# Decreased fetal movement: Diagnosis, evaluation, and management

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## INTRODUCTION

Maternal perception of fetal movement is reassuring for pregnant patients, while decreased fetal movement (DFM) is a common reason for concern. Fetal movement can be assessed using various methods of fetal kick counting, but this form of fetal surveillance has not achieved widespread acceptance. This is, in part, because optimal methods of diagnosis, evaluation, and management of DFM have not been determined.

This topic will review normal fetal movement and provide the author's approach to diagnosis, evaluation, and management of DFM. Other methods of fetal surveillance are discussed separately. (See "Overview of antepartum fetal assessment".)

## NORMAL FETAL MOVEMENT

Sonographically, fetal activity can be noted as early as 7 to 8 weeks of gestation [1]. Maternal perception of fetal movement typically begins in the second trimester at around 16 to 20 weeks of gestation and occurs earlier in parous patients than nulliparous patients [2]. The mother's first perception of fetal movement, termed "quickening," is often described as a gentle flutter [3].

In the second and third trimesters, sonography reveals a wide range of movements of the fetal trunk (eg, bending, startle, hiccup, breathing, rotation), limbs (eg, stretch, hand to face, opening and closing of hands), and face and head (eg, head rotation, suck, yawn, tongue protrusion). When sonographically detected movements were correlated with maternal

perception, approximately 50 percent of isolated limb movements were perceived by the mother, whereas 80 percent of movements involving both the trunk and limb were perceived, in one study [1]. In a literature review, mothers perceived 33 to 88 percent of sonographically visualized fetal movements [4].

Fetal movement varies somewhat depending on the time of day and gestational age. Frequency increases from morning to night, with peak activity late at night [5]. Although some studies report a decrease in strength or frequency near term, the strength and frequency in normal pregnancies are probably constant throughout the third trimester, and many patients report an increase in the last two weeks before delivery [6,7]. The discordant observations are likely due to counting during fetal quiet cycles, which become longer with advancing gestation, or inclusion of high-risk pregnancies.

## PREVALENCE OF DECREASED FETAL MOVEMENT

At least 40 percent of pregnant patients become concerned about DFM one or more times during pregnancy, but most episodes are transient [8]. Four to 15 percent of pregnant patients will contact their care provider because of persistent DFM in the third trimester [9-12].

## PATHOPHYSIOLOGY

A normal quantity and quality of fetal movement and other types of fetal biophysical activity (breathing movements, tone) virtually ensures functional integrity of fetal regulatory systems. When these regulatory systems are subjected to mild hypoxemia, DFM is believed to represent a compensatory fetal behavioral response, analogous to the compensatory physiological response of redistribution of blood flow to essential organs. As hypoxemia becomes more severe and prolonged, compensatory responses may fail to protect the fetus, eventually leading to organ damage or death.

## SIGNIFICANCE

Maternal perception of DFM has traditionally been considered a marker for pregnancies at increased risk of fetal death and other adverse outcomes.

- In a prospective, population-based registry of 2313 patients with third trimester singleton pregnancies with DFM who presented to health care facilities in Norway, many of these fetuses were dead at presentation, and mortality among those who

presented with a live fetus was higher than that of the general obstetric population: 8.2/1000 births versus 2.9/1000 births [9].

- In a case control study from England in which perception of fetal movement two weeks prior to the stillbirth was evaluated in 291 cases of stillbirth and 733 gestationally matched controls, DFM was associated with an increased risk of stillbirth (adjusted odds ratio [aOR] 4.51, 95% CI 2.38-8.55), whereas increasing strength of fetal movements was associated with a decreased risk of stillbirth (aOR 0.14, 95% CI 0.08-0.24) [13]. Daily fetal hiccups were also associated with a reduced risk of stillbirth (aOR 0.31, 95% CI 0.17-0.56). Although these findings were subject to recall bias, the authors also asked study subjects about their perception of uterine contractions and found no difference between cases and controls. The most common disorder associated with stillbirth in this study was fetal growth restriction, which was associated with 45.2 percent of cases.

- In other studies, up to 23 percent of cases of third trimester DFM have been associated with adverse outcomes, including impaired fetal growth, preterm birth, early term birth (≥37 weeks but <39 weeks), neonatal depression, and emergency delivery [14-16]. Fetal growth restriction appeared to be a major factor contributing to the increased risk of adverse outcome in pregnancies with DFM [16-19].

It has been hypothesized that recognition of DFM may provide an opportunity for identifying fetuses that may be compromised and could benefit from intervention, usually delivery, and thereby prevent possible progression to fetal/neonatal injury or death. However, the only large randomized trial did not support a clear benefit of increasing patients' awareness of the need for prompt reporting of DFM and evaluating and managing pregnancies with DFM with a standard protocol. (See 'Efficacy' below.)

## DIAGNOSIS OF DECREASED FETAL MOVEMENT

**Our approach —** Although there is no consensus for the diagnosis of DFM, we consider qualitative (subjective) maternal perception of a reduction of fetal movement diagnostic. Therefore:

- We give all pregnant patients verbal and written information on normal fetal movements across gestation and normal wake/sleep cycles.

- At each clinical visit, we emphasize the importance of maternal awareness of fetal movements.

- We counsel patients that they should contact their health care provider immediately if they perceive DFM from baseline.

The best diagnostic criteria are controversial because the level of fetal movement that reliably distinguishes a healthy fetus from a fetus at increased risk of adverse outcome has not been determined [20]. Furthermore, there is no evidence that any quantitative alarm limit is more effective than qualitative maternal perception of DFM for identifying fetuses at risk of adverse outcome. This is due to wide biologic variation in normal fetal movement among healthy fetuses, as well as the wide variation in maternal perception of fetal activity.

Our approach reflects the clinical practice guideline for the management of patients who report DFM developed by Mater Research, The Stillbirth Foundation, the Perinatal Society of Australia and New Zealand, and the International Stillbirth Alliance [21,22]. It is intended for management of patients with singleton pregnancies in the third trimester and has been slightly modified for clarity.

**Other approaches** — Kick counts are a quantitative alternative to our qualitative approach to assessment of fetal activity. The minimum number of maternally perceived fetal movements consistent with fetal well-being has been termed the "alarm limit." Various methods for defining an alarm limit have been proposed; the following are four examples of thresholds for reassurance of fetal well-being [6,23-29]:

- Perception of least 10 fetal movements (FMs) over up to two hours when the mother is at rest and focused on counting ("count to 10" method).
- Perception of at least 10 FMs during 12 hours of normal maternal activity.
- Perception of at least 4 FMs in one hour when the mother is at rest and focused on counting.
- Perception of at least 10 FMs within 25 minutes in pregnancies 22 to 36 weeks and 35 minutes in pregnancies 37 or more weeks of gestation.

The "count to 10" method is the only alarm limit derived from a population-based study and subsequently evaluated as a screening test in the same population [23]. In this study, the mean time interval to detect 10 FMs was 20.9 +/- 18.1 minutes. Failure to meet the 10 FM threshold within two hours prompted intervention, leading to a threefold increase in intervention for DFM and a reduction in fetal mortality among patients with DFM (from 44 per 1000 to 10 per 1000). This method has a high compliance and acceptance rate among patients because it is easy to perform, convenient, and does not take much time [30]; it is also clinically practical. However, a prospective cohort study of "time to count 10 fetal movements" in a Norwegian population did not demonstrate significant differences in the meantime to count 10 FMs between pregnancies with suboptimal outcomes and those with normal outcomes, indicating more research is needed on the optimum method for assessing DFM [29]. Stillbirth parent advocates have developed an easy to use "APP" to help expectant

patients be mindful of fetal movement "Count the Kicks" (Kicks Count), for patients who like to use their phone, this provides reminders to expectant mothers and encourages patients to contact their provider if she has concerns about the fetal well-being and DFM.

## DIFFERENTIAL DIAGNOSIS

Transient decreases in fetal activity can be due to fetal sleep states, maternal medications that cross the placenta (eg, sedatives), or maternal smoking. Fetal sleep is a common and benign cause of DFM. Sleep cycles may last up to 40 minutes [31]. In a study that observed late preterm fetuses from uncomplicated pregnancies for 100 minutes, quiet sleep (no eye movements, no somatic movements except for the occasional startle, and a fetal heart rate pattern with little baseline variability) occurred at least once in 30 percent of fetuses, but 96 percent of the fetuses cycled between quiet sleep and active states during the period of observation [32].

Poor maternal perception of fetal activity is another reason for maternal report of DFM. It may be due to early gestational age, decreased/increased amniotic fluid volume, maternal position (sitting or standing versus lying), fetal position (anterior position of the fetal spine), anterior placenta, maternal physical activity, or the mother just being mentally distracted [2,4,9,33,34]. Although obesity has been reported to decrease maternal perception of fetal activity, a systematic review found that increased maternal body size was not associated with altered perception of fetal movement, but was associated with increased presentation for DFM [35]. However, the evidence was very low quality.

In a study of fetal movements before confirmation of fetal death, some patients interpreted contractions as fetal movement [36].

Because these entities cannot be differentiated from pathologic causes of DFM without further evaluation, a sudden decrease in fetal movement should be evaluated as a potential marker of fetal compromise [37].

## EVALUATION

Randomized trials have not compared approaches for the evaluation and management of patients with DFM. Clinical approaches described in observational studies include: physical examination, nonstress or contraction stress tests, ultrasound examination (biophysical profile [BPP]), umbilical artery Doppler, testing for fetomaternal hemorrhage (eg, Kleihauer-Betke test or flow cytometry), and amnioscopy [11,38]. The wide range of diagnostic approaches reflects efforts to detect acute and chronic fetal hypoxemia and other fetal pathologies (eg, infection, neuromuscular disease, severe anemia) associated with DFM.

Our approach reflects the clinical practice guideline for the management of patients who report DFM developed by Mater Research, The Stillbirth Foundation, the Perinatal Society of Australia and New Zealand, and the International Stillbirth Alliance [21,22]. The following synopsis is discussed in detail below.

- Patients with DFM should be evaluated as soon as possible, preferably within two hours.
- The evaluation should include assessment of maternal, obstetric, and fetal risk factors for stillbirth. The goal of the evaluation is to rule out imminent risk factors for stillbirth and to try to determine the cause of DFM, such as fetal growth restriction with decreasing placental function. A plan of care is formulated based on the results of the evaluation.
- Clinical assessment of a patient with DFM should include review of symphysis fundal height measurements and a nonstress test (NST) should be performed to exclude immediate fetal compromise. In the absence of a fetal heart rate tracing warranting emergency delivery, an ultrasound examination for fetal biometry and amniotic fluid volume should be obtained, ideally within 24 hours. Fetal morphology is assessed if not recently performed. Testing for fetal to maternal bleeding should be considered in selected cases.
- If the clinical assessment (including NST and ultrasound) is normal and maternal concern of DFM persists, further management is individualized.

**Initial evaluation** — We suggest the following basic initial evaluation. All patients who present with the complaint of DFM should be evaluated by an obstetric provider.

- **Check fetal heart rate** – Fetal viability should be determined by documenting the fetal heart rate (usually done with a hand-held Doppler device [eg, Doptone]). After fetal demise, the mother may attribute passive intrauterine motion or intestinal activity to fetal movement.
- **Review prenatal record** – The prenatal record should be reviewed for maternal medical or obstetric conditions and characteristics that place the fetus at increased risk of adverse outcome.
- **Perform a NST** – A nonstress test (NST) is performed and provides immediate information about fetal well-being. In a series of 2313 patients with DFM in a Norwegian database, the NST was nonreactive or showed other nonreassuring patterns in 4 percent [9,11]. (See "Nonstress test and contraction stress test".)

**Additional testing**

**Ultrasound examination** — If the NST is reactive, we believe that ultrasound examination is a valuable additional tool for assessment of pregnancies complicated by persistent DFM, and is reassuring for mothers [39]. Ultrasound examination is performed within 24 hours to reassess fetal well-being unless the patient reports that the fetus is active and "back to normal" after a reactive nonstress test. Ultrasound examination should include a biophysical profile (ie, assessment of fetal activity, breathing, tone, and amniotic fluid volume), as well as fetal growth and anatomic survey if not recently performed [40]. Growth restriction has been associated with a decrease in the number, quality, strength, and duration of fetal movements and repeated episodes of DFM at term [41,42]. This is not surprising since the fetus depends on the placenta for both oxygen and nutrients, thus chronic placental insufficiency can affect both fetal oxygenation and fetal growth.

In Norwegian series, patients randomly assigned to perform fetal movement counting had higher detection of fetal growth restriction than patients who received usual care (20 of 23 fetuses [87.0 percent] versus 12 of 20 fetuses [60.0 percent], respectively; relative risk 1.5, 95% CI 1.0-2.1) [43]. Ultrasound examination detected an abnormality (eg, fetal growth restriction, oligohydramnios, polyhydramnios, congenital anomaly, low biophysical profile score) in 12.6 percent of all consultations for DFM [9,11] and the population of pregnancies affected by DFM had birth weight percentiles skewed downwards at all gestational ages.

**Doppler velocimetry** — Doppler velocimetry is restricted to pregnancies in which fetal growth restriction has been identified on ultrasound examination, as no benefit has been demonstrated with routine examination of all pregnancies with DFM [44]. In a series from Norway, Doppler demonstrated a pathologic pattern in 1 percent of the 1151 cases evaluated at hospitals that performed Doppler on most patients [9]. Most of these abnormalities were associated with growth restricted fetuses. When small for gestational age infants (birth weight less than the 10th percentile) and cases with nonreactive NSTs or abnormal ultrasound examination were excluded, Doppler velocimetry was abnormal in only 1 of 940 cases.

**Testing for fetomaternal bleeding** — We suggest performing a maternal assay (Kleihauer-Betke stain or flow cytometry) to detect fetomaternal hemorrhage as part of the evaluation of the pregnant patient who presents with **both** DFM and signs of fetal anemia, such as a sinusoidal fetal heart rate pattern or fetal hydrops on ultrasound examination associated with elevated middle cerebral artery (MCA) peak systolic velocity (PSV) on Doppler (MCA-PSV ≥1.5 multiples of the median [MoMs] is strongly suggestive of fetal anemia). Evaluation and management of these pregnancies is discussed separately. (See "Spontaneous massive fetomaternal hemorrhage".)

A large fetomaternal hemorrhage (FMH) is estimated to occur in 0.3 percent of pregnancies and is a significant contributor to stillbirth [45]. Although testing for FMH in all cases of DFM

has been suggested, DFM due to a large FMH is rare. One review described 134 cases of large FMH (>50 mL) of which 78 were detected antepartum and 21 survived [46]. Thirty-three patients had DFM as their only symptom. Fetal movement was absent in 17 cases for a period ranging from 24 hours to 7 days. In this group, six infants survived, five were stillborn, and five died in the neonatal period. However, the number of mothers who experienced DFM in this series was not well-documented. Subsequent case reports of severe and spontaneously occurring FMH detected antenatally included 13 cases that presented with DFM and one that did not [47-53].

## PREGNANCY MANAGEMENT

Findings at the initial evaluation guide our approach to subsequent management, which is based on data from observational studies of pregnancies with DFM and pregnancies with medical or obstetric complications associated with a high risk of adverse outcome. No data from randomized trials are available to guide practice recommendations for management of DFM [54].

- **Nonreactive nonstress test, low biophysical profile score, fetal growth restriction** – These abnormal findings are managed according to usual clinical standards. (See "Nonstress test and contraction stress test" and "Biophysical profile test for antepartum fetal assessment" and "Fetal growth restriction: Pregnancy management and outcome", section on 'Prenatal care'.)

- **Return of normal fetal activity and normal evaluation** – Patients who experience a brief period of DFM followed by resumption of normal fetal activity during fetal evaluation and a normal evaluation can resume routine prenatal care. They are instructed to continue to monitor fetal movement and call their provider if they perceive recurrent persistent DFM. In addition, we suggest a follow-up phone call to the patient to inquire if she has ongoing concerns about fetal movement.

- **Persistent DFM and normal fetal evaluation** – No studies have evaluated the optimal frequency and method of follow-up of pregnancies complicated by persistent DFM in which the antepartum evaluations discussed above are normal. Our approach depends on whether the pregnancy has reached term and whether additional maternal or fetal risk factors for adverse outcome are present. In view of the high number of adverse outcomes despite normal findings observed in Norwegian studies of DFM [9,12] and the fact that reassurance from antenatal testing is time limited, we believe repeated evaluation or delivery is important in managing pregnancies with persistent DFM and an initially normal evaluation (including objective observation of fetal activity equivalent to a biophysical profile score ≥8).

- For patients ≥39 weeks of gestation, we recommend delivery. In low-risk nulliparous patients, there are no substantial benefits, but potential harms, of expectant management beyond 39 weeks [55]. Patients with DFM are high risk and even more likely to benefit as they have a higher risk of cesarean birth due to fetal heart rate abnormalities [56].

- For patients <37 weeks of gestation, we recommend nonstress testing and ultrasound examination twice weekly and instruct patients to call their provider if they perceive a further decrease or absence of fetal movement.

- For patients ≥37 weeks and <39 weeks, we discuss the increasing risk of sudden unexplained intrauterine death after 37 weeks of gestation [57], the diminishing hazard of induction at this gestational age, and the possibility that delivery may be beneficial. Counseling patients about monitoring fetal activity is problematic if they have poor perception of fetal movement. We discuss the advantages and disadvantages of continued antepartum evaluation, and suggest induction, especially if there are additional risk factors for adverse outcome. This is a shared decision; if after counselling, the patient chooses expectant management, then we perform twice weekly testing until 39 weeks and recommend delivery at that time. There are no randomized trials demonstrating the efficacy and hazards of this approach.

## EFFICACY

Fetal movement counting has not been proven to reduce the risk of perinatal mortality. However, we continue to counsel patients about DFM and manage them as described above. (See 'Our approach' above.)

In a 2020 meta-analysis of five randomized trials comparing pregnancy outcome in patients who received counseling about fetal movement counting versus those who did not, both groups had similar incidences of perinatal death (0.54 versus 0.59 percent, relative risk [RR] 0.92, 95% CI 0.85-1.00), as well as reports of DFM, birth weight <10$^{th}$ percentile, five-minute Apgar score <7, and neonatal intensive care unit admission [58]. The intervention resulted in slightly higher rates of preterm delivery (7.6 versus 7.1 percent, RR 1.07, 95% CI 1.05-1.10), induction (36 versus 31 percent, RR 1.15, 95% CI 1.09-1.22), and cesarean birth (28 versus 25 percent, RR 1.11, 95% CI 1.10-1.12).

It is difficult to explain the lack of reduction in adverse outcome. One possibility is that DFM is commonly reported by patients with healthy fetuses and fetal death is rare; therefore, the positive predictive value is extremely low. Another possibility is the Hawthorne effect (ie, patients in the control group were more aware of DFM as they were in trials evaluating this

issue). It is also possible that more research is needed to determine effective management of these pregnancies.

The meta-analysis was dominated by a single cluster randomized trial (AFFIRM, n = 385,552 pregnancies) [59]. Similar trials are in progress and may help to determine whether the results from the meta-analysis were due to chance or low statistical power, given that the absolute risk of perinatal death was low and the confidence interval for the risk reduction ranged from 0 to 15 percent.

## SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Fetal surveillance".)

## SUMMARY AND RECOMMENDATIONS

- **Diagnosis –** The diagnosis of decreased fetal movement (DFM) is based on qualitative (subjective) maternal perception of a reduction of fetal movement. Patients are instructed to contact their health care provider for further evaluation if they perceive a significant and persistent reduction in fetal movement and never to wait longer than two hours if there is **absent** fetal movement. If the patient is in doubt about what constitutes DFM, we instruct her in the kick count method of assessing fetal activity and ask that she call her provider if she counts fewer than 10 kicks over two consecutive hours at times when the fetus is usually active and she is lying on her side (not supine) and focused upon counting. (See 'Diagnosis of decreased fetal movement' above.)

- **Initial evaluation –** All patients who present with the complaint of DFM should be evaluated by an obstetric provider. Our basic evaluation includes evaluation of the fetal heart rate (with a hand-held Doppler device), review of the prenatal record for risk factors for adverse pregnancy outcome, and a nonstress test. We also make a follow-up phone call to the patient to enquire if she has ongoing concerns about fetal movement. (See 'Initial evaluation' above.)

- **Additional testing**

  - We obtain an ultrasound examination within 24 hours to reassess fetal well-being unless the patient reports that the fetus is active and "back to normal" after a reactive nonstress test. Ultrasound examination should include a biophysical profile, as well as fetal growth and anatomic survey if not recently performed. (See 'Ultrasound examination' above.)

- Doppler velocimetry is restricted to pregnancies suspected of fetal growth restriction or fetal anemia. (See 'Doppler velocimetry' above.)

- Testing for fetomaternal hemorrhage is restricted to pregnancies with signs of fetal anemia (eg, sinusoidal fetal heart rate pattern, fetal hydrops on ultrasound examination associated with elevated middle cerebral artery [MCA] peak systolic velocity [PSV] on Doppler). (See 'Testing for fetomaternal bleeding' above.)

- **Management** – Management of patients with persistent DFM depends on the gestational age and the presence of other identifiable risk factors for stillbirth. The evidence from randomized trials is controversial and has not shown clear benefit from self-monitoring for DFM. Thus, management of DFM is mostly based on expert opinion. If no cause for persistent DFM is determined (see 'Pregnancy management' above):

  - For patients ≥39 weeks of gestation with DFM, we suggest delivery (**Grade 2B**). In low-risk nulliparous patients, there are no substantial benefits, but potential harms, of expectant management beyond 39 weeks. Patients with DFM are high risk and even more likely to benefit as they have a higher risk of cesarean birth due to fetal heart rate abnormalities.

  - For patients <37 weeks of gestation with DFM, we suggest nonstress testing and ultrasound examination twice weekly and instruct patients to call their provider if they perceive a further decrease or absence of fetal movement (**Grade 2C**).

  - For patients ≥37 weeks and <39 weeks with DFM, we suggest induction (**Grade 2C**). We discuss the increasing risk of sudden unexplained intrauterine death after 37 weeks of gestation, the diminishing hazard of induction at this gestational age, and the possibility that delivery may be beneficial. This is a shared decision; if after counselling, the patient chooses expectant management, then we perform twice weekly fetal testing until 39 0/7 weeks and suggest delivery at that time.



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## Contributor Disclosures

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