartum factors that increase risk of fetal compromise. Intrapartum cardiotocography is recommended	
Antenatal risk factors • abnormal antenatal CTG • abnormal Doppler umbilical artery velocimetry • suspected or confirmed intrauterine growth restriction • oligohydramnios or polyhydramnios • prolonged pregnancy ≥ 42 weeks;[22] • multiple pregnancy[23] • breech presentation[24, 25] • antepartum haemorrhage • prolonged rupture of membranes (≥ 24 hours)[24] • known fetal abnormality which requires monitoring • uterine scar (e.g. previous caesarean section) • essential hypertension or pre-eclampsia • diabetes where medication is indicated[26] or poorly controlled, or with fetal macrosomia • other current or previous obstetric or medical conditions which constitute a significant risk of fetal compromise (e.g. cholestasis, isoimmunisation, substance abuse) • decreased fetal movements[24, 25] • morbid obesity (BMI: ≥ 40)[27, 28] • maternal age: ≥ 42[29-31] • abnormalities of maternal serum screening associated with an increased risk of poor perinatal outcomes (e.g. low PAPP-A <0.4MoM)[32]	**Intrapartum risk factors** • induction of labour with prostaglandin/oxytocin • abnormal auscultation or CTG • oxytocin augmentation • regional anaesthesia (e.g. epidural or spinal)* and paracervical block • abnormal vaginal bleeding in labour • maternal pyrexia: ≥ 38°C[33] • meconium or blood stained liquor [34] • absent liquor following amniotomy • prolonged first stage as defined by referral guidelines • prolonged second stage as defined by referral guidelines • pre-term labour less than 37 completed weeks • tachysystole (more than five active labour contractions in ten minutes, without fetal heart rate abnormalities) • uterine hypertonus (contractions lasting more than two minutes in duration or contractions occurring within 60 seconds of each other, without fetal heart rate abnormalities) • uterine hyperstimulation (either tachysystole or uterine hypertonus with fetal heart rate abnormalities).
*Following a decision to insert an epidural block, a CTG should be commenced to establish baseline features prior to the block's insertion.	

Table continues on following page.

Conditions where a recommendation for intrapartum cardiotocography is not indicated when the condition occurs in isolation, but if multiple conditions are present, a recommendation for intrapartum cardiotocography should be considered	
Antenatal risk factors • pregnancy gestation 41.0 – 41.6 weeks' gestation[29-31,22] • gestational hypertension[35] • gestational diabetes mellitus without complicating factors • obesity (BMI: 30-40) • maternal age: ≥ 40 and < 42 years	**Intrapartum risk factors** • maternal pyrexia: ≥ 37.8°C and < 38°C [33]

Communication with, and information for, pregnant women

Two papers demonstrate the importance of providing information to women in labour. The first describes the results of a questionnaire that was sent to women 8–9 months after they gave birth in Victoria, Australia.[37] Not having an active say in decisions was associated with a six-fold increase in dissatisfaction among nulliparous women and a 15-fold increase among multiparous women. When adjusted for parity, insufficient information was highly related to dissatisfaction with intrapartum care ($P < 0.001$). In a second qualitative study where 20 women were interviewed about their second stage of labour, these women wanted more informational support, especially in alleviating unvoiced fears about their child's health.[36]

Women are encouraged to involve themselves in making informed decisions together with their obstetrician, general practitioner or midwife about intrapartum fetal surveillance, based on accurate information and consideration of their particular risk factors, if any. RANZCOG has developed an updated patient information pamphlet to complement this Guideline, which can be obtained from RANZCOG.

Women should have the same level of general care and support, regardless of their decision about intrapartum fetal surveillance.

Recommendation 1	Grade and supporting references
During pregnancy, women should be offered information on intrapartum fetal surveillance by those responsible for provision of maternity care.	Consensus-based recommendation [36-38] (Level IV)

Communication and information between clinicians

Intrapartum fetal surveillance and its interpretation is a complex task which requires:
- a sound understanding of fetal physiological responses to hypoxia;
- good pattern recognition skills; and
- the ability to integrate this knowledge with each clinical situation.

Case reviews have indicated that adverse perinatal outcomes are more likely to occur where there is lack of clear communication between clinicians caring for the individual woman and failure to use clear and consistent terminology.[15, 54] A comprehensive education and credentialing program can best address these issues, enabling suitable competency assessment of health professionals to identify and minimise system errors, which contribute to poor fetal surveillance practices.[8]

A systematic review of 20 studies published by Pehson and colleagues in 2011 reported several studies demonstrating an increase in knowledge and skills in fetal surveillance in all staff following multidisciplinary training.[39] There was also a significant reduction in suboptimal intrapartum care observed after the introduction of mandatory educational interventions to improve CTG skills to all staff.[55]

Recommendation 2	Grade and supporting references
Health professionals who provide intrapartum care have a responsibility to ensure that they undertake that care with an understanding of the relevant maternal and fetal pathophysiology and understand the available fetal surveillance options.	B [39] (Level I)

Intrapartum Fetal Surveillance

There is universal acceptance that the fetus in labour is at particular risk from hypoxic damage.[56] It is expected that the detection of fetal compromise enables appropriate and timely intervention, thereby reducing the incidence of adverse outcomes.[20]

Recommendation 3	Grade and supporting references
Fetal surveillance in labour, whether by intermittent auscultation or by electronic fetal monitoring, should be discussed with and recommended to all women.	C [20, 38] (Level III-3)

Intrapartum Fetal Surveillance in the absence of recognised risk factors

Admission CTG

The admission CTG is a commonly used screening test, which aims to identify, on admission to the delivery unit, the fetus at increased risk of intrapartum hypoxia. A number of cohort studies[57, 58] and case control series[59] have suggested that the use of an admission CTG improves the prediction of important adverse perinatal outcomes including neonatal acidaemia, neonatal encephalopathy,[59] long-term neurological impairment [60] and death.[57]

In contrast to these cohort studies, a meta-analysis of the randomised controlled trials (RCTs) of admission CTG in low risk labours[40] failed to show an immediate benefit to the neonate. The review found a 20% increase in the caesarean section rate in the admission CTG group.

While many centres or clinicians will objectively follow the recommendations of Devane et al., 2012 and not recommend admission CTGs for low risk women, others will continue to recommend admission CTGs for low risk women for one or more of the following reasons:

- Multiple authors have highlighted that the RCTs have not been of sufficient size to demonstrate statistically significant differences in the incidence of important but infrequent neonatal outcomes such as hypoxic ischaemic encephalopathy (HIE)[16, 61-63] and it remains possible that the admission CTG confers a fetal benefit in a very small number of labours.[65] Importantly, in the Dublin trial,[64] the largest trial reported to date, which therefore dominates the meta-analysis,[40] early amniotomy was performed and continuous CTG undertaken if meconium-stained liquor was observed. In Australia and New Zealand, early amniotomy is less commonly practised, and therefore less women with meconium stained liquor, an important intrapartum risk factor for fetal

hypoxia, will be recognised early in labour. Thus, the possible benefits of admission CTG in Australian practice may be greater than would have been detectable in the Dublin trial.

- Other regional variations reduce the relevance of the RCT meta-analysis to the Australian and New Zealand context. For example, the RCTs were conducted in hospitals with a tradition of one-to-one midwife-patient ratios in labour and immediate access to operative intervention should that become necessary. It is unfortunate, but there are centres in Australia and New Zealand where staffing ratios are suboptimal and/or access to an operating theatre limited by the need to call in theatre staff from home and/or competition with emergency general surgery.
- Many women in Australia are accepting of an increase in the caesarean section rate even if the fetal benefit is very small.[65]

Recommendation 4	Grade and supporting references
Limitations in the randomised controlled trial evidence make it difficult to depend on that evidence to guide practice in the Australian and New Zealand context regarding the use of admission CTG in women. Admission CTG increases the rate of continuous cardiotocography use which may increase the rate of caesarean section but may identify a small number of previously unidentified at risk fetuses. Attending clinicians should decide whether or not to recommend admission CTG according to individual women's circumstances and decisions.	A [40] (Level I)
Good Practice Note	**Grade and supporting references**
Women should receive 1:1 midwifery intrapartum care. Cardiotocography should not be used as a substitute for adequate intrapartum midwifery staffing.	Good Practice Note (Consensus-based)
Good Practice Note	**Grade and supporting references**
It is important to identify the potentially unrecognised "at risk" fetus. Cardiotocography may be beneficial for women with risk factors for fetal compromise that on their own do not meet the criteria for recommending continuous cardiotocography (e.g. maternal age 40-41, BMI 35-39, assisted reproduction, gestational hypertension etc.) but do so where more than one such risk factor is present, as multiple factors are more likely to have a synergistic impact on fetal risk.	Good Practice Note (Consensus-based) [41]

Modality of intrapartum fetal monitoring in the absence of recognised risk factors

A systematic review of RCTs of intermittent auscultation (IA) versus continuous CTG in low risk women revealed a significant reduction in neonatal seizures (RR 0.50) with a non-significant increase in the caesarean section rate (RR 1.95).[42] It is only when high risk labours are included as well that the increase in caesarean section rate with continuous CTG becomes statistically significant and this is regardless of whether fetal blood sampling in labour was deployed or not.[42]

Many centres or clinicians will recommend IA rather than continuous CTG for women without risk factors, given a likely increase in the caesarean section rate and the probability of only a small fetal benefit. Other centres or clinicians will recommend continuous CTG for women without risk factors for one or more of the following reasons:

- The RCTs have not been of sufficient size (inadequately powered) to address infrequent but clinically important neonatal outcomes such as hypoxic ischaemic encephalopathy (HIE), cerebral palsy or perinatal death.
- In the largest trial[17] which dominates the meta-analysis, early amniotomy was performed and continuous CTG undertaken if meconium-stained liquor was observed. In Australia and New Zealand early amniotomy is less commonly practised and therefore fewer women with meconium stained liquor (an important intrapartum risk factor for fetal hypoxia) will be recognised early in labour. Thus, the possible benefits of admission CTG in Australian and New Zealand practice may be greater than would have been detectable in the 1985 trial of McDonald et al.
- As previously discussed with regard to admission CTG and midwife staffing ratios, other regional variations reduce the relevance of the RCT meta-analysis to the Australian context (see Admission CTG section above).

Recommendation 5	Grade and supporting references
Intermittent auscultation is an appropriate method of intrapartum fetal monitoring in women without recognised risk factors. Weighing the probable increase in operative birth against a possible fetal benefit in a very small number of labours, the use of cardiotocography in women without recognised risk factors for fetal compromise should be individualised after discussion with the woman.	B 42 (Level I)
Good Practice Note	**Grade and supporting references**
Regardless of the method of intrapartum monitoring, it is essential that an accurate record of fetal wellbeing is obtained. Fetal and maternal heart rates should be differentiated whatever the mode of monitoring used.	Good Practice Note (Consensus-based)

Method of auscultation

Intermittent auscultation (IA) is defined as the auscultation of the fetal heart using a hand-held Doppler at regular intervals and for a pre-defined duration during labour. There is evidence that use of a Pinard stethoscope is not as accurate as a hand held Doppler in the detection of fetal heart rate abnormalities.[43, 66]

In relation to the frequency of auscultation, there have been no clinical studies comparing different frequencies to guide practice. The Dublin study[17] used auscultation at 15 minute intervals and some authorities have accepted this frequency as appropriate without further evidence. Based upon this trial, the RCOG/NICE guideline recommendeds 15 minute intervals of intermittent auscultation.[1] However, it has been highlighted that there is no high level evidence to support this recommendation[67] and the observational evidence of experts is that every 30 minutes is adequate. This frequency of monitoring is widespread established standard practice in Australia, New Zealand and many overseas countries.[14, 43, 66]

Accordingly, it is recommended that IA should be undertaken and documented:

- Every 15-30 minutes in the active phase of the first stage of labour.
- After each contraction or at least every five minutes in the active second stage of labour.

Recommendation 6	Grade and supporting references
When using intermittent auscultation, it should be performed according to a standardised protocol:	
1. Intermittent auscultation must be performed with a technique that can accurately measure the fetal heart rate in the individual woman.	B [43] (Level II)
2. Each auscultation episode should commence toward the end of a contraction and be continued for at least 30-60 seconds after the contraction has finished.	Consensus-based recommendation
3. Auscultation in labour should be undertaken and documented: • Every 15-30 minutes in the active phase of the first stage of labour. • After each contraction or at least every five minutes in the active second stage of labour.	Consensus-based recommendation

Intrapartum Fetal Surveillance in the presence of, or with the emergence of fetal and/or maternal risk factors

A number of antenatal and intrapartum risk factors have been shown to be associated with the development of neonatal encephalopathy, cerebral palsy or perinatal death (see section on risk factors). In the presence of any of these risk factors, continuous electronic fetal monitoring should be recommended.[22, 24, 25, 34, 42, 68-71]

Recommendation 7	Grade and supporting references
Continuous CTG should be recommended when either risk factors for fetal compromise have been detected antenatally, are detected at the onset of labour or develop during labour.	B [42] (Level I)

Good Practice Notes	Grade and supporting references
Interruptions to fetal heart rate monitoring **Personal care** Where continuous electronic fetal monitoring is required, and if the electronic fetal monitoring to date is considered to be normal, monitoring may be interrupted for short periods of up to 15 minutes to allow personal care (e.g. shower, toilet). Such interruptions should be infrequent and not occur immediately after any intervention that might be expected to alter the fetal heart rate (e.g. amniotomy, epidural insertion or top-up etc.). Women's wellbeing is considered and their wishes are respected in relation to monitoring. Disturbances to the woman are also minimised e.g. monitoring volume low, upright positions/mobility, and use of water for pain relief.	Good Practice Note (Consensus-based)
Procedures Consideration should be given to instituting electronic fetal monitoring prior to insertion of a regional anaesthetic or paracervical block to establish baseline fetal heart rate characteristics. Interruptions to fetal monitoring should be minimised given the potential for fetal vulnerability during these times.	Good Practice Note (Consensus-based)
Transfers The fetal heart rate should be monitored by intermittent auscultation during unavoidable interruptions, at times of potential fetal vulnerability, with re-commencement of continuous CTG when feasible. Interruptions to fetal monitoring should be minimised during transfer to the operating theatre and prior to delivery of the fetus.	Good Practice Note (Consensus-based)

Management of fetal heart rate patterns considered suggestive of fetal compromise

Fetal compromise in labour may be due to a variety of pathologies including placental insufficiency, uterine hyperstimulation, maternal hypotension, cord compression and placental abruption. Identification and management of reversible abnormalities may prevent unnecessary intervention. In particular, when uterine hypertonus is associated with abnormal fetal heart rate patterns, acute tocolysis has been shown to be useful.[72, 73] However, if significant abnormalities persist, further evaluation or delivery is indicated.[68, 74-77]

Recommendation 8	Grade and supporting references
In clinical situations where the fetal heart rate pattern is considered abnormal, immediate management should include: • Identification of any reversible cause of the abnormality and initiation of appropriate action (e.g. maternal repositioning, correction of maternal hypotension, rehydration with intravenous fluid, cessation of oxytocin and/or tocolysis for excessive uterine activity) and initiation or maintenance of continuous CTG. • Consideration of further fetal evaluation or delivery if a significant abnormality persists. • Escalation of care if necessary to a more experienced practitioner.	A [42] (Level I)
Good Practice Notes	**Grade and supporting references**
The normal CTG is associated with a low probability of fetal compromise and has the following features: • Baseline rate 110-160 bpm. • Baseline variability of 6-25 bpm. • Accelerations 15bpm for 15 seconds. • No decelerations. All other CTGs are by this definition abnormal and require further evaluation taking into account the full clinical picture. **The following features are unlikely to be associated with fetal compromise when occurring in isolation:** • Baseline rate 100-109 bpm. • Absence of accelerations. • Early decelerations. • Variable decelerations without complicating features. **The following features may be associated with significant fetal compromise and require further action, such as described in Recommendation 8:** • Baseline fetal tachycardia >160 bpm. • Reduced or reducing baseline variability 3-5bpm. • Rising baseline fetal heart rate. • Complicated variable decelerations. • Late decelerations. • Prolonged decelerations. **The following features are likely to be associated with significant fetal compromise and require immediate management, which may include urgent delivery:** • Prolonged bradycardia (<100 bpm for >5 minutes). • Absent baseline variability <3bpm. • Sinusoidal pattern. • Complicated variable decelerations with reduced or absent baseline variability. • Late decelerations with reduced or absent baseline variability. See Appendix G for Definitions.	Good Practice Notes (Consensus-based)

Excessive uterine activity and uterine hyperstimulation

Excessive uterine activity is defined as:

- more than five active labour contractions in ten minutes, without fetal heart rate abnormalities (tachysystole)
  OR
- contractions lasting longer than two minutes in duration or contractions occurring within 60 seconds of each other, without fetal heart rate abnormalities (uterine hypertonus).

Uterine hyperstimulation is defined as:

- Excessive uterine activity, (either tachysystole or uterine hypertonus) with fetal heart rate abnormalities.

Uterine hyperstimulation may occur as tachysystole or uterine hypertonus, which may lead to fetal heart rate changes. Tachysystole is commonly associated with induction of labour, particularly following prostaglandin administration[78-82] or augmentation of labour.[78, 83] It can also occur in spontaneous labour[84, 85] and may be in association with placental abruption[84] or intrauterine infection.[84, 86] As tachysystole or uterine hypertonus may progress to uterine hyperstimulation, it is important that continuous electronic fetal monitoring is undertaken where they are observed.

During excessive uterine activity, uterine blood flow and fetal oxygenation are impaired. Over time, uterine hyperstimulation can negatively impact on fetal status and newborn outcomes. In a study involving 1,433 women, increased uterine activity during the first and second stage of labor was significantly associated with an increased incidence of lower pH values in the umbilical artery suggesting a risk of progressive deterioration of fetal status where there is hyperstimulation.[87]

Maternal risks of uterine hyperstimulation include uterine rupture in both scarred and unscarred uterus with tachysystole (with or without evidence of fetal compromise); and rare complications such as amniotic fluid embolism are increased in hyperstimulated labours.[88] There may be further maternal risks associated with category 1 caesarean sections in the setting of hyperstimulation.

Evidence was examined with respect to whether tocolytic therapy is effective in the management of uterine hyperstimulation and, if so, which tocolytic agent should be administered for treatment of uterine hyperstimulation. Tocolytics of interest included: intravenous or subcutaneous terbutaline (250 micrograms), sublingual GTN spray (400 micrograms) or intravenous salbutamol (100 micrograms) as these are available for use in Australia. It should be noted that in New Zealand, terbutaline is only able to be prescribed as an inhaled preparation but GTN and salbutamol are the same as in Australia.

The literature search identified 30 potentially relevant articles. However 27 were excluded for reasons including that they were for treatment of pre-term labour, not hyperstimulation or they were comparing different routes of administration of the tocolytics of interest (primarily GTN patches rather than sublingual GTN spray). One Level II randomised controlled trial on the effect of terbutaline on fetal distress was carried out on 20 patients who showed evidence of ominous fetal heart rate patterns and scalp pH values of <7.25.[44] It showed that treatment with terbutaline significantly improved the acid-base status of the fetus ($P<0.01$) with no significant fetal or maternal morbidity occurring in the treatment group.[44]

Further high-quality trials on the effectiveness of all the tocolytic agents used in Australia and New Zealand are required.

Recommendation 9	Grade and supporting references
Excessive Uterine Activity in the absence of fetal heart rate abnormalities In the presence of excessive uterine activity (defined as either): • tachysystole (more than five active labour contractions in ten minutes, without fetal heart rate abnormalities); or • uterine hypertonus (contractions lasting more than two minutes in duration or contractions occurring within 60 seconds of each other, without fetal heart rate abnormalities). Appropriate management of uterine hypertonus or tachysystole should include: • continuous cardiotocography; • consider reducing or ceasing oxytocin infusion; • maternity staff remaining with the woman until normal uterine activity is observed; and • tocolysis may be considered.	Consensus-based recommendation
Recommendation 10	**Grade and supporting references**
Uterine hyperstimulation is defined as tachysystole or uterine hypertonus in the **presence** of fetal heart rate abnormalities. Appropriate management of uterine hyperstimulation should include: • continuous cardiotocography; • reducing or ceasing oxytocin infusion; • maternity staff remaining with the woman until normal uterine activity is observed; • consideration of tocolysis; or • consideration of urgent delivery. Maternity care providers should be familiar with and have a protocol for acute tocolysis (relevant to the level of service) in the event that uterine hyperstimulation occurs. Tocolytic regimens available may include: • salbutamol, 100 micrograms intravenously; • terbutaline, 250 micrograms intravenously or subcutaneously (Grade C); or • GTN spray, 400 micrograms sublingually.	Consensus-based recommendation Terbutaline recommendation C [44] (Level II)
Good Practice Note	**Grade and supporting references**
Excessive uterine activity in the absence of evidence of fetal compromise is not in itself an indication for tocolysis.	Good Practice Note (Consensus-based)

Fetal blood sampling

A systematic review of RCTs of intermittent auscultation (IA) versus continuous CTG in BOTH low and high risk women reveals a significant increase in the caesarean section rate, whether fetal blood sampling (FBS) was deployed in labour (RR 1.50; 95%CI 1.10-2.06) or not (RR 1.96; 1.24-2.09).[42] It is therefore possible that the availability of FBS in labour will lessen the increase in the caesarean rate that comes as a consequence of using continuous CTG.

However, in Australia and New Zealand many women birth in hospitals where undertaking FBS may delay a necessary delivery and thereby worsen outcomes. For example, in some hospitals the decision to delivery interval for an emergency caesarean section may generally be considerably longer than in those hospitals from which the RCT literature is derived. In these circumstances, FBS may compound the delay. Therefore, while FBS facilities are desirable, (particularly in larger units that have ready access to operative delivery if required) it is not practical for all hospitals to provide FBS.

In the past, some hospitals interested in providing FBS were unable to because of the costs of maintaining the necessary hardware. More recently, the introduction and validation of scalp lactate measurement[89] has provided an affordable alternative. Indeed, in a trial comparing FBS for pH measurement with FBS for lactate, there were significantly less failed procedures in the lactate measurement group[45] suggesting that lactate measurement is easier to perform – requiring less sample volume – and so more likely to be appropriately utilised. If FBS is performed, the scalp pH or lactate result should be interpreted taking into account any previous measurement, the rate of progress in labour and other clinical circumstances.

Fetal blood sampling	
Recommendation 11	Grade and supporting references
Units employing electronic fetal monitoring are strongly encouraged to have access to fetal blood sampling facilities to assist in the management of labours where the fetus is demonstrating equivocal CTG changes.	Consensus-based recommendation
Recommendation 12	Grade and supporting references
If fetal blood sampling is indicated, the use of scalp lactate rather than pH measurement will provide an easier and more affordable adjunct to electronic fetal monitoring for most units.	A [45] (Level I)
Good Practice Note	Grade and supporting references
Thresholds for lactate may vary between institutions. Institutions should have local protocols for lactate thresholds.	Good Practice Note (Consensus-based)

In situations where FBS is contraindicated or not possible, decisions regarding delivery should take into account the severity of the fetal heart rate abnormality and the clinical situation.[15, 90, 91]

Recommendation 13	Grade and supporting references
Delivery should be expedited where: • There is clear evidence of serious fetal compromise (FBS should not be undertaken). • CTG abnormalities are of a degree requiring further assessment, but FBS is contraindicated, clinically inappropriate or unavailable. • The decision to delivery interval may be prolonged by virtue of location, clinical staff availability, patient factors or access to clinical services.	Consensus-based recommendation
Good Practice Note	**Grade and supporting references**
If fetal blood sampling is undertaken, it is recommended that the woman be in the left-lateral position or lithotomy with a wedge in place to avoid inferior vena cava syndrome or supine hypotension syndrome. Contraindications to FBS include: • Evidence of serious, sustained fetal compromise. • Fetal bleeding disorders (e.g. suspected fetal thrombocytopenia, haemophilia). • Face or brow presentation. • Maternal infection* (e.g. HIV, hepatitis B, hepatitis C, herpes simplex virus and suspected intrauterine sepsis). *Group B Streptococcus carrier status does not preclude FBS	Good Practice Note (Consensus-based)
Good Practice Note	**Grade and supporting references**
Fetal blood sampling is not generally recommended in pregnancies at less than 34 weeks of gestation because delivery may be inappropriately delayed in a premature "at risk" fetus that may sustain damage earlier than would be expected in a term fetus.	Good Practice Note (Consensus-based)
Good Practice Note	**Grade and supporting references**
If a fetus is in a breech presentation during labour and is exhibiting signs of fetal compromise that are not readily remediable, it would be more appropriate to deliver that baby by caesarean section than to undertake fetal blood sampling.	Good Practice Note (Consensus-based)

Other techniques for Intrapartum Fetal Surveillance

Fetal ECG/ST segment analysis, fetal pulse oximetry, scalp electrodes and intrauterine pressure catheters

A number of techniques for intrapartum fetal surveillance other than electronic fetal monitoring were considered by this Guideline Review Working Party including:

- fetal ECG/ST segment analysis[46, 47];
- fetal pulse oximetry[48]; and
- intrauterine pressure catheters.[92-94]

None of these published RCTs demonstrated a benefit over electronic fetal monitoring by CTG. At this time, the Guideline Review

Working Party does not recommend use of fetal ECG/ST segment analysis, fetal pulse oximetry or intrauterine pressure catheters for use in intrapartum routine fetal surveillance.

At the end of 2013, a new Cochrane Review was published examining internal versus external tocodynamometry during induced or augmented labour.[94] This review included both studies which were originally considered by the Guideline Review Working Party when formulating the recommendation on intrauterine pressure catheters,[92, 93] and also included another trial of 239 women.[95] Importantly, there were no changes to any of the outcomes of interest compared with this Working Party's original review of evidence on intrauterine pressure catheters earlier in 2012. The only additional information provided in the 2013 review was that where infection was not reported in the 2010 Bakker Review, the 2013 Bakker Cochrane Review does look at infection rates and finds that there is no increased risk for infection reported when an intrauterine catheter was used.[94]

Recommendation 14	Grade and supporting references
There is insufficient evidence to recommend fetal ECG/ST segment analysis or fetal pulse oximetry for use in intrapartum fetal surveillance.	A 46, 47, 48, 92-94 (Level I)
Recommendation 15	**Grade and supporting references**
If there is difficulty auscultating the fetal heart OR obtaining an adequate fetal heart rate tracing at any time in labour, the fetal heart rate should be monitored using a scalp electrode.	Consensus-based recommendation

Amnioinfusion

Amnioinfusion has been used to dilute thick meconium, for treatment of abnormal fetal heart rate patterns and prophylactically or therapeutically in cases of oligohydramnios resulting from rupture of membranes. Of the Level I systematic reviews considered regarding amnioinfusion,[49-51] there was insufficient evidence to recommend amnioinfusion for any indication in the Australian and New Zealand healthcare setting. However, amnioinfusion may confer a small benefit in a small number of cases where fetal blood sampling is not possible or contraindicated and caesarean section is relatively contraindicated.

Recommendation 16	Grade and supporting references
Amnioinfusion is not recommended for routine treatment of variable decelerations in labour. However, in a small number of cases where fetal blood sampling is not possible or contraindicated and caesarean section is relatively contraindicated, amnioinfusion may confer a small benefit.	B 49-51 (Level I)

Maintaining standards in Intrapartum Fetal Surveillance

Standardisation

Reports on strategies to reduce medical errors have highlighted the need to simplify systems and standardise procedures.[97, 98] With respect to undertaking CTG monitoring, there is no evidence that any particular paper speed is preferable, but it is recognised that the paper speed selected should be familiar to all users. The Guideline Review Working Party endorses the RCOG/NICE recommendation for standard CTG settings.[1, 99]

Recommendation 17	Grade and supporting references
Settings on CTG machines should be standardised to enable a consistent approach to teaching and interpretation of CTG traces, particularly as many health professionals move between different institutions in Australia and New Zealand.	Consensus-based recommendation
Recommendation 18	**Grade and supporting references**
Until there is clear evidence that interpretation based on one paper speed is superior to the others, it is recommended that the paper speed of 1cm per minute be adopted universally.	Consensus-based recommendation
Good Practice Notes	**Grade and supporting references**
• Date and time settings on CTG machines should be validated whenever used. • CTGs should be labelled with the mother's name, hospital number, date and time of commencement and include the maternal observations. • Any intrapartum events that may affect the fetal heart rate (e.g. vaginal examination, obtaining a fetal blood sample (FBS), insertion/top-up of an epidural) should be noted contemporaneously including date, time and signature. • For women receiving continuous CTG, the trace should be reviewed at least every 15-30 minutes and any abnormalities acted upon. It should be regularly recorded, either by written or electronic entry, in the medical record that the CTG has been reviewed. • Health professionals should be aware that machines from different manufacturers use different vertical axis scales and this can change the perception of fetal heart rate variability.	Good Practice Notes (Consensus-based)

Implementation

Education

Hospitals and health services should ensure that the health professionals providing intrapartum care have access to regular training in intrapartum fetal surveillance. Training should occur in a multidisciplinary forum to optimise communication between professional groups.

The Guideline Review Working Party has assessed grading and classification systems for fetal heart rate interpretation. Without an adequate appreciation of the underlying pathophysiology such systems may mislead the user. If used, the inclusion of grading/classification systems in education programs should be in addition to, rather than instead of, an understanding of fundamental physiology.

It is acknowledged that this Guideline needs to be complemented by a comprehensive and ongoing education and assessment program for health professionals. The Guideline Review Working Party is aware of a number such programs currently available in Australia and New Zealand, including the Fetal Surveillance Education Program (www.fsep.edu.au). Further information about the Fetal Surveillance Education Program and other education resources is available through RANZCOG. The Guideline Review Working Party believes that institutions providing birthing services have a responsibility to ensure that the relevant health professionals are appropriately skilled in fetal surveillance and maintain those skills. Accordingly, it is recommended that institutions ensure that their staff have access to and are supported to use suitable educational resources, such as the Fetal Surveillance Education Program and its suite of educational resources.

Clinical audit and practice review

Health professionals with responsibility for the intrapartum care of women should review their current practice in line with this Guideline. This Guideline is likely to improve clinical practice and outcomes where it becomes a foundation of routine clinical care. Institutions and health professionals are encouraged to develop and undertake regular audits of guideline implementation and regular reviews of clinical practice. It is believed that such audits and reviews are best undertaken in a multidisciplinary environment. Aspects of care and guideline implementation that are suitable for audit include:

- Women receiving continuous CTG (including those with and without indications for such monitoring).
- Women with indications for continuous CTG who did not receive it.
- Delivery interventions arising from clinical interpretations of the CTG.
- Poor perinatal outcomes.
- Fetal scalp samplings/umbilical cord blood gas analysis.
- Maternal satisfaction with labour care.

RANZCOG has developed and piloted an audit tool to facilitate the ongoing monitoring of CTGs (Appendix J).

In addition to formal audits, it is recommended that health professionals participate in regular practice review meetings such as CTG reviews and reviews of intrapartum interventions triggered by fetal surveillance.

Local evaluation of the use of fetal surveillance should address:

- Education of health professionals and skill maintenance.
- On-going competency assessment of health professionals.
- Provision of relevant information for women.
- Availability of monitoring equipment including FBS.
- Timely access to operative delivery.

Paired umbilical cord blood gas analysis

There has been some debate on whether umbilical cord blood gas analysis should be performed in some, or all, deliveries. The literature search identified a recently published retrospective observational study of all deliveries greater than or equal to 20 weeks gestation at a Western Australian tertiary obstetric unit between January 2003 and December 2006. This study aimed to evaluate the impact on perinatal outcomes of introducing universal umbilical cord blood gas analysis at delivery.[52] Paired umbilical arterial and venous blood samples were collected at all deliveries for blood gas and lactate analysis. This study showed that the introduction of universal umbilical cord blood gas analysis into a unit was associated with a reduction in the incidence of acidaemia, the incidence of lactic acidaemia at birth as well as neonatal nursery admissions. These perinatal outcomes were independent of obstetric intervention rates. The blood gas results proved to be a useful clinical audit tool in providing targeted education for staff providing intrapartum care.

Recommendation 19	Grade and supporting references
Paired umbilical cord blood gas or lactate analysis should be taken at delivery where any of the following are present: • Apgar score < 4 at 1 minute. • Apgar score < 7 at 5 minutes. • Fetal scalp sampling performed in labour. • Operative delivery undertaken for fetal compromise. Where paired umbilical cord blood gas or lactate analysis is taken at delivery as part of a clinical audit regimen, this process should not interfere with management of the third stage of labour.	C [52] (Level III-3)
Recommendation 20	**Grade and supporting references**
All health professionals involved in providing antenatal and intrapartum care should participate in regular multi-disciplinary clinical audits focussing on maternal and perinatal outcomes in relation to intrapartum fetal monitoring.	Consensus-based recommendation
Good Practice Note	**Grade and supporting references**
The following practices assist with clinical audit and education: • Regular CTG review meetings. • Review of the use of FBS where available.	Good Practice Note (Consensus-based)
Good Practice Note	**Grade and supporting references**
CTG traces should be stored in a manner that enables ready access for multidisciplinary clinical audit and clinical education.	Good Practice Note (Consensus-based)

Maintenance of competence

Health professionals with responsibility for performing and interpreting continuous CTG should receive regular training and assessment. The RANZCOG FSEP assessment tool (www.fsep.edu.au/products/assessment-tool.html) is now recognised as a valid and reliable assessment of fetal surveillance knowledge and associated cognitive skills and should be a component of any overall competency assessment program.

Local implementation

It is anticipated that this Guideline will provide the foundation for hospital policies and procedures, which should take into account the constraints of local practitioners and resources. The implementation of this Guideline should be undertaken as part of the quality improvement program for each hospital. Hospitals should review existing service provision against this Guideline. The review should identify necessary resources required to implement the recommendations in this Guideline.

Considerations for Indigenous and Culturally and Linguistically Diverse populations

The importance of clear communication with the woman and her birth partner about fetal surveillance in labour were discussed earlier in this Guideline. All health care providers responsible for providing intrapartum care should ensure they are sensitive to cultural factors and that they deliver information in a suitable format that each patient is able to understand. The indications for fetal monitoring in labour apply to all women, regardless of culture and language.

Evaluation

RANZCOG is committed to the ongoing evaluation of this Guideline and encourages all health professionals to provide feedback on the feedback sheet, which can be accessed via the RANZCOG website (www.ranzcog.edu.au) or a hard copy obtained from College House, Melbourne, Australia.

Strategy for dissemination and implementation

This Guideline will be made available in an electronic version on the RANZCOG website, in a range of formats including PDF and as part of the FSEP App (www.fsep.edu.au/index.php?option=com_content&view=article&id=78:fsepapp&catid=1:latest-news).

Appendix A: Fetal Surveillance Guideline Review Working Party

Membership of the Fetal Surveillance Guideline Review Working Party

Fetal Surveillance Guideline Review Working Party: 2011 – 2013

The Guideline Review Working Party is a multi-professional team brought together on a project basis to review and revise the IFS Clinical Guideline (Second Edition).

Member	Details
Chair Associate Professor E Weaver	Obstetrician Department of Obstetrics and Gynaecology Nambour General Hospital University of Queensland Queensland
Ms S Elworthy	Acting Maternity Services Educator Mercy Hospital for Women Midwife Representative Victoria
Dr L Farrell	Obstetrician Department of Obstetrics and Gynaecology St John of God Hospital Subiaco Western Australia
Dr J Harvey	Senior Visiting Medical Specialist Women and Babies Division Adelaide Women's and Children's Hospital South Australia
Dr G Jenkins	Obstetrician Department of Obstetrics and Gynaecology Norwest Private Hospital New South Wales
Ms J Jones	Midwifery Educator King Edward Memorial Hospital ACM Representative Western Australia
Dr H Murray	Senior Staff Specialist Department of Obstetrics and Gynaecology John Hunter Hospital New South Wales
Professor M Permezel	Head of Department of Obstetrics and Gynaecology Mercy Hospital for Women University of Melbourne Victoria
Dr P Reynolds	Obstetrician Department of Obstetrics and Gynaecology Royal Hobart Hospital Tasmania
Associate Professor S Robson	Consultant Obstetrician Vice President and Chair, Women's Health Committee Royal Australian and New Zealand College of Obstetricians and Gynaecologists

Dr M Sangalli	Obstetrician, MFM Specialist Women's Health Service Capital and Coast District Health Board New Zealand
Professor S Walker	MFM Specialist Perinatal Department Mercy Hospital for Women Victoria
RANZCOG Staff	
Mr M Beaves	Program Manager Fetal Surveillance Education Program
Dr A Wilson	Guideline Developer / Women's Health Coordinator Women's Health Services
Ms S Chang	Program Administrator Fetal Surveillance Education Program

New Zealand Consultation Group	
Chair Associate Professor E Weaver	Obstetrician Department of Obstetrics and Gynaecology Nambour General Hospital University of Queensland Queensland
Professor M Permezel	Head of Department of Obstetrics and Gynaecology Mercy Hospital for Women University of Melbourne Victoria
Ms Karen Guilliland	CEO New Zealand College of Midwives
Ms Norma Campbell	Midwifery Advisor New Zealand College of Midwives
Associate Professor S Robson	Consultant Obstetrician Vice President and Chair, Women's Health Committee Royal Australian and New Zealand College of Obstetricians and Gynaecologists
Professor S Walker	MFM Specialist Perinatal Department Mercy Hospital for Women Victoria
Dr J Tait	Obstetrician, Wellington New Zealand and Immediate Past Chair New Zealand Regional Committee
Mr M Beaves	Program Manager Fetal Surveillance Education Program, RANZCOG
Dr A Wilson	Guideline Developer / Women's Health Coordinator Women's Health Services, RANZCOG

The New Zealand Consultation Group were brought together to ensure that this Guideline is applicable to the New Zealand healthcare context.

Guideline Review Group: 2004 – 2006

The Guideline Review Group was a multi-professional team brought together on a project basis to review and revise the first edition of this Guideline.

Member	Details
Professor E Wallace	Consultant (Chair) Department of Obstetrics and Gynaecology Monash Medical Centre and Southern Health Victoria
Dr J Dowd	Clinical Director Emergency Department Royal Women's Hospital Victoria
Professor D Ellwood	Director of Fetal Medicine Unit Department of Obstetrics and Gynaecology The Canberra Hospital Australian Capital Territory
Dr J Hornbuckle	Consultant in Maternal Fetal Medicine King Edward Memorial Hospital Western Australia
Dr P Kirker	Health Risks Consultant DHS Public Healthcare Program Victorian Managed Insurance Authority Victoria
Dr H Merkur	Visiting Medical Officer Western Sydney Area Health Service New South Wales
Dr D Morris	Director of Obstetrics Training Women's and Children's Hospital South Australia
Professor M Permezel	Head of Department of Obstetrics and Gynaecology Mercy Hospital for Women Victoria
Dr E Uren	Consultant Department of Obstetrics and Gynaecology South West Health Care Warrnambool Victoria
Dr E Weaver	Consultant Obstetrician Chair of Continuing Professional Development Committee RANZCOG Queensland

Associate Professor J Westgate	Associate Professor of Obstetrics and Gynaecology University of Auckland New Zealand
RANZCOG Staff	
Ms V Jenkins	Manager Fellowship Services
Mr M Beaves	Program Manager Fetal Surveillance Education Program
Ms S Fischer	Program Coordinator Fetal Surveillance Education Program
Ms H Peterson	Program Administrator Fetal Surveillance Education Program

Guideline Review Group: 2001 – 2002

The Guideline Development Group was a multi-professional team brought together on a project basis to consider the evidence and develop the first edition of this Guideline.

Member	Details
Dr M O'Connor	(Chair to May 2002) Director of Delivery Suites Royal Women's Hospital Victoria
Associate Professor E Wallace	Consultant (Chair May 2002) Maternal Fetal Medicine Monash Medical Centre Victoria
Ms L Dunlop	Divisional Director (Acting) Division of Maternity Services Royal Women's Hospital Victoria
Dr E McCarthy	Consultant Department of Obstetrics and Gynaecology Mercy Hospital for Women Victoria
Ms D Patterson	Unit Manager Family Birth Unit Mercy Hospital for Women Victoria
Professor M Permezel	Head of Department of Obstetrics and Gynaecology Mercy Hospital for Women Victoria
Dr C Tippett	Consultant Department of Obstetrics and Gynaecology Monash Medical Centre Victoria
Ms D Trickey	Project Leader Maternity Services Monash Medical Centre Victoria

Dr M Umstad	Consultant Obstetrician Division of Maternity Services Royal Women's Hospital Victoria
RANZCOG Staff	
Ms V Jenkins	Manager Fellowship Services
Ms S Toohey	Coordinator Practice Improvement
Project Team	
Dr S Higgins	Consultant Maternal Fetal Medicine Royal Women's Hospital Victoria
Associate Professor J F King	Consultant in Perinatal Epidemiology Royal Women's Hospital Victoria
Mrs L Rigg	Project Officer Royal Women's Hospital Victoria
Ms H Russell	Manager Royal Women's Hospital Victoria

Reference Group (2002)

Members of the Reference Group were invited to attend a meeting at College House on 8 February 2002. The Reference Group members were further consulted with the final draft in July 2002.

Dr John Campbell President RANZCOG	Dr Fung Yee Chan MFM
Dr Andrew Child President Elect	Professor David Ellwood Chair of MFM Committee
Dr Peter Kirker General Practitioner	Dr David Morris Director of Obstetrics
Dr Brian Peat Obstetrician	Dr Ian Pettigrew Obstetrician

Terms of reference of Fetal Surveillance Guideline Review Working Party (2011–2013)

Title of Committee: Fetal Surveillance Guideline Review Working Party (2011-2013)

1. Reporting to

The Fetal Surveillance Guideline Review Working Party reports directly to the RANZCOG Board and Council.

2. Date of Establishment

The Fetal Surveillance Guideline Review Working Party was established on 3 September 2011.

3. Functions and Responsibilities

The primary function of the Fetal Surveillance Guideline Review Working Party shall be to undertake a review of the literature available since the publication of the Second Edition of the Intrapartum Fetal Surveillance Clinical Guidelines and to review the Guidelines for currency and relevance to clinical practice.

The Working Party shall then be responsible for the preparation of revised Guidelines, which shall be recommended to the Council and Board for consideration in line with the timeframe set out in 5 (Reporting Timeline and Mechanisms).

4. Membership

The Fetal Surveillance Guideline Review Working Party shall comprise the following members:

- The Immediate Past President, who shall Chair the Working Party;
- One (1) College Fellow from each of the following states and territories in Australia:
  - Australian Capital Territory;
  - New South Wales;
  - Queensland;
  - South Australia;
  - Tasmania;
  - Victoria; and
  - Western Australia;
- One (1) College Fellow from New Zealand; and
- One (1) midwife, being the midwife who is appointed for the time being to the RANZCOG Women's Health Committee (WHC).

The members of the Working Party, other than the midwife, shall be selected so as to ensure representation of each of the following groups:

- Private practitioner;
- CMFM subspecialist;
- Current member of the WHC;
- Current member of the RANZCOG Board;
- Current member of the RANZCOG Council; and
- Provincial Fellow.

All members shall be in active obstetric practice.

The Working Party shall have the ability to co-opt individuals with specific expertise, knowledge or background as considered necessary for specified periods of time in order to expedite specific matters. Such individuals may or may not be Fellows of the RANZCOG and will be nominated following discussion between the Chair of the Working Party and the President. All Working Party members appointed to consider specific matters have voting rights in regard to that matter.

All appointments to the Working Party will be made by the Board on the recommendation of the President for a period of two (2) years in line with the terms of Council and in accordance with RANZCOG Policy Tenure of Appointment to RANZCOG Committees and External Bodies.

All Working Party members have voting rights. Ex officio members are:

- RANZCOG President;
- RANZCOG Board members not appointed to the Working Party; and
- RANZCOG CEO.

Ex-officio members do not have voting rights.

5. Reporting Timeline and Mechanisms

A paper on the completed literature review will be prepared for the information and consideration of the Board at its meeting scheduled for January 2012. A further discussion paper, including recommendations, addressing the matters set out in 3 above shall be presented to the Board at its meeting scheduled for May 2012, with final recommendations to be made to the RANZCOG Council and Board at their meetings scheduled for July 2012.

6. Quorum

The quorum for meetings of the Working Party shall be half the membership of the core membership group plus one. Any question arising from meetings of the Working Party shall be decided by a majority of votes of the members present and voting on that question and, in the case of equality of votes, the Chair shall have a second or casting vote in addition to a deliberative vote.

7. Agenda items

The Working Party shall be coordinated through Women's Health Services.

Requests for agenda items/reports should be sent to Working Party members by the Working Party Coordinator, twenty-one (21) days prior to the meeting date.

All Working Party agenda items must be forwarded to the Working Party Coordinator/Chairman, by COB fourteen (14) days prior to the next scheduled meeting.

The Chair has the right to refuse to list an item on the formal agenda, but members may raise an item under 'Other Business' if necessary and as time permits.

The Working Party agenda, with attached meeting papers will be distributed at least seven (7) days prior to the next scheduled meeting.

8. Minutes and Meeting Papers

Accurate minutes will be kept of each meeting. The minutes may be confined to a report of the resolutions of the Working Party and any recommendations.

Draft minutes are to be completed no later than fourteen (14) days following each meeting and passed to the Chair for approval.

Full copies of the draft minutes, including attachments, shall be provided to all members of the Working Party no later than seven (7) working days following approval by the Chair.

Reports and recommendations to the RANZCOG Board are to be drawn up by the Coordinator of the Working Party in conjunction with the Chair and presented to the next meeting of the Board.

The minutes shall be submitted to members of the Working Party for ratification at the next meeting of the Working Party. When confirmed, the minutes shall be signed by the Chair.

By agreement of the Working party, out of session decisions will be deemed acceptable. Where agreed, all out of session decisions shall be recorded in the minutes of the next scheduled meeting of the Working Party.

9. Frequency of Meetings
The Working Party meets as required in order to consider matters referred to it; however, the Chair, or other members through the Chair, may call meetings as considered necessary.

Members of the Working Party may meet in person, by telephone or other telecommunications or electronic means or by correspondence for the purposes of carrying out their functions.

Declarations of interest of Working Party Members

Associate Professor E Weaver Participated in the development of the RANZCOG Intrapartum Fetal Surveillance Clinical Guideline (Second Edition) 2005-2006.
Ms S Elworthy Midwife representative in the RANZCOG Women's Health Committee.
Dr L Farrell Participated in the development of hospital guideline at St. John of God Subiaco Hospital.
Dr J Harvey Participated in the development and endorsement of the obstetrics guidelines as a member of the RANZCOG Women's Health Committee 2010-2012.
Professor M Permezel Participated in the development and endorsement of the First and Second Edition Intrapartum Fetal Surveillance Clinical Guidelines 2001–2002 and 2005–2006.
Professor S Walker Participated in the development of the internal hospital guideline on fetal surveillance in labour.
Dr A Wilson Employed by RANZCOG to develop guidelines

The other members of the Working Party did not report any competing interests.

Appendix B: Overview of the guideline development process

Steps in updating this Guideline

The Fetal Surveillance Guideline Review Working Party carried out the following steps in developing this IFS Clinical Guideline (Third Edition):

- Developed structured clinical questions.
- Developed a search strategy and searched the literature.
- Assessed the eligibility of studies for inclusion.
- Critically appraised the included studies.
- Summarised the relevant data into evidence tables and evidence summaries.
- Assessed the full body of evidence and formulated recommendations according to NHMRC grading criteria via an evidence statement form.

Developing structured clinical questions

The Intrapartum Fetal Surveillance Clinical Guidelines – Second Edition were used as a starting point to draft a set of clinical questions to guide the content of the third edition of this Guideline.

The PICO (Patient/Intervention/Comparison Intervention/Outcome) criteria in Table 1 were used to develop the clinical questions for the review of this guideline. The patient group of interest in this Guideline is pregnant women in established labour who are admitted to hospital. The interventions of interest covered in this Guideline are admission CTG, intermittent auscultation, continuous CTG or intermittent CTG (15 minutes every 2 hours). Other techniques for fetal surveillance include: fetal ECG/ST segment analysis, fetal pulse oximetry and intrauterine pressure catheters.

The outcomes of interest are broken down by delivery method, birthing interventions, neonatal, maternal and other outcomes as listed in Table 1.

Table 1: PICO criteria for developing the clinical questions

Patient	**Intervention**	**Comparison Intervention**	**Outcomes**	
Pregnant women in established labour admitted to hospital	Admission CTG	Intermittent Auscultation Continuous Electronic Fetal Monitoring Intermittent Electronic Fetal Monitoring (15 minutes every 2 hours)	Delivery method: Birthing interventions: Neonatal: Other: 	• Caesarean section • Operative delivery (instrumental vaginal birth) • Epidural • Augmentation of labour • Induction • Continuous CTG during labour • Amniotomy • Seizures • Hypoxic ischemic encephalopathy • Low Apgar scores (<7 at or after 5 minutes) • Admission to special care nursery and/or NICU • Perinatal death • Meconium aspiration • Cerebral palsy • Infection • Maternal • Satisfaction/dissatisfaction • Anxiety • Infection • Fetal blood sampling • Cord pH and or lactate • Fetal scalp pH and or lactate

The Fetal Surveillance Guideline Review Working Party reviewed and refined the draft clinical questions at their meeting in July 2012 and added some new areas including uterine hyperstimulation. The final approved list of clinical questions is provided at Appendix C with any new areas to be considered in the third edition highlighted with a *. These clinical questions guide the content of this third edition Guideline and the literature search strategy.

Developing a search strategy and searching the literature

Systematic identification of relevant studies for all questions was conducted by the Clinical Practice Improvement Unit at the Royal Women's Hospital on behalf of RANZCOG. This was with the exception of the additional clinical questions relating to uterine hyperstimulation which was conducted by the Evidence Synthesis Program, Monash Applied Research Monash University.

The list of terms used to identify relevant citations is available from RANZCOG. Broadly, the search was conducted in the following sections:

1. Intrapartum/labour
   AND
2. Cardiotocograph/electronic fetal monitoring/ heart rate fetal/CTG/electronic fetal monitor/fetal surveillance
   AND
3. Admission/Screening

Further information on search terms can be obtained from RANZCOG.

The following databases were searched:

- Ovid MEDLINE
- EBM reviews including:
  - Cochrane Database of Systematic Reviews 2005 to August 2012
  - ACP Journal Club 1991 to August 2012
  - Database of Abstracts of Reviews of Effects 3rd Quarter 2012
  - Cochrane Central Register of Controlled Trials September 2012
  - Cochrane Methodology Register 3rd Quarter 2012
  - Health Technology Assessment 3rd Quarter 2012
  - NHS Economic Evaluation Database 3rd Quarter 2012
  - EMBASE
  - CINAHL
- Royal College of Obstetricians and Gynaecologists (RCOG)/National Institute of Clinical Excellence (NICE) guidelines
- Other sources of evidence e.g. Society of Obstetricians and Gynaecologists Canada (SOGC), United States National Guideline Clearinghouse, and the American College of Obstetricians and Gynaecologists (ACOG).

Where the clinical questions were the same as those addressed in the Intrapartum Fetal Surveillance Clinical Guidelines - Second edition (2006), the literature search was limited to August 2004 to March 2012 as the earlier dates were covered in prior editions of this Guideline. For the clinical questions on uterine hyperstimulation, as this question had not been previously addressed, the literature was searched from January 1985-19 September 2012.

The clinical question relating to risk factors associated with poor outcomes (antenatal and intrapartum) was not subject to a full systematic review of the literature as initial searches on this topic demonstrated a lack of Level I evidence in this area. Therefore, a more general literature search through Ovid MEDLINE was carried out on risk factors associated with poor outcomes (antenatal and intrapartum).

Assessing the eligibility of studies

During the initial search citations were screened and selected using the following pre-agreed inclusion and exclusion criteria.

Table 2: Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Limited from August 2004 - March 2012 (uterine hyperstimulation limited from January 1985-19 September 2012) Intrapartum Management Treatment Other options Human	Investigations other than search Reference to Antenatal only Antenatal diagnosis Non-human Non-fetal Not intrapartum Care / management of neonate Non-English

The initial search conducted by the Clinical Practice Improvement Unit at the Royal Women's Hospital retrieved 708 citations. These citations were triaged by two reviewers with methodological and clinical expertise into those:

- Possibly containing relevant evidence or authoritative opinion (185 publications) and
- Unlikely to contain relevant evidence, authoritative opinion or had been considered in previous literature reviews for RANZCOG Intrapartum Fetal Surveillance Guideline (523 publications). These were not considered further.

The abstracts and full text publications from the 185 citations were retrieved and further screened to identify those studies with respect to quality of methodology and relevance to Australian and New Zealand obstetric practice. In addition, there was further exclusion of non-English citations. As a result, 28 articles were classified as key citations.

Uterine hyperstimulation

The initial search for literature on uterine hyperstimulation yielded 1565 citations, of which 518 were duplicate citations and were removed. The remaining 1047 articles were screened according to pre-agreed inclusion and exclusion criteria and any non-English citations were removed. This resulted in 30 potentially relevant articles that were retrieved for further review. Of these, 27 were excluded based on review of the full text (mainly related to pre-term rupture of membranes or different routes of administration of the tocolytics of interest). Two articles were reports of study protocols and one study met the inclusion criteria for uterine hyperstimulation.

An updated search of the Cochrane Database of Systematic Reviews was carried out in January 2014 and revealed six Cochrane Systematic Reviews had been updated (but all conclusions remained unchanged). These citations were updated throughout the text in 2014.

Critically appraising the included studies

Twenty-nine articles were classified as key citations, and were subjected to systematic critical appraisal by the Clinical Practice Improvement Unit and the single article on uterine hyperstimulation was subjected to systematic critical appraisal by the Evidence Synthesis Program, Monash Applied Research, Monash University. The critical appraisal assessed the level of evidence (design and issues of quality) and the level of risk of bias in published studies based on factors such as:

- Conflicts of interest declared and addressed
- Study design appropriate to answer the question
- Specified and appropriate method of randomisation
- Specified allocation concealment
- Blinding
- Duration of follow-up
- Outcomes measured in a standard, reliable way and assessed objectively and independently
- Sufficiently powered study to detect differences between groups
- Specified the number of individuals recruited to each arm of the study and amount of drop-outs
- Addressed whether all the subjects were analysed in the groups to which they were randomly allocated (intention to treat analysis)
- Selective outcome reporting addressed
- Appropriate outcomes measured
- Appropriate statistical analysis undertaken

An overall risk of bias was determined for each study according to the following metrics.

Table 3: NHMRC levels of evidence.

Risk of bias rating	Description
Low	All the criteria have been fulfilled or where criteria have not been fulfilled it is very unlikely that the conclusions of the study would be affected.
Moderate	Some of the criteria have been fulfilled and those criteria that have not been fulfilled may affect the conclusions of the study.
High	Few to no criteria fulfilled or the conclusions of the study are likely or very likely to be affected.
Insufficient information	Not enough information provided on methodological quality to be able to determine risk of bias.

Classification and assessment of evidence

Studies identified for inclusion in this third edition were classified according to the NHMRC designation of "levels of evidence" according to type of research question (the "NHMRC levels of evidence and grades for recommendations for developers of guidelines").[3]

Level	Intervention	Diagnosis	Prognosis	Aetiology	Screening
I	A systematic review of Level II studies	A systematic review of Level II studies	A systematic review of Level II studies	A systematic review of Level II studies	A systematic review of Level II studies
II	A randomised controlled trial	A study of test accuracy with: an independent, blinded comparison with a valid reference standard, among consecutive patients with a defined clinical presentation	A prospective cohort study	A prospective cohort study	A randomised controlled trial
III-1	A pseudo-randomised controlled trial (i.e. alternate allocation or some other method)	A study of test accuracy with: an independent, blinded comparison with a valid reference standard, among non-consecutive patients with a defined clinical presentation	All or none	All or none	A pseudo-randomised controlled trial (i.e. alternate allocation or some other method)
III-2	A comparative study with concurrent controls: • Non-randomised, experimental trial • Cohort study • Case-control study • Interrupted time series with a control group	A comparison with reference standard that does not meet the criteria required for Level II and III-1 evidence	Analysis of prognostic factors amongst untreated control patients in a randomised controlled trial	A retrospective cohort study	A comparative study with concurrent controls: • Non-randomised, experimental trial • Cohort study • Case-control study

III-3	A comparative study without concurrent controls: • Historical control study • Two or more single arm study • Interrupted time series without a parallel control group	Diagnostic case-control study	A retrospective cohort study	A case-control study	A comparative study without concurrent controls: • Historical control study • Two or more single arm study
IV	Case series with either post-test or pre-test/post-test outcomes	Study of diagnostic yield (no reference standard)	Case series, or cohort study of patients at different stages of disease	A cross-sectional study or case series	Case series

The evidence within the 29 key citations fell into the following Levels (as defined by the National Health and Medical Research Council)[3]:

- Level I evidence: 17 publications;
- Level II evidence: 2 publications;
- Level III evidence: 3 publications; and
- Level IV evidence: 6 publications.
- One Cochrane Protocol.

Data extraction

Details from the relevant studies were summarised into evidence tables and narrative evidence summaries. These tables and summaries were prepared by extracting information on pre-defined criteria from the included studies into a critical appraisal template (evidence tables and evidence summary template). The information collected on this template included general details (author, year, setting, country where the study was carried out, evidence level), participants (age, inclusion/exclusion criteria, withdrawals, losses to follow-up, sub-groups), outcome measures and results (number of participants in intervention and control, total participants, relative risk, 95 % confidence interval and P value). Information on conflict of interest declaration and management quoted in the included studies was also noted in the evidence table.

Where pooling and meta-analysis was available within existing reviews, these were used. No additional pooling of data or meta-analysis was undertaken during the data extraction process.

The Fetal Surveillance Guideline Review Working Party was provided with the evidence tables and narrative evidence summaries for each clinical question to assist with the development of recommendations.

Assessing the full body of evidence and formulated recommendations according to NHMRC grading criteria

To assist in the formulation of recommendations, the NHMRC grading process was applied.[3] For each clinical question (see Appendix C), the Fetal Surveillance Guideline Review Working Party developed a draft NHMRC Evidence Statement form based on the following NHMRC matrix.

NHMRC body of evidence assessment matrix and recommendation grading[3]

Level	A	B	C	D
Component	Excellent	Good	Satisfactory	Poor
Evidence base (quantity of evidence, level of evidence and quality of evidence)	one or more Level I studies with a low risk of bias or several Level II studies with a low risk of bias	one or two Level II studies with a low risk of bias or a SR/several Level III studies with a low risk of bias	one or two Level III studies with a low risk of bias, or Level I or II studies with a moderate risk of bias	Level IV studies, or Level I to III studies/SRs with a high risk of bias
Consistency	all studies consistent	most studies consistent and inconsistency may be explained	some inconsistency reflecting genuine uncertainty around clinical question	evidence is inconsistent
Clinical impact	very large	substantial	moderate	slight or restricted
Generalisability	population/s studied in body of evidence are the same as the target population for the guideline	population/s studied in the body of evidence are similar to the target population for the guideline	population/s studied in body of evidence differ to target population for guideline but it is clinically sensible to apply this evidence to target population	population/s studied in body of evidence differ to target population and hard to judge whether it is sensible to generalise to target population
Applicability	directly applicable to Australian healthcare context	applicable to the Australian healthcare context with few caveats	probably applicable to Australian healthcare context with some caveats	not applicable to Australian healthcare context

Regardless of whether evidence existed to answer the clinical questions, an NHMRC Evidence Statement form was prepared to assist the Working Party in the development of evidence based and consensus-based recommendations. Where evidence was available to answer the clinical questions, evidence-based recommendations were developed, with the grade of recommendations reflecting the volume, consistency, clinical impact, generalisability and applicability of the evidence (as per Table 2 and 3).[3]

Definition of NHMRC Grades of Recommendations[3]

Recommendation category		Description
Evidence-based recommendation	A	Body of evidence can be trusted to guide practice
	B	Body of evidence can be trusted to guide practice in most situations
	C	Body of evidence provides some support for recommendation(s) but care should be taken in its application
	D	The body of evidence is weak and the recommendation(s) must be applied with caution
Consensus-based recommendation		Consensus-based recommendations based on expert opinion where the available evidence was inadequate or could not be applied in the Australian healthcare context
Good Practice Note		Practical advice and information based on expert opinion to aid in the implementation of the Guideline

Where no robust evidence was available but there was sufficient consensus within the Working Party, consensus-based recommendations were developed, and agreed to by the entire committee (and are identifiable throughout the Guideline as such). Good Practice Notes which were developed through consensus of the entire Working Party are highlighted throughout the Guideline and provide practical guidance to facilitate implementation.

Where there were gaps identified in the evidence base, the Working Party developed recommendations for further research. All recommendations were developed and agreed to by all members of the Fetal Surveillance Guideline Review Working Party through informal group processes after open discussion at a face-to-face meeting facilitated by the Chair.

Declaration of interest process

Declaring interests is essential in order to prevent any potential conflict between the private interests of members and their duties as part of the Working Party updating this guideline.

A declaration of interest form specific to guidelines was developed by RANZCOG and approved by the RANZCOG Board in September 2012. The Fetal Surveillance Guideline Review Working Party members were required to declare their relevant interests in writing on this form prior to participating in the review of the Intrapartum Fetal Surveillance Clinical Guidelines – Second Edition.

Members were required to update their information as soon as they become aware of any changes to their interests and there was also a standing agenda item at each meeting where declarations of interest were called for and recorded as part of the meeting minutes.

To enable all Working Party members to take any interest(s) of their fellow members into consideration when reviewing evidence and formulating recommendations, a register of any recorded interests was shared with all members.

Management of conflict of interest

If Working Party members were identified as having significant real or perceived conflicts of interest, the management of this interest was at the discretion of the Chair (e.g. exclusion from the discussion or voting, or they may have been asked to step out of the room while an item they were conflicted on was discussed).

There were no significant real or perceived conflicts of interest that required management during the process of updating this Guideline.

Appendix C: Clinical questions

The clinical questions used to inform the update of the RANZCOG Intrapartum Fetal Surveillance (IFS) Clinical Guideline (Third Edition) are as follows. Please note: questions marked with a * are new questions to be addressed in the third edition.

Risk factors

1. What are the antenatal and intrapartum risk factors associated with an increased risk of fetal compromise?

Communication and Information

2. What information on intrapartum fetal surveillance during labour should be given to pregnant women? When and how should this information be provided to them, and by whom?*

Standardisation

3. How should competency in performing and interpreting CTG traces be assessed and maintained?
4. What is the preferred paper speed setting of CTG traces for both antenatal and intrapartum fetal monitoring?
5. How should CTG traces be stored?*

Intrapartum fetal surveillance in all women

6. Should intrapartum fetal surveillance be used to assess and monitor fetal well-being on all women on admission to hospital in labour?

Modality of Intrapartum fetal surveillance in the absence of risk factors for fetal compromise

Admission CTG

7. Should admission CTG be used to assess fetal well-being in *lower risk women* on admission to hospital in labour?

Intermittent auscultation or continuous electronic fetal monitoring for lower risk women

8. Which modality of intrapartum fetal surveillance should be recommended for assessing and monitoring fetal well-being in *lower risk women* on admission to hospital in labour? E.g. intermittent auscultation, continuous CTG or intermittent CTG (15 minutes every 2 hours)
9. Modality of intrapartum fetal surveillance in the presence of risk factors for fetal compromise
   Which modality of intrapartum fetal surveillance should be recommended for assessing and monitoring fetal well-being *in the presence of, or with the emergence of, fetal and/or maternal risk factors* in women on admission to hospital in labour?
   E.g. intermittent auscultation, continuous CTG or intermittent CTG (15 minutes every 2 hours).
10. Does the list of conditions listed in the Guideline as requiring continuous CTG in labour need to be expanded? (E.g. to include morbid obesity, gestational diabetes mellitus not being treated with insulin etc.)*

Method of intermittent auscultation

11. What is the most effective method of performing intermittent auscultation? (Doppler ultrasound or Pinard stethoscope?)

Difficulty getting a high quality CTG trace

12. If there is difficulty getting a high quality CTG recording, which assessment and monitoring modalities should be used? (e.g. fetal scalp electrode, intrauterine pressure catheters).*

Management of fetal heart rate patterns suggestive of fetal compromise

13. How should fetal heart rate patterns considered suggestive of fetal compromise be managed?

Definition and management of uterine hyperstimulation

14. What is the definition of uterine hyperstimulation?*
15. Is uterine hyperstimulation only associated with induction or augmentation, or can it occur in normal labour?*
16. Is there an increased risk of morbidity or mortality (maternal or fetal) from uterine hyperstimulation?*
17. Is tocolytic therapy effective in managing uterine hyperstimulation? If so, which tocolytic agent should be administered for treatment of uterine hyperstimulation?*
18. What additional emergency treatment may be provided for uterine hyperstimulation?*

Intrapartum Fetal Scalp Blood Sampling

19. Should intrapartum fetal scalp blood sampling be undertaken?
20. Which is more effective for assessing fetal acidosis, scalp lactate or scalp pH and base excess?
21. When should fetal scalp sampling be undertaken?

Umbilical cord blood sampling at delivery

22. Where intrapartum fetal scalp blood sampling has been undertaken, should umbilical cord arterial and venous blood be collected at time of delivery to confirm acid-base status?
23. Does routine umbilical cord blood sampling at delivery for pH and base excess or lactate improve perinatal outcomes?*

Techniques other than CTG or intermittent auscultation for intrapartum assessment of fetal well-being

24. What is the place of other trialled techniques for intrapartum fetal surveillance, such as fetal ECG/ST segment analysis, fetal pulse oximetry?*

Definitions required:

25. When does monitoring commence, if indicated? What is admission?*
26. Established labour/early labour*
27. Fetal tachycardia and bradycardia
28. Normal/reduced/absent variability
29. Uterine hyperstimulation (diagnostic criteria)*
30. Fetal heart rate patterns suggestive of compromise
31. Definitions of the different decelerations?

Appendix D: Consultation process – development of the guidelines 2000–2002

Purpose of consultation

The purpose of this consultation was to obtain comment from those involved in maternity services as providers (obstetricians and midwives) and as users (consumer groups) on draft guidelines, good practice notes and clinical practice algorithms for intrapartum fetal surveillance.

For each guideline, good practice note and clinical practice algorithm, comment was invited on the issues of:

- clarity;
- feasibility;
- evidence base;
- support;
- implementation; and
- additional comments.

Who was consulted

The RANZCOG Guideline Development Group provided names of 64 representatives of various special interest groups to be consulted, including: RACGP, ACCRM, ACMI and the Royal Women's Hospital (RWH) Project Team.

Process of consultation

An initial mail out was conducted on 15 November 2001. Two subsequent mail outs were requested to include greater representation from other states.

Those invited to comment were provided with a covering letter, a copy of the Draft Clinical Guidelines document, response framework and a prepaid return addressed envelope.

Telephone reminders to all (with the exception of New Zealand participants) regarding the mail outs were undertaken on 20 December 2001 and 7 January 2002.

Who responded

Of the 66 invited to comment, 43 responded by 11 January 2002.

State	Total distributed	Total returned
Victoria	28	19
NSW	9	5
WA	4	2
Tasmania	1	1
SA	5	3
Queensland	10	8
ACT	2	1
New Zealand	7	4

Key personnel from special interest groups were invited to comment

	Obstetricians	GPs	Midwives	Consumer groups
Total distributed	48	11	5	2
Total returned	35	4	4	0

Appendix E: Consultation process – revision of guidelines 2004–2006

Review of feedback

The College encouraged feedback from users of the guideline in the key areas of clarity and barriers to implementation. Users were also invited to provide additional comments. All comments were collated and considered in the revision process.

Literature appraisal

The literature search was extended to include and update recent references with particular emphasis on admission CTGs.

Multidisciplinary workshop

The College invited key stakeholders to participate in a multidisciplinary workshop designed to facilitate discussion between relevant medical, midwifery and consumer bodies. Feedback was sought from participants to ensure the relevance of the guidelines to Australian and New Zealand practice.

For each guideline, good practice note and clinical practice algorithm, comment was invited on the issues of:

- clarity;
- feasibility;
- evidence base;
- support;
- implementation; and
- additional comments.

The following stakeholders were invited to join the members of the Guideline Review Group in a multidisciplinary workshop conducted at College House, Melbourne, on 17 February 2006. Participation in this workshop did not indicate endorsement of the guidelines by the individual or organisation.

Stakeholder	Represented by
Australian College of Midwives Incorporated	Ms H Cooke
Australian College of Rural and Remote Medicine	Dr R Stewart
Department of Human Services, Victoria	Ms W Dawson
King Edward Memorial Hospital	Ms K Reid
Maternity Coalition	Ms L Arnott

New Zealand College of Midwives	Ms N Campbell
RANZCOG GP Obstetric Advisory Committee (Chair)	Dr J Taylor
The Three Centres (Southern Health)	Dr C Tippett
The Three Centres (Southern Health)	Ms H Gillies
The Three Centres (Mercy Hospital for Women)	Dr B White
The Three Centres (Mercy Hospital for Women)	Ms D Patterson
The Three Centres (Royal Women's Hospital)	Ms T Farrell

Stakeholder	Apologies received from
Royal Australian College of General Practitioners	Representative
The Three Centres (Royal Women's Hospital)	Professor J Oats
Victorian Managed Insurance Authority	Dr P Kirker

Appendix F: Consultation process – revision of guidelines 2012–2014

During February 2013, the draft third edition Guideline was sent out for targeted consultation to the following relevant stakeholder organisations and individuals:

- Australian College of Midwives (ACM)
- Australian College of Rural and Remote Medicine (ACRRM)
- Midwifery Council of NZ (MCNZ)
- New Zealand College of Midwives (NZCOM)
- Royal Australian College of General Practitioners (RACGP) (who declined to comment without payment)
- RANZCOG consumer representatives.

Following the consultative process, there were general comments received and the Guideline was amended accordingly, in consultation with the contributors.

Appendix G: Definitions

When does monitoring commence, if indicated? What is admission?

Women with an indication for continuous CTG, monitoring should commence as soon as possible after the establishment of active labour.

Established (active) labour

Regular painful contractions (contractions occurring every five minutes and persisting for 30 minutes or more) which may be associated with a show, ruptured membranes or cervical changes (full effacement, 4cm or more dilatation).[100, 101]

Early labour

Regular painful contractions (five minutely contractions persisting over 30 minutes) which may be associated with a show, intact membranes or some cervical changes that fall short of full effacement, and or <4cm dilatation).[100, 101]

When women telephone for advice who are potentially in labour, ascertainment of fetal well-being should be assessed by the presence of normal fetal activity. Where a woman has an indication for continuous CTG (e.g. with risk factors), she should be encouraged to present for assessment of fetal well-being following the onset of regular contractions.

Electronic Fetal Monitoring with CTG

The use of electronic fetal heart rate monitoring for the evaluation of fetal wellbeing in labour.[1] Cardiotocography (CTG) is one form of electronic fetal monitoring.

Description of CTG fetal heart rate patterns

Term	Definition
Baseline fetal heart rate	The mean level of the fetal heart rate when this is stable, excluding accelerations and decelerations and contractions. It is determined over a time period of five or 10 minutes and expressed in bpm. Preterm fetuses tend to have values towards the upper end of this range. A progressive rise in the baseline is important as well as the absolute values.
Normal Baseline	FHR 110–160 bpm
Baseline Bradycardia	<110 bpm
Baseline Tachycardia	>160 bpm
Baseline variability:	The minor fluctuations in baseline FHR. It is assessed by estimating the difference in beats per minute between the highest peak and lowest trough of fluctuation in one minute segments of the trace between contractions.
Normal baseline variability:	6–25 bpm at the baseline fetal heart rate
Reduced baseline variability	3–5 bpm* *Caution should be exercised in interpreting variability in the presence of an external transducer.
Absent baseline variability	<3 bpm
Increased baseline variability	>25 bpm
Sinusoidal	A regular oscillation of the baseline FHR resembling a sine wave. This smooth, undulating pattern is persistent, has a relatively fixed period of 2–5 cycles per minute and an amplitude of 5–15 bpm above and below the baseline. Baseline variability is absent and there are no accelerations.

Accelerations	Transient increases in FHR of 15 bpm or more above the baseline and lasting 15 seconds. Accelerations in the preterm fetus may be of lesser amplitude and shorter duration. The significance of no accelerations on an otherwise normal CTG is unclear.
Decelerations	Transient episodes of decrease of FHR below the baseline of more than 15 bpm lasting at least 15 seconds, conforming to one of the patterns below:
Early decelerations	Uniform, repetitive decrease of FHR with slow onset early in the contraction and slow return to baseline by the end of the contraction.
Variable decelerations	Repetitive or intermittent decreasing of FHR with rapid onset and recovery. Time relationships with contraction cycle may be variable but most commonly occur simultaneously with contractions.
Complicated variable decelerations	The following additional features increase the likelihood of fetal hypoxia: • Rising baseline rate or fetal tachycardia. • Reducing baseline variability. • Slow return to baseline FHR after the end of the contraction. • Large amplitude (by 60 bpm or to 60 bpm) and/or long duration (60 seconds). • Presence of smooth post deceleration overshoots (temporary smooth increase in FHR above baseline).
Prolonged decelerations	Decrease of FHR below the baseline for longer than 90 seconds but less than five minutes.
Late decelerations	Uniform, repetitive decreasing of FHR with, usually, slow onset mid to end of the contraction and nadir more than 20 seconds after the peak of the contraction and ending after the contraction. In the presence of a non-accelerative trace with baseline variability <5 bpm, the definition would include decelerations of <15 bpm.

Appendix H: Abbreviations

bpm	Beats per minute
BMI	Body Mass Index
CTG	Cardiotocograph(y)
ECG	Electrocardiogram
EFM	Electronic Fetal Monitoring
FBS	Fetal Blood Sampling
FHR	Fetal Heart Rate
HIE	Hypoxic Ischaemic Encephalopathy
IA	Intermittent Auscultation
MoM	Multiples of the Median
PAPP-A	Pregnancy-Associated Plasma Protein A
RCT	Randomised Controlled Trial
RR	Relative Risk
VE	Vaginal Examination
95% CI	95% Confidence Interval

Appendix I: Patient information pamphlet

RANZCOG Patient Information guides can be ordered from:

http://www.ranzcog.edu.au/womens-health/resources-for-women-a-practitioners/patient-information-pamphlets.html .

Appendix J: RANZCOG Practice Review and Clinical Risk Management activity sheet

Practice Review activities associated with the Fetal Surveillance Education Program (FSEP)

CPD points can be claimed on the completion of each stage

Stage	Activity	PR&CRM Points
STAGE ONE (OPTIONAL) Pre-education Intervention audit *To be undertaken prior to the workshop*	Perform an audit (may be retrospective) of the previous 30 consecutive deliveries or all deliveries for 3 months where CTG was used during labour* Refer to Attachment 1: Audit Tool for Intrapartum CTG Fetal Surveillance	**1 CPD point per hour in the PR&CRM category**
STAGE TWO Fetal Surveillance Education Program Full Day session	• Participation in the workshop • Completion of the FSEP Assessment • Completion of the FSEP Feedback Form	**7 PD/CPD points in the Clinical Expertise/ Meetings category**
STAGE THREE (OPTIONAL) Follow-up activities *To be undertaken 3-6 months after the workshop or ongoing*	Set goals, develop action plan and implement, monitor and evaluate the outcome of the changes made and any adverse events/complications. Refer to Attachment 2: PR&CRM Activity Worksheet Fellows may choose to do an audit of the following 30 consecutive deliveries or all deliveries for 3 months* Conduct regular multidisciplinary meetings to review obstetric cases and deliveries	**5 CPD points in the PR&CRM category** **PLUS** **1 CPD point/hour in the PR&CRM category for clinical meetings**

***Bonus 1 CPD point per hour in the PR&CRM category can be claimed for each audit (pre and post)**

Please keep a summary of your activity as verification documentation

To claim points in the Practice Review & Clinical Risk Management category, enter the title of the activity and the amount of points on your Annual Points Claim form.

For queries, contact PR&CRM staff on +61 3 9417 1699 or prcrm@ranzcog.edu.au

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