MATERNAL911

Preterm Labor

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Course Description:

When neonates enter the world prematurely, it is a long road to recovery. Preterm labor is certainly a factor for prematurity at birth. The Maternal 911 Preterm Labor course will help review and gain knowledge for the participant. This will help to prevent and resolve preterm labor and thus birth. The goal is a term birth allowing better success for the newborn. The recognition and management of preterm labor may have a huge impact in this arena of prematurity.

Approximate Time to Complete: 40 minutes

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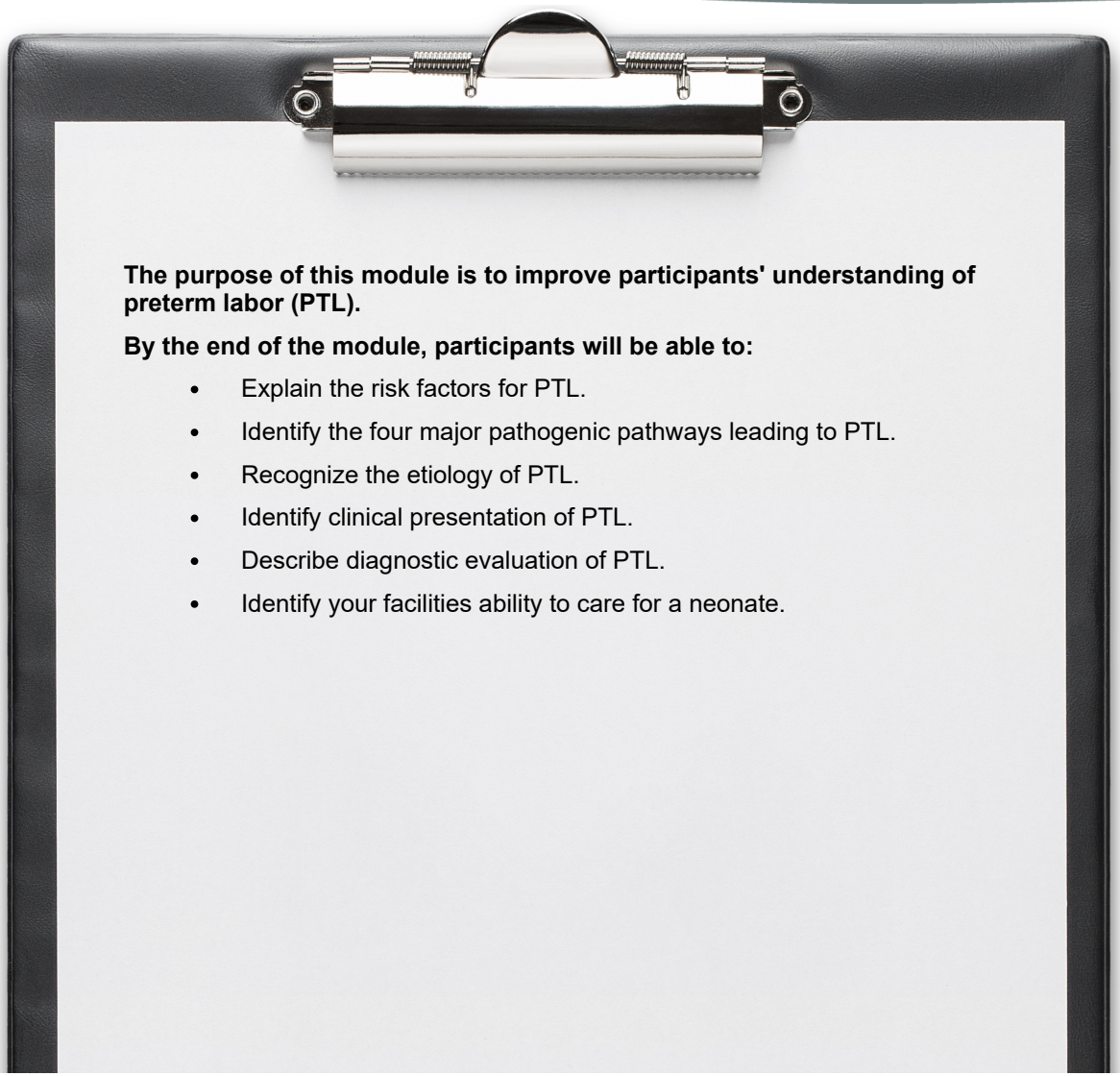

The purpose of this module is to improve participants' understanding of preterm labor (PTL).

By the end of the module, participants will be able to:

- Explain the risk factors for PTL.
- Identify the four major pathogenic pathways leading to PTL.
- Recognize the etiology of PTL.
- Identify clinical presentation of PTL.
- Describe diagnostic evaluation of PTL.
- Identify your facilities ability to care for a neonate.

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Preterm labor likely results from:

local changes that prematurely stimulate the cascade of events resulting in spontaneous labor or premature withdraw of suppressive factors that maintain uterine quiescence and thus inhibit this cascade.

A woman's likelihood of preterm delivery has contributing factors involving multiple genetic, environmental and immunological factors.

- Causal factors between genetic susceptibility and environmental stimuli must also play a role.

Defining early and late preterm births:

- early preterm birth is from 24 weeks 0 days to 33 weeks 6 days
- late preterm birth is from 34 weeks 0 days to 36 weeks 6 days

Definition

Preterm labor occurs due to four major pathogenic pathways:

- **Intrauterine infection**
- **Decidual hemorrhage**
- **Excessive uterine stretch**
- **Maternal or fetal stress**

Pathogenic Pathways

RISK FACTORS

- Risk factors are abundant for PTL and delivery (Table: **Risk Factors for Preterm Birth**).
- Research is showing the root cause of PTL may be from dysfunctional immunological defense within the tissue of the uterus, suggesting these risk factors are markers for these immune issues [1].
- Some risk factors are reversible, others are permanent.
- Ideally, identifying the risk factor for preterm birth (PTB) before conception or early in pregnancy could lead to interventions to help prevent PTB.

RISK FACTORS

However, this goal has been elusive for several reasons:

- It has been difficult to prove causality with many risk factors.
- The chain of cause for PTB is further complicated by obstetrical complications resulting in PTB requiring cofactors to exert the effect.
- Numerous PTBs occur among women without any risk factors at all.
- There is not an adequate animal model to study PTB.

True labor has similar clinical findings, contractions with cervical change, whether at term or preterm.

There are early non-specific signs and symptoms of labor which may be present for several hours in women not exhibiting cervical change:

- Menstrual-like cramping
- Mild, irregular contractions
- Low back ache
- Vaginal pressure
- Mucus discharge from the vagina such as mucus plug or bloody show, which may be:
- Pink
- Clear
- Slightly bloody

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CONCERNS

Click each blue tab to learn more.

CONCERNS

- Challenges to distinguish true labor from false labor exist.
- The sine qua non of labor are uterine contractions, but mild irregular contractions are a normal finding in all pregnancy stages.
- This adds to the challenge.

True labor is more likely when the following combine:

- Increased frequency of contractions
- Increased intensity of contractions
- Increased duration of contractions

However, these can occur transiently, especially at night and with increasing gestational age.

CONCERNS

Many researchers have tried unsuccessfully to identify a threshold contraction frequency that effectively identifies women whom progress to true labor.

Of all the women presenting < 34 weeks gestation with explicit contraction criteria for preterm labor, only 13 percent deliver within one week [2].

CONCERNS

Physical exam changes preceding or accompanying true labor include cervical:

- Dilation
- Effacement
- Softening
- Movement to more anterior position

During pregnancy, the first clinical manifestation of a short or dilated cervix may be triggered by subclinical inflammation [3].

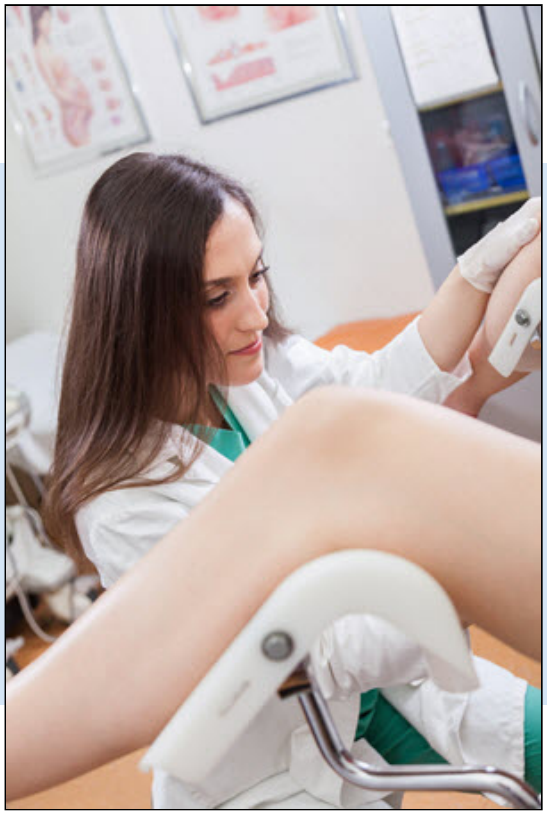
CONCERNS

Distinguishing cervical ripening from true labor involves the rate of cervical change:

- True labor cervical changes occur over minutes to hours
- Cervical ripening cervical change occurs over days to weeks

The initial evaluation of women with suspected PTL includes:

- Review the patients past and present:
- Obstetrical history
- Medical history
- Assessment of gestational age
- Evaluation of signs and symptoms of preterm labor and risk factors for PTB (Table: **Risk Factors Preterm Labor**).
- Maternal vital signs (temperature, blood pressure, heart rate, respiratory rate).
- Review of the fetal heart rate pattern.
- Assessment of contraction frequency, duration, and intensity.
- Examination of the uterus to assess firmness, tenderness, fetal size, and fetal position.
- Speculum examination using a wet non-lubricated speculum.
- Lubricants may interfere with tests on vaginal samples.



The goals of the initial examination are to:

- Determine cervical dilation because when > 3 cm, this supports preterm labor as a diagnosis.
- Assess the presence and amount of uterine bleeding.
- Bleeding from abruptio placenta or placenta previa can trigger PTL.
- Evaluate for intact or ruptured membranes by standard methods.
- Preterm premature rupture of membranes (PPROM) often precedes or occurs during PTL.
- Diagnosis and management of PPROM are reviewed separately.

Obtain a cervicovaginal fluid specimen in case fetal fibronectin (fFN) testing is desired.

If a speculum is not available a blind collection can be performed.

- There are different methods to obtain specimens:
- Depress the posterior vaginal wall with an unlubricated, gloved finger then pass the polyester swab slowly along the finger towards the posterior fornix until resistance is felt [4]
- Hold the labia apart, then pass the swab blindly into the vagina, directing slowly towards the posterior fornix until resistance is met [5]
- The swab is rotated in the posterior fornix for 10 seconds.
- In both methods, it is important to stop at the first sign of resistance to avoid rupturing exposed membranes, if present.

If fFN Testing is Desired

Cervical Examination

Cervical evaluation should only occur once the following have been excluded by the necessary means (i.e. ultrasound, history, physical exam, labs, etc.):

- Placenta previa
- Rupture of membranes

Once these have been ruled out, the cervix may be evaluated by digital exam for dilation and effacement.

The cervical evaluation should occur sooner if the information is urgently needed to provide care for the patient such as abnormal fetal heart rate or suspicion of advanced phase during active labor and when placenta previa is unlikely.

Again, when cervical dilation is > 3 cm, this supports PTL.

At this point, the inhibition of acute PTL is less likely to be successful as the cervix dilates beyond 3 cm.

Click the image to learn more.

Cervical Examination

During the second trimester, cervical assessment should include cervical dilation, cervical effacement, but also important to distinguish between patients whose membranes have hour-glassed or or prolapsed through mildly dilated cervix and those who are in active labor with advanced cervical dilation and effacement. Hour-glassed or prolapsed membranes indicate an incompetent cervix.

Women having risk factors for cervical insufficiency or incompetence may be assessed in the second trimester with transvaginal ultrasound.

Laboratory Evaluation

Ordering the following laboratory tests may be considered:

- Vaginal-rectal group B streptococcal culture if not done within the previous five weeks.
- Antibiotic prophylaxis depends on the results.
- Urine culture, since asymptomatic bacteriuria is associated with an increased risk of preterm labor and birth.
- Drug testing in patients with risk factors for substance abuse. There is an association between cocaine use and placental abruption.
- Fetal fibronectin (fFN) in women <34 weeks of gestation with cervical dilation <3 cm and cervical length 20 to 30 mm on transvaginal ultrasound examination.
- If not already performed, consider testing for sexually transmitted infections (STI), gonorrhea and chlamydia.

FETAL FIBRONECTIN

Fetal fibronectin (fFN) is an extracellular matrix protein present at the decidual-chorionic interface.

Disruption of the decidual-chorionic interface due to subclinical infection, inflammation, abruption, or uterine contraction leads to the release of fFN into the cervico-vaginal secretions. This is the basis for fFN as a marker for predicting spontaneous preterm birth [6].

A + fFN test in women with intact membranes, cervical dilation < 3cm, and no gross vaginal bleeding correlates with an increased risk of PTB within seven days.

A + fFN concentration correlates to 50 ng/mL or higher in cervico-vaginal fluid between 22 0/7 weeks and 34 6/7 weeks gestation.

Click the left and right arrows to see more.

FETAL FIBRONECTIN

fFN can be utilized to distinguish women in true preterm labor from those with false labor.

Improved neonatal outcomes may occur when accurate identification of women in true preterm labor are provided interventions:

- Antenatal corticosteroid therapy
- Group B streptococcal infection prophylaxis
- Magnesium sulfate for neuroprotection
- If needed, transfer to a facility with an appropriate level nursery

fFN testing may help to avoid unnecessary intervention and associated costs for 20-50 percent who will go on to delivery at term without tocolysis [7].

Women with a negative fFN have reduced hospitalization and evidence shown from randomized trials suggest fFN testing results in modest cost benefit for these reasons [8].

Click the left and right arrows to see more.

FETAL FIBRONECTIN

Five randomized trials and 15 diagnostic test accuracy studies in a 2013 systematic review of women with signs and symptoms of preterm labor having evaluation by cervicovaginal fFN for predicting preterm birth reported the following pooled estimates [8]:

Gestation	Sensitivity	Specificity
Delivery within 7-10 days	76.7	82.7
Delivery <34 weeks	69.1	84.4
Delivery <37 weeks	60.8	82.3

Click the left and right arrows to see more.

FETAL FIBRONECTIN

Positive and negative predictive values depend on the prevalence of preterm birth in the population.

A systematic review in which prevalence of PTB within seven days of fFN sampling varied from 2-30 percent among the included studies, the overall pretest probability of delivery within seven days of fFN testing was 7.7 percent, and based on positive or negative fFN results, the post-test probability were repectively 25.9 and 2.4 percent [9].

Click the left and right arrows to see more.

FETAL FIBRONECTIN

False positive fFN results can occur due to [10-12]:

- Ejaculate from coitus within the previous 24 hours
- A grossly bloody specimen
- Digital cervical examination

Transvaginal ultrasound is unlikely to cause a false positive result with a study of 310 women with a negative baseline fFN test had a second negative fFN test post ultrasound coordinating in 92% [13].

Substances placed vaginally may also interfere with the fFN assay [14]:

- Lubricants
- Medications
- Douching

Click the left and right arrows to see more.

FETAL FIBRONECTIN

Qualitative tests involve the threshold of 50 ng/mL and when compared to quantitative control of fFN the predictive value is improved [15-17].

In the United States, however, the instruments are not available for quantitative measures of fFN.

Click the next button to continue the course.

Based upon clinical criteria, the diagnosis of preterm labor arrives from regular painful uterine contractions along with cervical change:

- Dilation

and/or

- Effacement

Diagnosis of PTL certainly occurs when there is ruptured membranes [18].

The clinical findings of early labor are poorly predictive of the diagnosis, thus over diagnosing is common until labor is well established.

Click here to learn more.

In research settings the specific clinical criteria are selected to include:

- Persistent uterine contractions with four every 20 minutes or eight every 60 minutes

AND

- Documented cervical change

OR

- Cervical effacement 80 percent or greater

OR

- Cervical dilation greater then 2 cm.

Women who do not meet the criteria are often ultimately diagnosed with false labor and continue to a late preterm (34w 0d to 36w 6d) or term delivery, thus these criteria were chosen [19].

≥34 Weeks of Gestation

≥34 weeks of gestation

The threshold at which perinatal morbidity and mortality are too low to justify the potential maternal and fetal complications is the 34th week of gestation.

Costs associated with inhibition of preterm labor only result in short term delay of delivery at and beyond this 34th week.

Another concern is with antenatal steroids; the steroids are not typically administered after the 34th week of gestation because of the low risk of severe respiratory morbidity.

There are circumstances where antenatal steroid may be indicated beyond 34 weeks. This discussion is beyond the scope of the Maternal 911 program.

- However, recent data indicates betamethasone decreases newborn respiratory morbidity when given to women in the late preterm period between 34 0/7weeks and 36 6/7 weeks [33].

Click here to learn more.

The diagnosis of preterm labor is supported in a woman less than 34 weeks gestation with uterine contractions and cervical dilation ≥ 3cm.

- Diagnostic accuracy is not gained with addition of other studies such as fFN or ultrasonic measurement of cervical length.
- Preterm labor treatment is initiated.

The diagnosis of preterm labor is less clear in women with contractions, cervical dilation < 3 cm and intact membranes.

<34 Weeks of Gestation

<34 Weeks Gestation Ultrasound

- Measurement of cervical length is useful for supporting or excluding the diagnosis of preterm labor when the diagnosis is unclear.
- A short cervix before 32 weeks of gestation is predictive of preterm birth in all populations.

Click each button to learn more.

<34 Weeks Gestation Ultrasound

- Measurement of cervical length is useful for supporting or excluding the diagnosis of preterm labor when the diagnosis is unclear.
- A short cervix before 32 weeks of gestation is predictive of preterm birth in all populations.

Consider performing an obstetrical ultrasound examination to look for:

- Fetal, placental, and maternal structural abnormalities
- Confirm the fetal presentation
- Assess amniotic fluid volume and estimate fetal weight

Click each button to learn more.

<34 Weeks Gestation Ultrasound

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- A short cervix before 32 weeks of gestation is predictive of preterm birth in all populations.

Consider performing an obstetrical ultrasound examination to look for:

- Fetal, placental, and maternal structural abnormalities
- Confirm the fetal presentation
- Assess amniotic fluid volume and estimate fetal weight

This information can be useful for counseling the patient about the potential causes and outcomes of preterm birth and determining the best route of delivery, if required.

If the cervical length is...

<20 mm | **20-30 mm** | **>30 mm**

Cervical length <20 mm

- Symptomatic women with cervical length < 20 mm are at high risk (> 25 percent) of delivery within seven days
- The addition of fFN testing does not significantly improve the predictive value of cervical length measurement alone [26-28,31,32].
- To reduce morbidity associated with preterm birth, beginning interventions is reasonable without the fFN testing result.

Click each button to learn more.

If the cervical length is...

<20 mm	20-30 mm	>30 mm

- Cervical length 20 to 30 mm
- Symptomatic women with cervical dilation < 30 cm and cervical length 20 to 30 mm are at increased risk of preterm birth compared with women with longer cervical lengths, but most of these women do not deliver preterm.
- Therefore, for this subgroup of women, a cervicovaginal sample for fFN testing can be sent.
- Selective testing helps reduce diagnostic uncertainty and, in turn, unnecessary intervention, by identifying the significant proportion of patients in this group who are at low (< 5 percent) risk of preterm delivery within seven days [26].
- With fFN testing being expensive, a reduction of women tested by one third is advantageous [27,28].
- When the fFN is positive, it is reasonable to initiate interventions to reduce morbidity associated with preterm birth.
- If the fFN test is negative, discharging the patient after 6 to 12 hours of observation, given its high negative predictive value (98 to 100 percent for delivery within 7 or 14 days [29]) is reasonable [7].
- Use of sonographic cervical length and fFN determinations to differentiate true labor from false labor in preterm symptomatic women are supported by the American College of Obstetricians and Gynecologists [30] and Society for Maternal Fetal Medicine [36].

Click each button to learn more.

If the cervical length is...

Symptomatic women with cervical lengths measuring > 30 mm are at low risk of delivery within seven days, less than 5 percent deliver, regardless of fFN results.

- The addition of fFN testing does not significantly improve the predictive value of cervical length measurement alone [26,27,31,32].
- In this situation where the cervical length measures >30mm, the fFN sample is not recommened to be sent to the laboratory.

After four to six hours of observing, the woman is discharged home when the cervix is without progressive dilation and effacement as long as fetel well being is confirmed such as a reactive non-stress test (NST) and exclusion of obstetrical complications has occurred:

- Abruptio placenta
- Chorioamnionitis
- Preterm rupture of membranes

The woman is instructed to follow up in one or two weeks. She needs to be instructed to call or return if she experiences additional signs or symptoms of preterm labor or other pregnancy concerns:

- Bleeding
- Rupture of membranes
- Decreased fetal activity

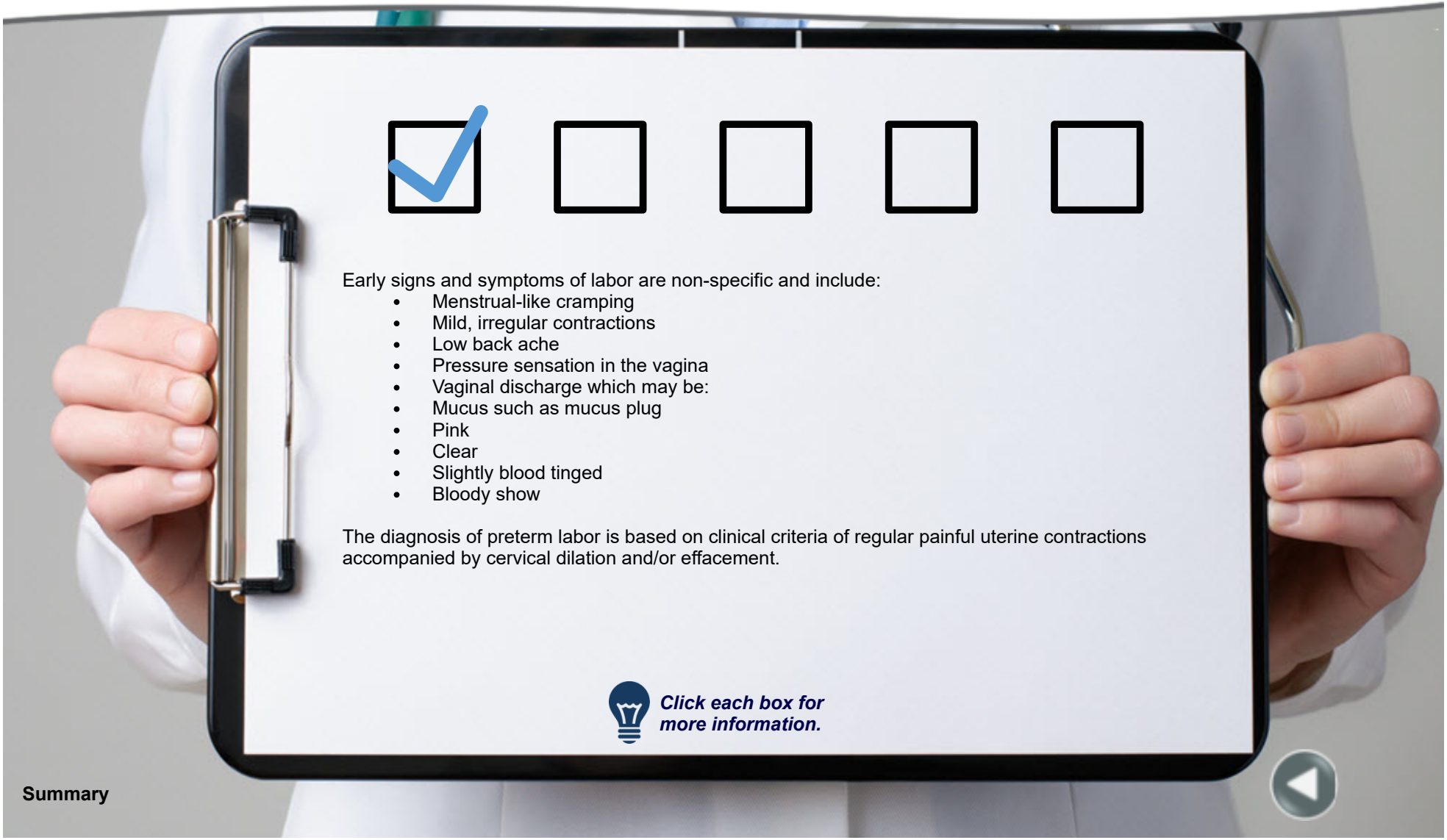
Treatment of women <34 weeks with suspected preterm labor

Hospitalization and initiation of the following treatments [33]:

- A course of antenatal corticosteroids to reduce neonatal morbidity and mortality associated with preterm birth.
- Tocolysis for 48 hours is utilized to delay delivery and allow antenatal corticosteroids given to the mother to achieve maximal effect on the fetus. Utilization of tocolysis beyond 48 hours is beyond the scope of the Maternal 911 program.
- For pregnancies between 24 and 32 weeks of gestation, magnesium sulfate, given for in-utero exposure provides neuroprotection against cerebral palsy and other types of motor dysfunction in offspring born preterm.
- Contraindications to tocolysis [33] (can either list or pop up on another screen/table
  - chorioamnionitis
  - lethal fetal anomaly
  - intrauterine fetal demise
  - nonreassuring fetal status
  - severe preeclampsia or eclampsia
  - maternal bleeding with hemodynamic instability
  - Preterm premature rupture of membranes, although tocolysis may be considered for purpose of maternal transportation, steroid administration or both.
  - Maternal contraindications to tocolysis (medication specific)
- Antibiotics for GBS chemoprophylaxis.
- Antibiotic therapy has no role in the treatment of acute preterm labor in the absence of a documented infection or GBS prophylaxis [34].
- Progesterone supplementation has no role in the treatment of acute preterm labor.

Interventions with proven efficacy for prevention of preterm birth include [35]:

- Smoking cessation.
- Progesterone supplementation in asymptomatic women with previous spontaneous preterm birth or in asymptomatic women with no history of spontaneous preterm birth but a short cervix (i.e. ≤20 mm) in the current pregnancy.
- Reduction of multiple gestation by limiting the number of embryo transfers in women undergoing assisted reproductive technology or multifetal pregnancy reduction.
- Avoidance of induction of labor (IOL) and scheduled cesarean delivery in the absence of medical indications.
- Cerclage in women with previous spontaneous preterm birth and a short cervix in current pregnancy.

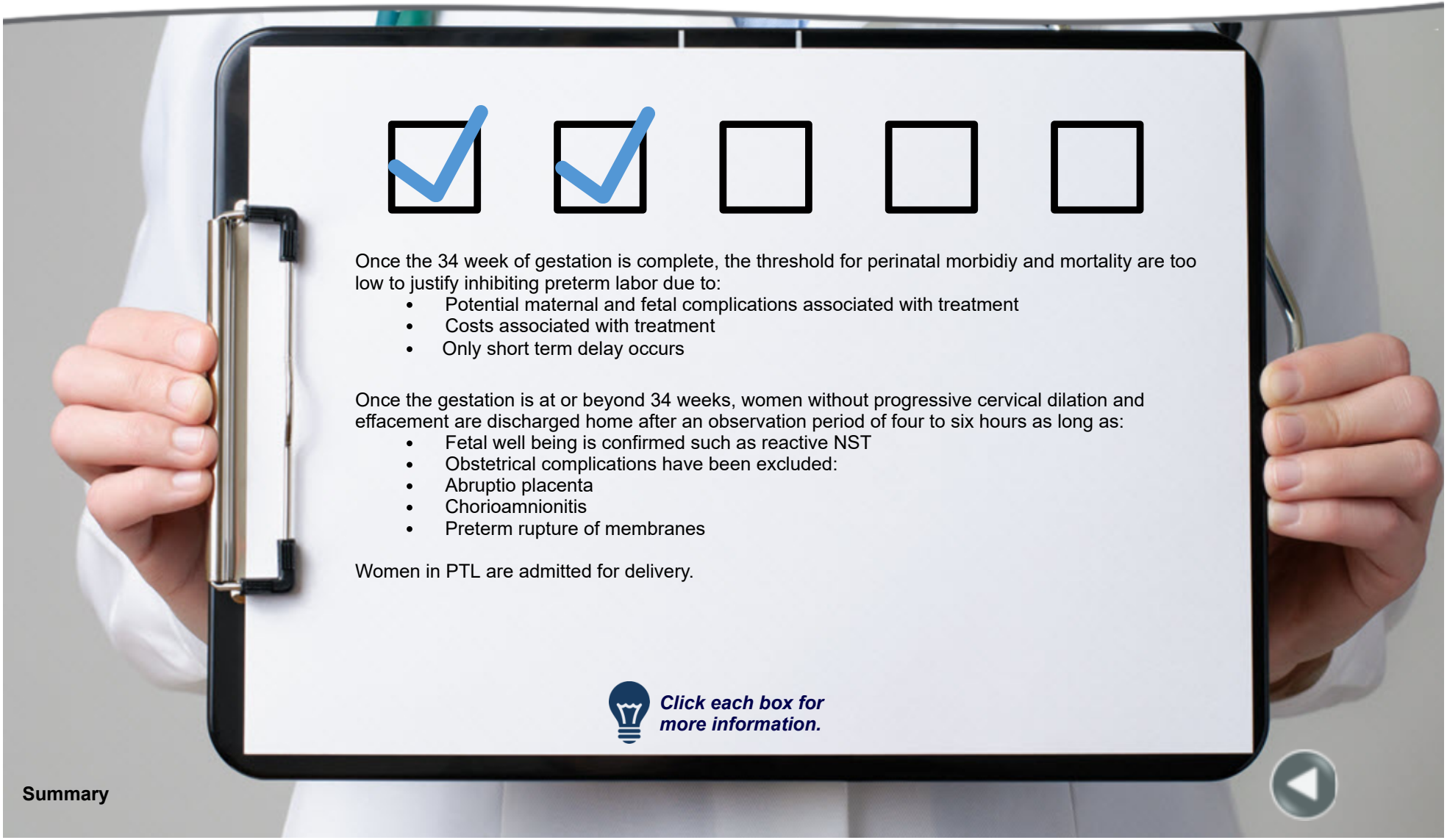


Early signs and symptoms of labor are non-specific and include:

- Menstrual-like cramping
- Mild, irregular contractions
- Low back ache
- Pressure sensation in the vagina
- Vaginal discharge which may be:
- Mucus such as mucus plug
- Pink
- Clear
- Slightly blood tinged
- Bloody show

The diagnosis of preterm labor is based on clinical criteria of regular painful uterine contractions accompanied by cervical dilation and/or effacement.

Click each box for more information.



Once the 34 week of gestation is complete, the threshold for perinatal morbidiy and mortality are too low to justify inhibiting preterm labor due to:

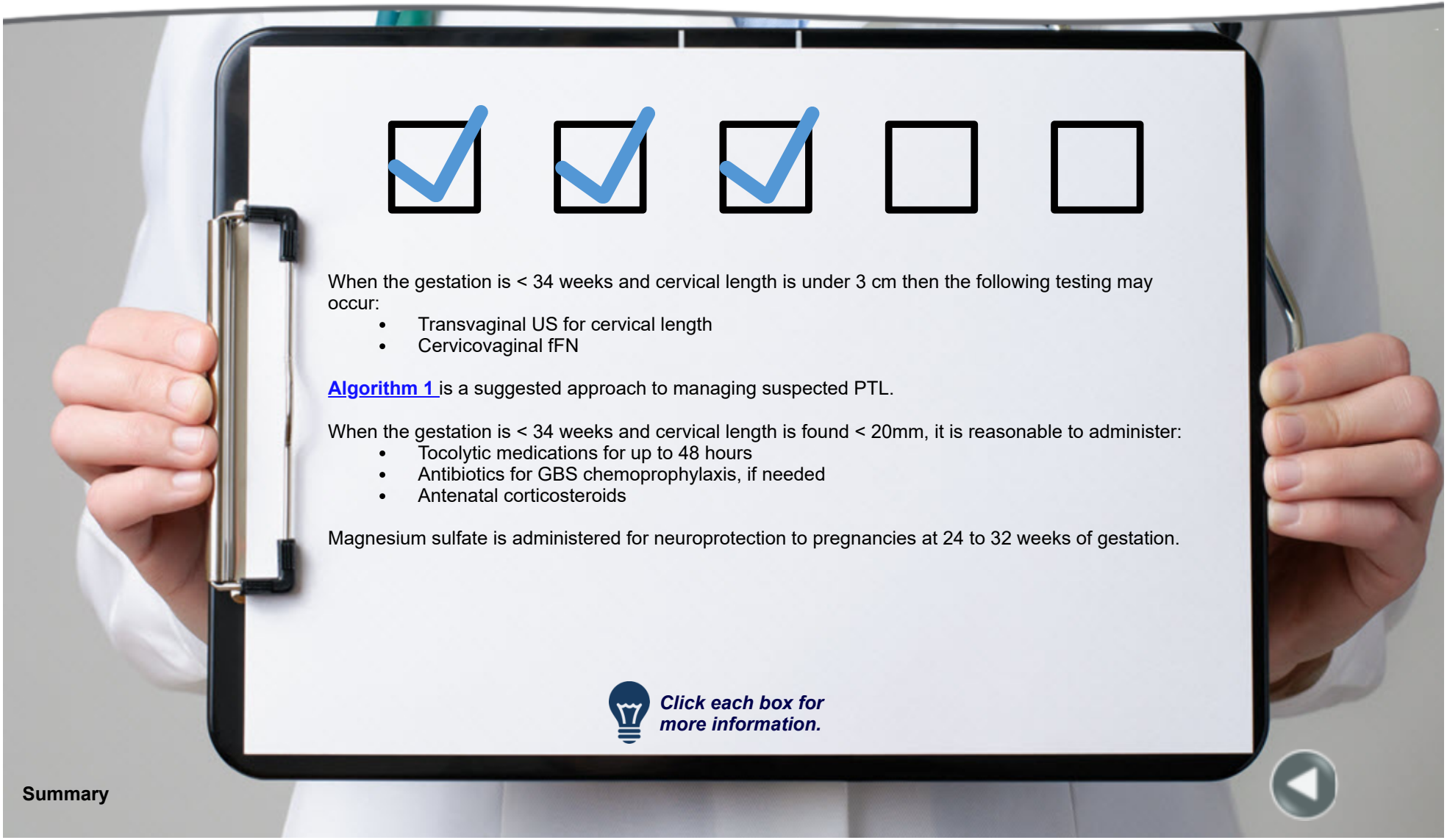
- Potential maternal and fetal complications associated with treatment
- Costs associated with treatment
- Only short term delay occurs

Once the gestation is at or beyond 34 weeks, women without progressive cervical dilation and effacement are discharged home after an observation period of four to six hours as long as:

- Fetal well being is confirmed such as reactive NST
- Obstetrical complications have been excluded:
- Abruptio placenta
- Chorioamnionitis
- Preterm rupture of membranes

Women in PTL are admitted for delivery.

Click each box for more information.



When the gestation is < 34 weeks and cervical length is under 3 cm then the following testing may occur:

- Transvaginal US for cervical length
- Cervicovaginal fFN

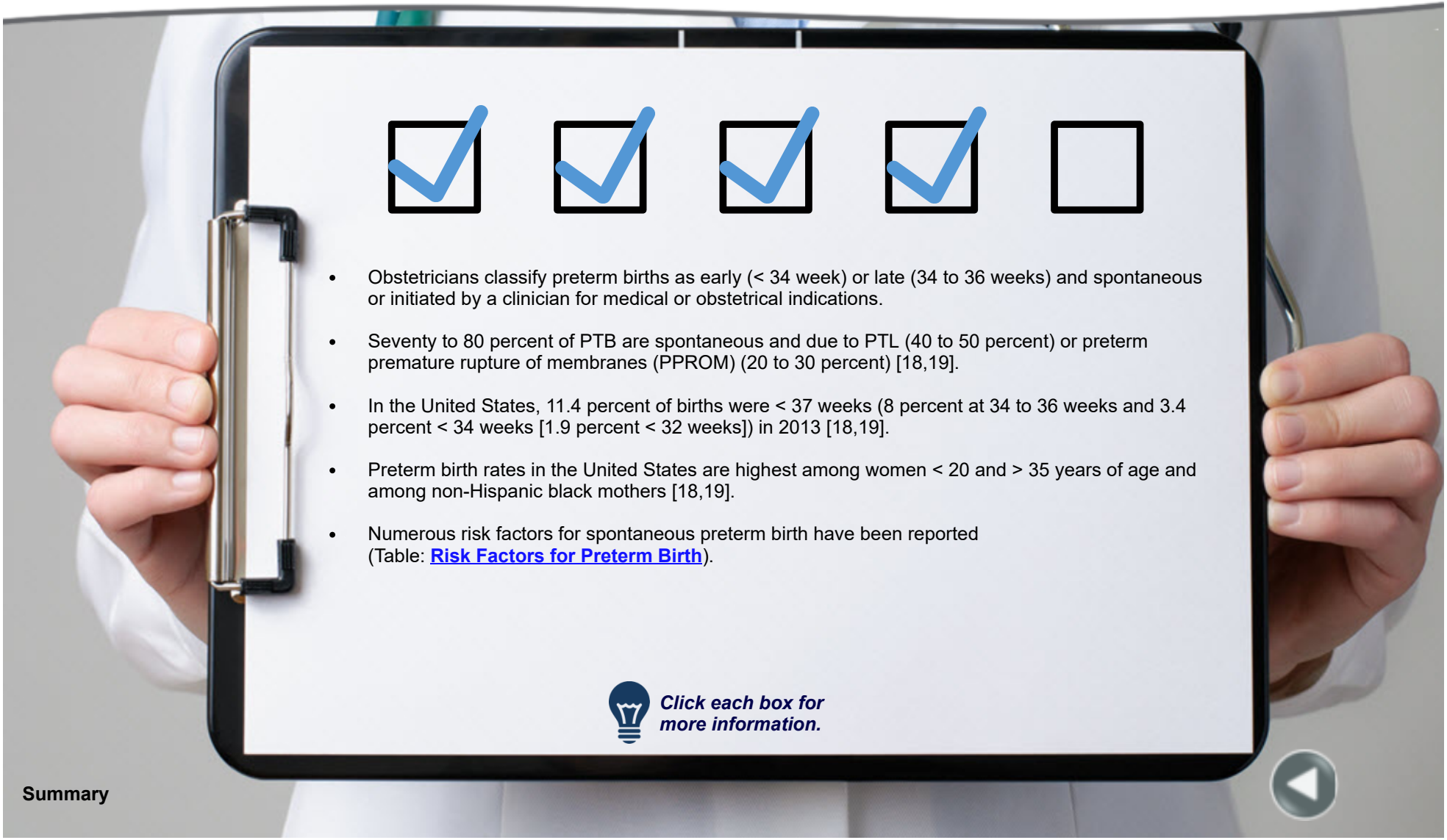
Algorithm 1 is a suggested approach to managing suspected PTL.

When the gestation is < 34 weeks and cervical length is found < 20mm, it is reasonable to administer:

- Tocolytic medications for up to 48 hours
- Antibiotics for GBS chemoprophylaxis, if needed
- Antenatal corticosteroids

Magnesium sulfate is administered for neuroprotection to pregnancies at 24 to 32 weeks of gestation.

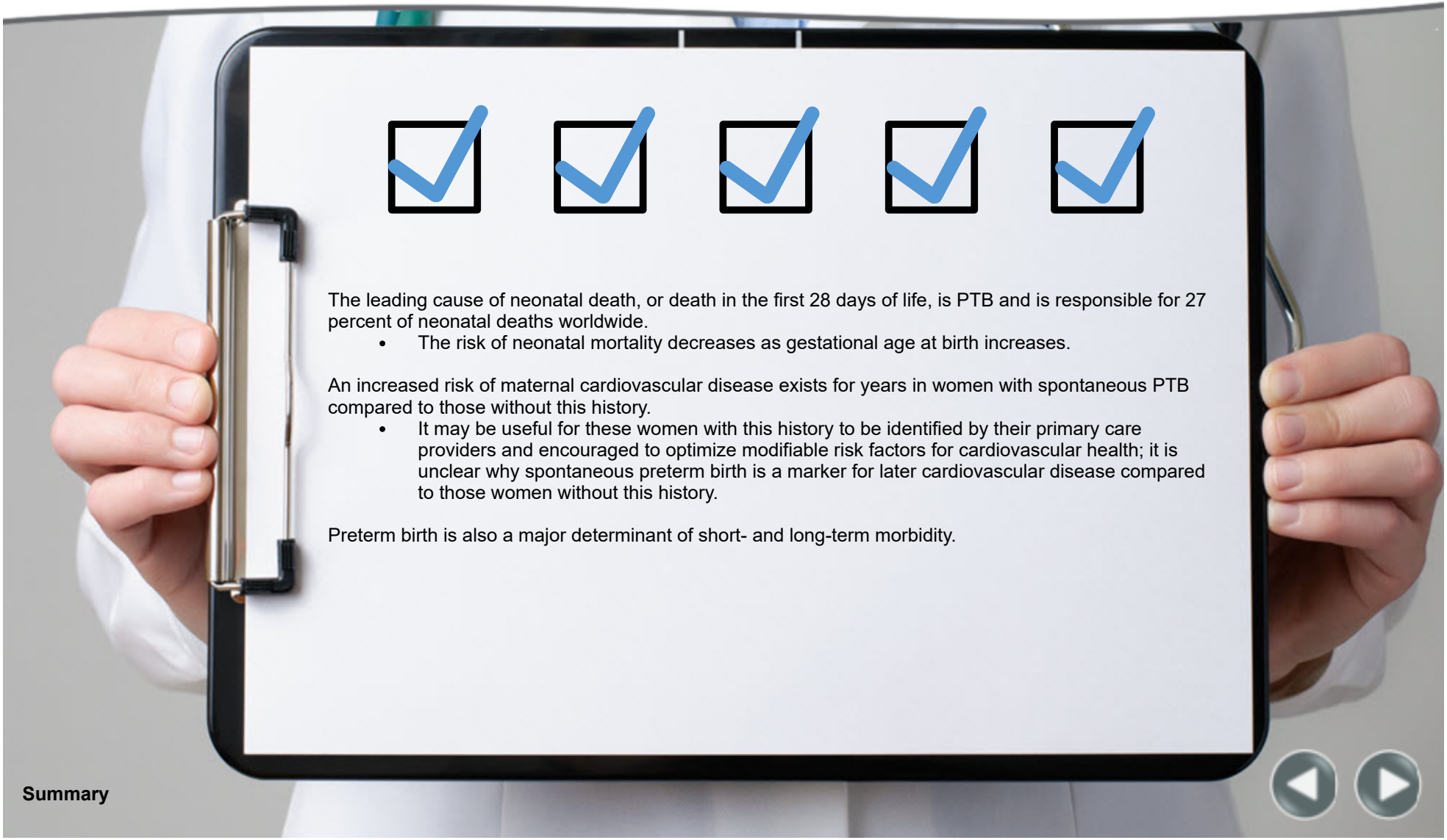
Click each box for more information.



- Obstetricians classify preterm births as early (< 34 week) or late (34 to 36 weeks) and spontaneous or initiated by a clinician for medical or obstetrical indications.
- Seventy to 80 percent of PTB are spontaneous and due to PTL (40 to 50 percent) or preterm premature rupture of membranes (PPROM) (20 to 30 percent) [18,19].
- In the United States, 11.4 percent of births were < 37 weeks (8 percent at 34 to 36 weeks and 3.4 percent < 34 weeks [1.9 percent < 32 weeks]) in 2013 [18,19].
- Preterm birth rates in the United States are highest among women < 20 and > 35 years of age and among non-Hispanic black mothers [18,19].
- Numerous risk factors for spontaneous preterm birth have been reported (Table: **Risk Factors for Preterm Birth**).

Click each box for more information.

Summary



The leading cause of neonatal death, or death in the first 28 days of life, is PTB and is responsible for 27 percent of neonatal deaths worldwide.

- The risk of neonatal mortality decreases as gestational age at birth increases.

An increased risk of maternal cardiovascular disease exists for years in women with spontaneous PTB compared to those without this history.

- It may be useful for these women with this history to be identified by their primary care providers and encouraged to optimize modifiable risk factors for cardiovascular health; it is unclear why spontaneous preterm birth is a marker for later cardiovascular disease compared to those women without this history.

Preterm birth is also a major determinant of short- and long-term morbidity.

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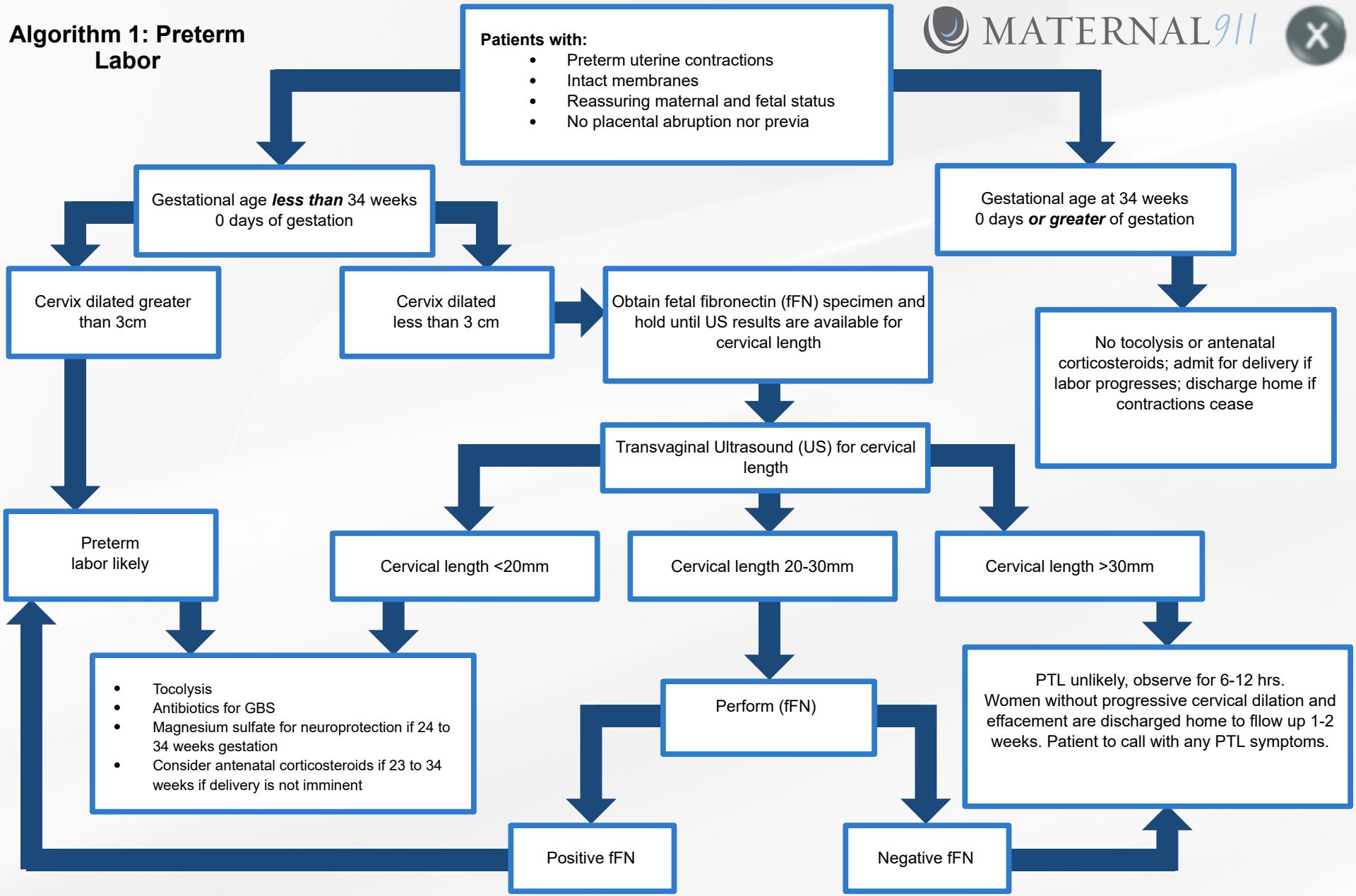
Congratulations!

You have successfully completed this module.

Click on the above 'X' to take the post-test for this course.
If you do not attain a passing score after two attempts at the post-test the entire program must be repurchased.

Algorithm 1: Preterm Labor



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Risk Factors for PTB		
No partner	Low socioeconomic status	Anxiety
Depression	Life events (divorce, death)	Occupational issues (physical exertion, use of industrial machines, mental stress)
Abdominal surgery in pregnancy	Multiple gestation	Polyhydramnios
Uterine anomaly, including DES changes of uterus and fibroids	Preterm Premature Rupture of Membranes (PPROM)	History of second trimester abortion
Systemic infection, pyelonephritis, appendicitis, pneumonia	Premature cervical dilation or effacement (short cervical length)	Transmission of Sexually Transmitted Infections (TSTI)
History of cervical surgery	Bacteriuria	Periodontal disease
Placental previa	Placental abruption	Vaginal bleeding, especially in more than one trimester
Previous preterm delivery	Substance abuse	Smoking
Maternal age (<18 or > 40)	African-American race	Poor nutrition and low body mass index
Inadequate prenatal care	Anemia (hemoglobin < 10g/dL)	Excessive uterine contractility
Low level of educational achievement	Maternal first degree family history of spontaneous PTB, especially if the woman herself was born preterm	Fetal anomaly
Fetal demise	Fetal growth restriction	Environmental factors (ie. heat, air pollution)
Positive fFN test result in vaginal secretions		

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