Clinical Practice Guideline

for the

Management of Women who report Decreased Fetal Movements

First edition, Version 1.1, July 2010

Clinical practice guideline for the management of women who report decreased fetal movements

Produced by:
The Australian and New Zealand Stillbirth Alliance (ANZSA).

Compiled by:
The Fetal Movement Study Group, as the Australian and New Zealand arm of the international Fetal Movement Intervention and Assessment (FEMINA) collaboration.

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The Mater Foundation and the Mater Mothers' Research Centre, Mater Health Services, Brisbane.

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DISCLAIMER

The main objective of this guideline is to assist clinicians in Australia and New Zealand with the management of women who report decreased fetal movements (DFM), and to enhance consistency in information and care provided to women. This guideline has been developed to help reduce the risk of adverse pregnancy outcomes, including the death of a baby and maternal anxiety.

This guideline is not intended to be prescriptive. It is designed to provide the best available information, enabling integration of the best evidence, clinicians' judgement and individual choice in arriving at decisions about care. Clinical practice guidelines are considered as generally recommended practice. Due to the lack of high quality evidence, recommendations in this guideline are mainly consensus-based, following consideration of the available evidence.

This guideline will be reviewed before September 2011. Comments should be forwarded to dfmguidelines@stillbirthalliance.org, with '*Decreased Fetal Movements Guideline*' in the subject line.

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Abbreviations

ACM	Australian College of Midwives
ANZSA	Australian and New Zealand Stillbirth Alliance
CTG	Cardiotocography
DFM	Decreased fetal movements
FEMINA	Fetal movement intervention and assessment collaboration
FGR	Fetal growth restriction
FHR	Fetal heart rate
NHMRC	National Health and Medical Research Council
NPSU	National Perinatal Statistics Unit
PMR	Perinatal mortality rate
PSANZ	Perinatal Society of Australia and New Zealand
RANZCOG	Royal Australian and New Zealand College of Obstetricians and Gynaecologists
SANDS	Stillbirth and Neonatal Death Support
SGA	Small for gestational age

Glossary of terms

Acidemia	Condition characterised by an increased acidity of the blood (which falls below 7 on the pH scale), which is caused by an increased concentration of hydrogen ions.
Amniotic fluid	The fluid that surrounds the developing baby within the amniotic sac. This environment cushions the baby from injury and plays an important role in fetal development.
Antenatal	Occurring before birth; concerned with the care and treatment of the unborn baby and pregnant woman.
Antepartum	Before the onset of labour.
Apgar score	A system to assess the status of the baby after birth. The Apgar score is based on the following five variables: heart rate, respiratory effort, muscle tone, reflex irritability and colour with a maximum score is 10. The Apgar score is recorded at one minute and five minutes after birth.
Cardiotocography (CTG)	The electronic monitoring of the fetal heart rate and of uterine contractions. The fetal heart rate is recorded by means of either an external ultrasonic abdominal transducer or a fetal scalp electrode. Uterine contractions are recorded by means of an abdominal pressure transducer. The recordings are graphically represented on a continuous paper print-out (trace).
Congenital malformation	A physical malformation, chromosomal disorder or metabolic abnormality which is present at birth.
Customised birthweight	The principal that the weight reference for the baby should be individualised (customised), and not be based on population averages. Factors shown to be predictive of birthweight are maternal height, weight at booking for the first antenatal visit, ethnicity, fetal gender and gestational age. The customised birthweight standard is an adjusted standard for the individual baby
Doppler	A diagnostic tool that uses low intensity ultrasound to detect the presence or absence of blood flow velocity in arteries or veins.
Fetal death	See “Stillbirth”

Fetal to maternal transfusion/hemorrhage	Bleeding across the placental interface from the fetus to mother. FMH is diagnosed using the Betke -Kleihauer stain, a test which detects the amount of fetal blood cells in the mother's blood. Although the definition of massive FMH is often arbitrary (varying from >50ml to >150ml), it has a clear association with fetal mortality and morbidity.
Fetal growth restriction (FGR)	This term often (incorrectly) used interchangeably with the term 'small for gestational age' (SGA). SGA is defined as a baby with an antenatal ultrasound biometry assessment less than the 10th percentile for gestational age, according to National birthweight percentiles. FGR strictly refers to babies that have failed to reach their growth potential during pregnancy. They are frequently *but not always* SGA. FGR is defined antenatally by an estimated fetal weight or serial antenatal ultrasound evidence of growth restriction or growth arrest and at birth a birthweight below the 10th percentile using the National birthweight percentiles. Ideally FGR should be defined according to the infant's individual growth potential using customised birthweight percentiles. However, there is currently insufficient information to allow the use of customised birthweight across Australia and New Zealand.
Gestation	The time from conception to birth. The duration of gestation is measured from the first day of the last normal menstrual period.
Growth restriction	See also "Fetal Growth Restriction". Birthweight below the 10th percentile for gestational age, according to National birthweight percentiles. Ideally FGR should be defined according to the baby's individual growth potential using customised birthweight percentiles.
Hypertension	Repeatedly and persistently elevated blood pressure exceeding 140/90 mmHg.
Hypoglycaemia	Condition characterised by an abnormally low level of blood glucose (<2.5 mmol/L) which usually results from excessive insulin or a poor diet.
Live birth	The complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which after such separation breathes or shows any other evidence of life, such as beating of the heart,

	pulsation of the umbilical cord or definite movement of the voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth in considered liveborn.
Neonatal	Pertaining to the newborn period which is the 28 days after birth.
Neonatal mortality rate (NMR)	The number of neonatal deaths (those occurring within the first 28 days of live) per 1000 births.
Oligohydramnios	Deficiency of amniotic fluid volume.
Perinatal mortality rate (PMR)	The number of stillbirths and neonatal deaths per 1000 births.
Preterm birth	The birth of a baby at less than 37 weeks gestational age.
Randomised controlled trial	A comparative study in which participants are randomly allocated to intervention and control groups and are followed up to examine differences in outcomes between the two groups.
Small for gestational age (SGA)	A baby/fetus with an antenatal ultrasound biometry assessment less than the 10^{th} percentile for gestational age, according to National birthweight percentiles.
Singleton	A single baby.
Stillbirth (Fetal Death)	Death prior to the complete expulsion or extraction from its mother of a product of conception of 20 or more completed weeks of gestation or of 400g or more birthweight. The death is indicated by the fact that after such separation the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles.
Stillbirth rate	The number of stillbirths per 1000 births.

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Summary of clinical practice recommendations

Recommendations for fetal movement monitoring

Recommendation 1	**Evidence level and references**	**Recommendation grade**
All pregnant women should be routinely provided with verbal and written information regarding normal fetal movements during the antenatal period. This information should include a description of the changing patterns of movement as the fetus develops, normal wake/sleep cycles and factors which may modify the mother's perception of movements such as maternal weight and placental position.	III-3 1, 15	**C**
Recommendation 2		
All women should be advised to contact their health care provider if they have any concern about decreased or absent fetal movements and be advised not to wait until the next day to report DFM.	III-3 15,71	**C**
Recommendation 3		
a. After discussion, women who remain unsure whether movements are decreased or not should be given guidance on counting fetal movements; i.e. to count while lying down on her side and concentrating on fetal movements. As a rule, when the baby is awake, if there are less than 10 movements felt in 2 hours she should contact her health care provider. b. Maternal concern of DFM overrides any definition of DFM based on numbers of fetal movements and women with a concern about DFM should be encouraged to contact their health care provider.	III-3 13, 15, 55, 71	**C** **√**
Recommendation 4		
a**.** Clinicians should emphasise the importance of maternal awareness of fetal movements at every routine antenatal visit. b**.** The use of kick-charts can currently not be recommended as part of routine antenatal care.	 I 56	**√** **B**

Recommendations for the investigations of decreased fetal movements

Recommendation 5	**Evidence level and references**	**Recommendation grade**
a. When a woman presents with DFM, assessment of the woman and her fetus should be undertaken as soon as possible.	III-3 [1, 15, 17, 52]	**B**
b. This assessment should preferably be undertaken within 2 hours if fetal movements are absent and within 12 hours if they are reported as decreased.	[15]	***√***
Recommendation 6		
a. Women who report DFM should be assessed for the presence of other risk factors associated with an increased risk of stillbirth (i.e. fetal growth restriction, hypertension, diabetes, advanced maternal age etc).	III-3 [13]	**C**
b. Women with DFM in combination with other risk factors should be managed as a high-risk pregnancy.		***√***
Recommendation 7		
Clinical assessment of a woman with DFM should always include review of fetal growth as noted by symphysis-fundal height measurements in the pregnancy record.		***√***
Recommendation 8		
a. A CTG should be performed to exclude fetal compromise.	III-3 [15, 17, 74]	**C**
b. Further evaluation is recommended for women with any abnormal CTG pattern.		***√***
Recommendation 9		
Ultrasound scan assessment for fetal biometry and amniotic fluid volume should be considered as part of the preliminary investigation of a woman presenting with DFM where maternal perception of DFM persists despite a normal CTG or in the circumstance of suspected fetal growth restriction.	III-3 [13, 15, 17, 38, 71, 74]	**B**
Recommendation 10		
Ultrasound scan assessment should include assessment of fetal morphology if this has not already been performed.	III-2 [15]	**C**

Recommendation 11		
Where, in the presence of DFM, an ultrasound scan assessment is indicated, this should be performed within 24 hours.		√
Recommendation 12		
Testing for fetomaternal haemorrhage should be considered in the preliminary investigation of women with DFM where a CTG abnormality is detected, in the presence of an ultrasound scan showing a normally grown fetus.	[79]	√
Recommendation 13		
Where, after further discussion and in the presence of a normal clinical assessment (including a CTG and ultrasound), maternal concern still remains about DFM, further management should be individualised.	[81]	√

1. Introduction

In recognition of the variation in clinical practice and information provided to women regarding decreased fetal movements (DFM)[1-3], the Fetal Movement Study Group at the Mater Medical Research Institute (previously Mater Mothers' Research Centre), Mater Health Services, Brisbane, has coordinated the development of this guideline on behalf of the Australian and New Zealand Stillbirth Alliance (ANZSA). In compiling this guideline, the study group followed the National Health and Medical Research Council (NHMRC) guidelines for the development of clinical practice guidelines[4] (Appendix 1).

While it is acknowledged that robust evidence is lacking in this area, there is some indication from studies that a reduction in stillbirth rates by may be achieved by increasing maternal and clinical awareness about the importance of DFM.

This guideline will continue to be updated as further evidence becomes available from high quality studies.

2. Purpose of the guideline

The purpose of this guideline is to assist clinicians in providing consistent best-practice management for women with singleton pregnancies who report or are concerned about DFM in the third trimester of pregnancy.

The management of women with specific pregnancy conditions identified during the course of care in accordance with this guideline (e.g. fetal growth restriction, hypertension, diabetes) is beyond the scope of this guideline.

An information brochure has also been prepared to inform and assist women and their health care providers to facilitate shared management decisions. This brochure is based on the key recommendations set out in this guideline and is available online at www.stillbirthalliance.org.au/guideline.htm

3. Audience

The target audience for this guideline are health care professionals providing antenatal care in Australia and New Zealand.

Pregnant women and their partners may also find this guideline helpful. The information brochure for women will provide relevant information about fetal movements.

4. Aims and objectives

The aim of this guideline is to improve the process and outcome of care for women with DFM. Accordingly, the following objectives were set out to achieve this:

1. To provide an evidence-based consensus approach to the management of women with DFM;
2. To improve consistency in the management of women with DFM;
3. To assist healthcare providers to appropriately counsel women with DFM;
4. To reduce maternal anxiety about fetal activity and self-monitoring;
5. To aid in the identification of women with higher risk pregnancy.

5. Methods

For the outline of the methods, please refer to **Appendix 1**.

6. Background

The decline seen in the perinatal mortality rates in high income countries is attributed to the advances in neonatal care, leading to a reduction in neonatal mortality rates. In contrast, fetal death rates have failed to show any reduction for more than a decade[5]. The wide variation in the reported contribution of unexplained stillbirths from 15%[6] to 71%[7] has been attributed to classification systems used, thoroughness of the investigation of deaths and the definition of stillbirth used[8]. The large proportion of unexplained antepartum stillbirths[9] is a major barrier to the further reduction of stillbirth and perinatal mortality rates. The majority of these unexplained deaths occur in late gestation in apparently healthy pregnancies. Many of these babies are however found to be growth restricted after birth [10, 11], indicating potential for the prevention of some of these deaths if antenatal detection and appropriate intervention had been achieved.

Based on the most recent data from the National Perinatal Statistics Unit[9] there were 294,205 births in Australia in 2007 and 3024 perinatal deaths, giving a perinatal mortality rate (PMR) of 10.3 per 1000 births. The perinatal mortality comprised 2177 stillbirths and 846 neonatal deaths, giving a stillbirth rate of 7.4 per 1000 births and a neonatal death rate of 2.9 per 1000 births. The PMR of babies born to Aboriginal or Torres Strait Islander mothers was double that of babies born to non-indigenous mothers (20.1 versus 9.8 per 1000 births)[9].

In New Zealand in 2005, there were 59,130 births and 551 perinatal deaths, giving a PMR of 9.3 per 1000 births. Fetal and neonatal death rates in New Zealand in 2005 were 6.8 and 3.1 per 1000 births, respectively[12]. Although the PMR for babies born to Pacific mothers has decreased, this rate was still 10% higher than the PMR of babies born to other mothers (10.2/ 1000 births compared to 9.2/1000 births for babies born to pacific and other mothers, respectively). The PMR of babies born to Maori mothers has gradually decreased since 1994 and in 2005 this rate was similar to other mothers (9.4/1000 births compared to 9.2/ 1000 births for babies born to Maori and other mothers, respectively)[12].

Maternal perception of DFM is a common cause for maternal concern, with 4-15% of women contacting their health care provider because of concern in third trimester[13-15]. Maternal perception of DFM is an indicator for pregnancies at increased risk of adverse outcomes; studies have reported associations between DFM and low birth weight[16-23], oligohydramnios, preterm birth[16, 24], threatening preterm labour[16], congenital malformations and chromosomal abnormalities[25], feto-maternal transfusion[26], perinatal brain injuries and disturbed neurodevelopment[27, 28], intrauterine infections[29], low Apgar scores and acidemia[18, 20], hypoglycemia[16], umbilical cord complications and placental insufficiencies[17, 23], emergency deliveries, inductions of labour and Caesarean sections, stillbirths and neonatal deaths[30, 31]. Fetal growth restriction appears to be a major factor contributing to the increased risk in these pregnancies[17, 31-36].

Even in pregnancies that are deemed low risk, DFM have been shown to increase the risk of adverse outcome, including fetal growth restriction (FGR), preterm birth and antepartum fetal deaths[13, 16, 17, 34, 37]. A recent prospective population based study in Norway reported that the fetal death rate in women who had a live fetus at time of presentation with DFM was 8.2 per 1000 compared to 2.9 per 1000 in the general population[30]. Additionally, a case-control study from the UK reported that FGR was present in 11% of women with DFM compared with 0% in the control group[38], suggesting that persistent DFM may alert clinicians of presence of possible FGR .

Contributing factors relating to (suboptimal) care account for 30-50% of stillbirths and neonatal deaths[7, 39, 40]. A number of studies of fetal deaths in Østfold and Norway identified that an inappropriate response to maternal perception of DFM was a common factor contributing to these deaths[39, 40]. Similar findings have been shown in studies undertaken in Norway[41] and Lithuania[42] where prolonged DFM (>24 hours) as well as sudden loss of fetal movements was shown in 47%-64% of all fetal deaths. Fetal deaths which are preceded by a decrease in fetal activity form an important group on which to focus future research and prevention strategies towards reducing stillbirth rates.

Despite the apparent increased risk associated with maternal perception of DFM, a recent study from Norway reported that one in four women could not recall having received any information about fetal movements during routine antenatal care[1]. Furthermore, existing guidelines on antenatal care[43, 44], whilst acknowledging the importance of DFM, provide little guidance on what constitutes a clinically significant decrease in fetal movements, nor what is the best practice for the management of DFM. Wide variation in clinical practice regarding the management of DFM was shown in a recent survey of the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG)[2], as well as in a similar survey for midwives in Australia and New Zealand (ANZ)[45]. These surveys revealed that, although monitoring fetal activity through asking women about fetal movements was considered an important part of routine antenatal care, the definition of alarm limits, the level of clinical assessment and the follow-up of women presenting with DFM varied widely.

These findings are consistent with other similar surveys from the UK[46] and Norway[30]. Variation in clinical practice was also confirmed in another Australian study[47]. In this clinical audit of practice across six public hospitals in Queensland, 6-8% of pregnant women reported concern about DFM. Whilst the majority of these women were investigated by CTG, the use of ultrasound scan in the initial assessment of these women varied widely amongst clinicians.

7. Defining DFM and maternal perception of fetal activity

Recommendation 1	**Evidence level* and references**	**Recommendation grade***
All pregnant women should be routinely provided with verbal and written information regarding normal fetal movements during the antenatal period. This information should include a description of the changing patterns of movement as the fetus develops, normal wake/sleep cycles and factors which may modify the mother's perception of movements such as maternal weight and placental position.	III-3 1, 15	**C**
Recommendation 2		
All women should be advised to contact their health care provider if they have any concern about decreased or absent fetal movements and be advised not to wait until the next day to report DFM.	III-3 15, 71	**C**

Recommendation 3		
a. After discussion, women who remain unsure whether movements are decreased or not should be given guidance on counting fetal movements; i.e. to count while lying down on her side and concentrating on fetal movements. As a rule, when the baby is awake, if there are less than 10 movements felt in 2 hours she should contact her health care provider.	III-3 [13, 15, 55, 71]	**C**
b. Maternal concern of DFM overrides any definition of DFM based on numbers of fetal movements and women with a concern about DFM should be encouraged to contact their health care provider.		**√**

*The classification of the evidence and grading of the recommendations are based on criteria recommended by the National Health and Medical Research Committee[4]

Currently there is no universally agreed definition of DFM. Attempts have been made to define normal patterns of fetal movements. In a study of women with normal uncomplicated pregnancies, 99% of women were able to feel 10 movements within 60 minutes[30]. Studies have been conducted on the correlation between maternal perception of fetal movements and fetal movements detected on ultrasound scans, showing large variations, with correlation rates ranging from 16-90%[3, 47, 48]. This variation in maternal perception may be related to gestational age, amount of amniotic fluid volume, medications, fetal sleep state, obesity, anterior placenta, smoking and nulliparity [49-51].

Other considerations that complicate the interpretation of fetal health based on the number of fetal movements are the limited understanding of patterns of fetal activity during "sleep" and active cycles, and the changes in the type of movements as pregnancy advances. Fetal movements are usually absent during fetal "sleep" cycles. These quiet cycles occur regularly throughout the day and night and usually last 20 – 40 minutes[50, 51]. They rarely exceed 90 minutes in the normal, healthy fetus[50-52].

Women with DFM who ask for advice are often told that their baby may respond with movements within 20 minutes after having something very sweet or sugary to eat, or after having an icy cold drink. However, there is no evidence to support this advice. Fetal movements have been shown not to be altered by intravenous glucose administration, or by a recent meal[53, 54].

It is also important to note that whilst the type of fetal movements may change as pregnancy advances in the third trimester, there is no evidence to suggest that the number of fetal movements decrease as pregnancy advances or during the onset of labour[15].

At this current time, the most vigorously tested definition of DFM comes from Moore et al who recommend "less than 10 movements within 2 hours when the fetus is active"[55]. This is also the currently recommended alarm limit adopted by the American Academy of Paediatrics and the American College of Obstetricians and Gynaecologists[44].

8. The role of formal fetal movement counting

Recommendation 4	Evidence level and references	Recommendation grade
a. Clinicians should emphasise the importance of maternal awareness of fetal movements at every routine antenatal visit.		**√**
b. The use of kick-charts can currently not be recommended as part of routine antenatal care.	I [56]	**B**

The recent Cochrane review[56] of four reasonably good quality randomised trials involving a total of 71,370 women, assessed the effect of formal fetal movement counting on perinatal death, major morbidity, maternal anxiety and satisfaction, pregnancy intervention and other adverse pregnancy outcomes. Two of the included studies[57, 58] compared different fetal movement counting methods, and measured their acceptability. One study compared fetal movement counting with biochemical assessment. The fourth and largest study was the cluster-randomised trial by Grant *et al*[59] comparing formal fetal movement counting (using the Cardiff method) versus no instruction to monitor fetal movements. The control group did include selective use of counting based on clinician preference. The review authors concluded that there was not enough evidence to recommend or not recommend formal fetal movement counting for all women or for women at increased risk of adverse pregnancy outcomes.

The large trial by Grant et al[59] contributing largely to the Cochrane Review findings, however deserves closer review. This multicentre cluster randomised controlled trial was conducted to investigate the role of fetal movement counting in 68,654 women of at least 28 weeks gestation. When compared to women receiving standard antenatal

care (including an informal inquiry about fetal movements during antenatal clinic visits), this study found no significant reduction in the stillbirth rates in women undertaking daily fetal movement counting using a "kick-chart". There was however a trend towards more antenatal admissions in the fetal movement counting group than in the control group. Further, there was an increased use of other fetal testing methods, with more women having cardiotocography in the fetal movement counting group than in the group where movement counting was selective.

Although the trial was subject to some methodological bias due to the use of "within hospital" clusters, the overall stillbirth rate of the intervention and the control group combined fell during the study period from 4 per 1000 to 2.8 per 1000 births. It is postulated that this may be attributed to increased maternal awareness and vigilance of DFM[13, 59]. There was some evidence of an indirect benefit of fetal movement counting as some of the deaths in the fetal movement counting group occurred as a result of poor management following presentation with a live baby[56, 59].

A reduction in stillbirth rates has been associated with increased awareness of DFM in a recent quality improvement study in Norway[1, 15]. The study used a prospective "before- and-after" study design to evaluate the combined impact of providing women with information on DFM, and clinicians with clinical practice guidelines on DFM. This combined intervention was associated with a reduction in stillbirth rates, giving an adjusted odds ratio (OR) of 0.67 (95% CI: 0.49-0.94) in the overall study population and an adjusted OR of 0.51 (95% CI: 0.32-0.81) in women with DFM.

A recent literature review[60] of interventions to reduce stillbirth recommended routine fetal movement counting for high risk pregnancies only, especially where there is evidence of FGR. However, this recommendation is limited due to the studies upon which it is based. Limitations of two studies[61, 62] include the methodology used (non-randomised studies), the small numbers enrolled and changes in the population and in practice which may have occurred since these studies were undertaken; both conducted in the late 1980's.

A concern about the introduction of formal fetal movement counting as a part of routine antenatal care relates to its potential to result in an increase in the number of antenatal hospital visits, interventions and costs without additional benefit. In addition, in line with the trend of increased interventions shown in the Grant trial[59], a review of three case controlled studies reported that the proportion of women requesting an antenatal visit based on complaints about DFM increased from 6.7 to 8.8%[13]. Monitoring of fetal movements in that population increased the number of antenatal visits in pregnancy by 2-3 per 100 pregnancies.

As opposed to formal fetal movement counting, one study[1] reported that provision of uniform information on fetal movements was associated with a reduced risk of being examined in hospital and was not associated with increased maternal concern and anxiety.

9. Which investigations should be undertaken for DFM?

9.1 Fetal heart rate monitoring

Recommendation 5	**Evidence level and references**	**Recommendation grade**
a. When a woman presents with DFM, assessment of the woman and her fetus should be undertaken as soon as possible.	III-3 1, 15, 17, 52	**B**
b. This assessment should preferably be undertaken within 2 hours if fetal movements are absent and within 12 hours if they are reported as decreased.	15	***√***
Recommendation 6		
a. Women who report DFM should be assessed for the presence of other risk factors associated with an increased risk of stillbirth (i.e. fetal growth restriction, hypertension, diabetes, advanced maternal age etc).	III-3 13	**C**
b. Women with DFM, in combination with other risk factors, should be managed as a high-risk pregnancy.		***√***
Recommendation 7		
Clinical assessment of a woman with DFM should always include review of fetal growth as noted by symphysis-fundal height measurements in the pregnancy record.		***√***

Recommendation 8		
a. A CTG should be performed to exclude fetal compromise.	III-3 [15, 17, 74]	**C**
b. Further evaluation is recommended for women with any abnormal CTG pattern.		***√***

The first step in the management of DFM is to ensure the fetus is alive and not in eminent danger of death. Once death is excluded, any coincidental associated pathology should also be excluded as a possible cause for DFM.

A handheld Doppler can in immediately confirm the presence of a fetal heart beat. In doubtful cases, a cardiotocography (CTG) may be required to detect a fetal heart beat and to establish the fetal heart rate (FHR) pattern. In both situations a fetal heart beat needs to be differentiated from the maternal heart beat. This is easily done, in most cases, by noting the difference between the FHR and the maternal pulse rate. If the presence of a fetal heart beat is not confirmed, or still in doubt, then an immediate ultrasound scan assessment of fetal cardiac activity must be undertaken.

Once fetal death is excluded, a CTG is used to assess fetal compromise in most health care settings in Australia. The interpretation of the CTG fetal heart rate pattern is assisted by the RANZCOG classification of fetal heart rate patterns[63]. The presence of a normal FHR pattern (i.e. showing accelerations in fetal heart rate coinciding with fetal movements and the absence of decelerations) is a positive indicator of fetal wellbeing and suggests a normally functioning autonomic nervous system[64]. The fetal heart rate (FHR) accelerates with 92-97% of all gross body movements felt by the mother[65, 66]. Other FHR patterns may or may not be associated with fetal compromise. For example, a "flat" FHR pattern showing reduced variability (<5bpm) may be present during the sleep cycle of a healthy fetus but is likely to be associated with fetal compromise if it lasts for >90 minutes[67-69].

Although CTG has become part of clinical practice, the Cochrane review[70], comprising 4 trials and 1588 women, did not confirm or refute any benefits for routine CTG monitoring of "at risk" pregnancies. However, the authors acknowledge several limitations of this review, including the small numbers of women studied, other methodological concerns, and also the fact that these trials were conducted in the early 1980s when these tests were just being introduced into clinical practice.

Recent non-randomised studies show some distinct benefits of screening low and at risk pregnancies using CTG monitoring in the presence of DFM. For example, in a Norwegian study of 3014 women who presented with DFM, a CTG was performed in 97.5% of cases and an abnormality was detected in 3.2%[71]. In an observational study of women presenting with DFM who had an initial CTG and an ultrasound scan, 21% had an abnormality initially that required action and 4.4% were admitted for immediate delivery[17]. Another study showed that stillbirth rates (corrected for lethal congenital anomalies), after a normal and abnormal CTG, were 1.9 and 26 per 1000 births, respectively[72]. Although the evidence on the effectiveness of CTG monitoring in the identification of "at-risk" babies is inconclusive, the use of CTG as a screening tool can be justified as an abnormal FHR pattern may be associated with poor outcomes[73].

9.2 Ultrasound scans for DFM

Recommendation 9	**Evidence level and reference**	**Recommendation grade**
Ultrasound scan assessment for fetal biometry and amniotic fluid volume should be considered as part of the preliminary investigation of a woman presenting with DFM where maternal perception of DFM persists despite a normal CTG or in the circumstance of suspected fetal growth restriction.	III-3 13, 15, 17, 38, 71, 74	**B**
Recommendation 10		
Ultrasound scan assessment should include assessment of fetal morphology if this has not already been performed.	III-2 15	**C**
Recommendation 11		
Where, in the presence of DFM, an ultrasound scan assessment is indicated, this should be performed within 24 hours.		***√***

Although evidence is currently lacking to recommend ultrasound assessment for all cases of women presenting with DFM, ultrasonography may be used for the detection of conditions that contribute to DFM. A meta-analysis of three trials, including 1893 women with at risk pregnancies provided with "kick-charts", illustrated a strong association between fetal growth restriction and DFM (OR 6.34 95% CI 4.19-9.58)[13]. In a prospective cohort of 3014 women with DFM[71] detection of an abnormality (FGR, reduced amniotic fluid volume or fetal abnormality) was reported in 11.6% on

ultrasound. The CTG in this study was abnormal in only 3.2% of cases and an abnormal umbilical artery Doppler was noted in 1.9%.

In a Norwegian study[15], an investigation protocol of CTG and ultrasound scan was used in the management of women with DFM. The study recommended that both investigations should be performed within 2 hours if women reported no fetal movements and within 12 hours if they reported decreased fetal movements. In this study, the ultrasound scan was conducted to assess amniotic fluid volume, fetal growth and fetal anatomy. The addition of Doppler studies in the investigation protocol did not show any further benefit. Although the number of ultrasound scans more than doubled (OR 2.64, 95% CI 2.02-3.45), this appeared to be compensated with a reduction in additional follow-up consultations and admissions for induction of labour[15]. The study reported no increase in the number of preterm births, infants requiring transfer to neonatal care, or infants with severe neonatal depression or fetal growth restriction. Importantly, a significant reduction in perinatal mortality was shown (OR 0.51, 95%CI 0.32-0.81).

Another study of 489 women with DFM[74] demonstrated that women with DFM, but no other pregnancy risk factor, did not require further follow-up once the CTG and the amniotic fluid volume were confirmed normal. An ultrasound scan was performed to assess amniotic fluid volume in women with DFM and revealed a 3.7 times greater likelihood of a diminished amniotic fluid volume compared to women without DFM.

9.3 Fetomaternal haemorrhage and DFM

Recommendation 12	**Evidence level and reference**	**Recommendation grade**
Testing for fetomaternal haemorrhage should be considered in the preliminary investigation of women with DFM where a CTG abnormality is detected, in the presence of an ultrasound scan showing a normally grown fetus.	[79]	**√**

Massive fetal to maternal haemorrhage (varying from >50mls to >150mls) has been demonstrated in approximately 4% of stillbirths and in 0.04% of neonatal deaths[75, 76]. Clinical risk factors do not reliably predict the likelihood of massive fetal to maternal haemorrhage (FMH)[76] and DFM may be the only history suggesting this possibility[75, 77-79]. A sinusoidal FHR pattern is the classic CTG sign indicating severe fetal anaemia[75], however this is not present in all cases. It is possible that the only "suspicious" CTG signs may be reduced or absent variability[80].

10. Ongoing maternal concern about DFM

Recommendation 13	Evidence level and reference	Recommendation grade
Where, after further discussion and in the presence of a normal clinical assessment (including a CTG and ultrasound), maternal concern remains about DFM, further management should be individualised.	81	***√***

Following exclusion of fetal compromise at an initial episode of DFM, maternal concern about DFM may still remain or may result in subsequent consultations for DFM. To date, there are no studies to guide the management of women who have ongoing concern about DFM and very little data exists on outcomes for this group of women. Yet, a recent small retrospective study, involving 203 women, showed that women with more than one presentation of DFM were at increased risk of poor pregnancy outcomes[81].

While research is limited, and with the additional anxiety caused for women and the potential for increased risk, closer surveillance of women with ongoing concerns of DFM would seem appropriate. These management strategies need to take into account the presence of other risk factors and gestation. Early delivery is an option which may be considered. However, a decision to deliver needs to be weighed against the risks to the mother and baby at that particular gestation[5].

11. Discussion and implication for further research

Leading international authorities have recommended that women experiencing DFM should notify their healthcare providers. However, beyond this recommendation there is limited guidance for clinicians on how to manage this presentation, resulting in much variation amongst clinicians with regards to appropriate clinical management of these women. While further research is needed[56], this guideline was developed to promote clinical practice which is based on the best available evidence, thereby improving information and counselling offered to women during the antenatal period and reducing variation in clinical practice in Australia and New Zealand.

The recommendations of this guideline cover 2 key areas: 1) information for pregnant women about what constitutes normal fetal movements and advice about when concerns of a reduction in movements should be reported to a health care provider; and 2) information for clinicians with regards to the management and investigation of women with DFM. In the absence of robust research in this area the thirteen key

recommendations were largely based on consensus after careful consideration of the available evidence.

Improving the consistency and standard of information provided to pregnant women on fetal movements and on the significance of reporting decreased fetal movements is likely to reduce anxiety associated with DFM and, more importantly, may lead to timely intervention and a reduction in late fetal deaths. The findings of the Norwegian study[15] are encouraging in their demonstration of a reduction in the stillbirth rate by one third following the implementation of a guideline and the provision of information about fetal movements to pregnant women.

The working party emphasises the importance of well-designed studies in order to develop and test appropriate screening tools which identify “at-risk” pregnancies on the basis of fetal movement. Further high quality randomised controlled trials are needed to determine appropriate intervention strategies for women with DFM. Other outcomes which should be examined in future trials include maternal anxiety and morbidity, healthcare utilisation and costs. Trials should be adequately powered to examine the effect on perinatal mortality and major neonatal morbidity. Support for such research has been indicated by a recent survey of Obstetricians and Gynaecologists in Australia and New Zealand[2].

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Appendix 1: Methods for guideline development

As the Australian and New Zealand arm of the international Fetal Movement Intervention and Assessment (FEMINA) collaboration, this clinical practice guideline was developed by a working party of clinicians and health service researchers, and co-ordinated by the Mater Mothers' Research Centre (MMRC), Mater Health Services, South Brisbane.

A literature review was undertaken based on questions identified by members of the working party. Relevant papers were identified and classified according to level of evidence. Recommendations were prepared with strength of recommendation grading and were presented to the working party for consensus. Following comment and necessary amendments, a final consultation draft of the guideline was circulated (see *Stake-holder consultation*).

The working party adopted the procedures recommended by the NHMRC for developing this guideline. These procedures comprised:

- Reviewing the scope of the guideline for clinical relevance, to identifying questions, target groups and health outcomes relevant to the guideline;
- Assessing existing guidelines;
- Conducting a systematic graded review of the literature, to identify and evaluate the evidence relating to the effectiveness and appropriateness of the recommended interventions;
- Subjecting the draft guideline to wider stake-holder consultation;
- Refining the guideline and related materials to make them user friendly to the target users.

Further the following recommended steps will be undertaken in collaboration with ANZSA:

- Disseminating and implementing the guideline;
- Monitor, evaluate and maintain the guideline
- Identifying gaps in current information for the ongoing refinement of the guideline.

Literature search and synthesis of the evidence

Questions raised by the working party:

The following questions were raised by the working party and formed the basis of the search strategy,

- What is the definition of DFM?
- Within what time frame should a women report concerns of DFM?
- What is the role of formal fetal movement monitoring in reducing adverse pregnancy outcome?
- Which investigations should be conducted when a woman presents with DFM?
- What follow-up care should be provided to women who report DFM?

Search strategy

A literature search was undertaken of major guideline websites (see below) and electronic databases: Medine OVID, CINAHL, Cochrane Library databases and Maternity and Infant Care.

The search of electronic databases was limited to the English language, and searches were undertaken using the following terms:

Medline OVID

((“fetal Movement” OR “foetal movement”).sh,ab,ti. OR ("fetal motility" or "foetal motility").sh.ab,ti. OR ("fetal activity" or "foetal activity").sh,ab,ti. OR ("fetal hypomotility" or "foetal hypomotility").sh,ab,ti. OR ("fetal hypoactivity" or "foetal hypoactivity").ab,ti. OR (fetal adj2 movement).ab,ti. OR (foetal adj2 movement).ab,ti.))

Cochrane Library

(fetal OR foetal) near/3 (movement* OR activity OR motility OR hypomotility OR hypoactivity).ti,ab.
MeSH descriptor Fetal Movement explode all trees

CINAHL

"Fetal Movement” (CINAHL heading) OR ("fetal movement*" OR "foetal movement*" OR "fetal activity" OR "foetal activity" OR "fetal hypoactivity"

OR "foetal hypoactivity" OR "fetal hypomotility" OR "foetal hypomotility" OR "fetal motility" OR "foetal motility").ab,ti

Maternity and infant care

"fetal movement".de OR ("fetal movement$" OR "foetal movement$" OR "fetal activity" OR "foetal activity" OR "fetal hypoactivity" OR "foetal hypoactivity" OR "fetal hypomotility" OR "foetal hypomotility" OR "fetal motility" OR "foetal motility").ab,ti

Relevant references provided in bibliographies from various articles were searched manually, as were any references recommended in personal communications with experts in the field.

The relevant existing guidelines were searched using the following Internet site*:*

Site	Web Address
National Guideline Clearinghouse	http://www.guideline.gov/

Level of evidence & grading of recommendations

The relevant papers were identified and classified according to level of evidence. Evidence based recommendations were prepared and graded on the strength of the evidence. This classification of the evidence and grading of the recommendations was based, as stated below, on criteria advocated by the National Health and Medical Research Committee[4].

Levels of Evidence

Level I Evidence obtained from a systematic review of all relevant randomised controlled trials.

Level II Evidence obtained from at least one properly designed randomised controlled trial.

Level III-1 Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).

Level III-2 Evidence obtained from comparative studies with concurrent controls and allocation not randomised (cohort studies), case control studies, or interrupted time series with a control group.

Level III-3 Evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group.

Level IV Evidence obtained from case series, either post-test or pre-test and post-test.

Grading of recommendations[82]

Grade of recommendation	Description
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
√	Body of evidence is weak and recommendation is based on consensus for good clinical practice

Body of Evidence Matrix [82]

Component	A	B	C	D
	Excellent	**Good**	**Satisfactory**	**Poor**
Evidence base [1]	several level I or II studies with low risk of bias	one or two level II studies with low risk of bias or a SR/ multiple level III studies with low risk of bias	level III studies with low risk of bias, or level I or II studies with moderate risk of bias	level IV studies, or level I to III studies with high risk of bias
Consistency [2]	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 [3]	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 Australian healthcare context with few caveats	probably applicable to Australian healthcare context with some caveats	not applicable to Australian healthcare context

[1] Level of evidence determined from the NHMRC evidence hierarchy; [2] If there is only one study, rank this component as 'not applicable'; [3] For example, results in adults that are clinically sensible to apply to children OR psychosocial outcomes for one cancer that may be applicable to patients with another cancer.

Stake-holder consultation

The recommendations were then presented to the working party for comment and consensus. Following necessary amendments, consultation was undertaken including the following organisations and individuals:

1. Members of the FEMINA Collaboration
2. Representatives of hospitals participating in the ANZ arm of the FEMINA Collaboration within Queensland
3. Australian and New Zealand Stillbirth Alliance Research Committee and Clinical Practice and Education Committees;
4. Perinatal Society of Australia and New Zealand
5. Royal Australasian College of Obstetrics and Gynaecology
6. Australian College of Midwives
7. New Zealand College of Midwives
8. SIDS and Kids
9. Stillbirth Foundation Australia
10. SANDS Australia
11. Bonnie Babes Foundation Inc.

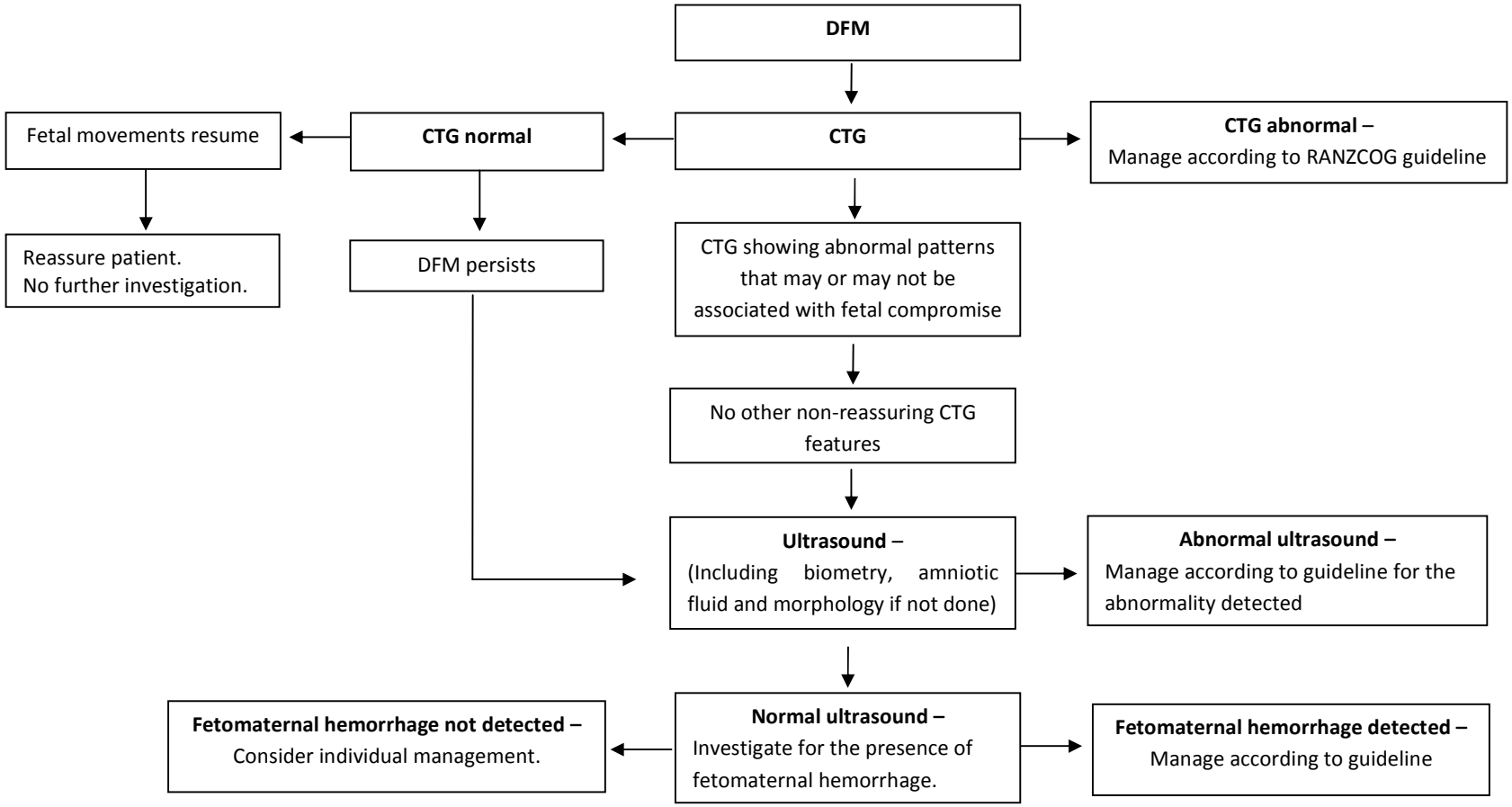

Figure 1. Flow chart for the management of DFM