CHAPTER 20
INDUCTION OF LABOUR

Learning Objectives
By the end of this chapter, the participant will:

1. List appropriate indications for induction of labour.
2. Discuss a plan for the induction of labour.
3. Define a structured plan for induction based on the clinical indications of each woman.

Introduction

Induction of labour is performed frequently. The frequency in which induction is performed varies from health care facility to health care facility within regions and within countries. In Canada, induction rates are close to 20%. Done for the correct reasons and in the correct way, induction of labour is useful and benefits the woman and her fetus. If done incorrectly or inappropriately, unnecessary risks may be encountered. The goal is to support as natural a birth experience as possible.

Definitions

Induction
Induction is the initiation of contractions for the purpose of achieving a vaginal birth in a pregnant woman who is not in labour.

Augmentation
Augmentation is the enhancement of contractions in a pregnant woman who is already in labour.

Cervical ripening
Cervical ripening is the use of pharmacologic or other means to soften, efface, and/or dilate the cervix to increase the likelihood of a vaginal delivery after labour induction.

Contraindications

Any contraindication to labour
- Placenta or vasa praevia or cord presentation
- Abnormal fetal lie or presentation (transverse and footling breech)
- Prior classical or inverted T uterine incision (always ensure documentation and confirmation)
- Significant prior uterine surgery (e.g. full-thickness myometrium) (always ensure documentation and confirmation)
- Active genital herpes infection
- Pelvic structural deformities
- Invasive cervical carcinoma
- Previous uterine rupture

Indications

Induction is indicated when the risk of continuing the pregnancy for the mother or the fetus exceeds the risk associated with the induced labour and delivery. The indication must be convincing, compelling, consented to, and documented. These conditions are NOT met when the proposed indication is solely for the convenience of the physician or the woman alone.

Performance of an induction should be prioritized according to the urgency of the clinical situation and the availability of resources. The health-care team should prioritize these indications. Examples of such situations include:

Indications—urgent

- Gestational hypertension with adverse conditions
- Significant maternal disease not responding to treatment
- Significant but stable antepartum hemorrhage
- Chorioamnionitis
- Suspected fetal compromise
- Term premature rupture of membranes, with maternal group B streptococcus (GBS) colonization

Indications—other

- Diabetes mellitus (glucose control may dictate urgency)
- Alloimmune disease at term or near term
- Intrauterine growth restriction
- Prelabour rupture of membranes (PROM) at term or near term, GBS negative
- Post-term pregnancy
- Intrauterine death in a prior pregnancy
- Intrauterine fetal death
- Logistic problems (rapid labour, distance to hospital)

Indications—unacceptable

- Suspected fetal macrosomia
- Absence of fetal or maternal indicationconvenience of physician or woman

For all inductions, the woman, her family, and the health care provider involved must have a clear understanding of the potential risks and benefits involved.

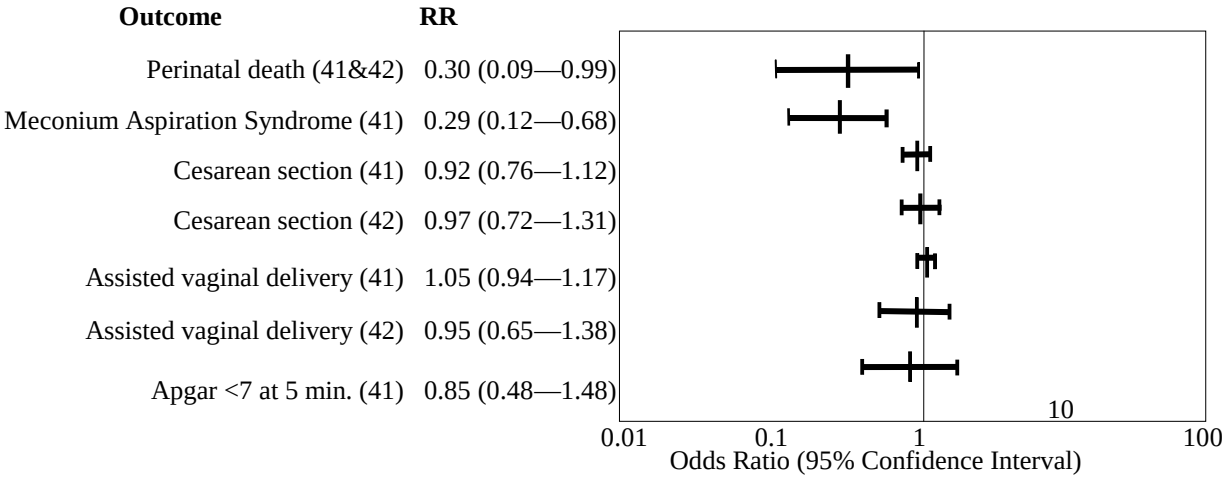
Post-Term Pregnancy

Post-term pregnancy has become one of the leading indications for induction. Post-term is defined as a gestation greater than or equal to 42 and 0/7 weeks (294 days from the first day of the last menstrual period) and occurs in about 6% of births. These pregnancies have been shown to have an associated increase in perinatal mortality, morbidity, and operative delivery.

Several trials have examined the policy of induction at 41+1 or more weeks' gestation in an attempt to avoid adverse outcomes associated with post-term pregnancy. The following meta-analysis of 19 trials (7,984 women) concluded that a "policy of labour induction at 41 completed weeks or beyond was associated with fewer (all-cause) perinatal deaths" (Gülmezoglu et al, 2006).

- The relative risk (RR) for perinatal death in the trials where induction was initiated after 41 weeks was 0.25 with 95% confidence interval (CI) of 0.05–1.18 (10 trials, 0/2835 vs. 6/2808). For trials where inductions were initiated after 42 weeks, the RR for perinatal death was 0.41, with 95% CI=0.06–2.73 (two trials, 1/151 vs. 3/145). When the 41 and 42 week trials were analyzed together, the RR reached significance at 0.30, with 95% CI=0.09– 0.99.
- In trials where induction occurred after 41 weeks, there was a reduced risk of meconium aspiration syndrome (RR=0.29; 95% CI=0.12–0.68; four trials, 1,325 women)
- There was no difference in the risk of cesarean section (10 trials at 41 weeks; n=5,755; RR=0.92; 95% CI=0.76–1.120) (five trials at 42 wks; n=810; RR=0.97; 95% CI=0.72–1.31).
- There was no difference in the risk of assisted vaginal birth or Apgar scores of <7 at 5 minutes.

Figure 1- Comparison of labour induction after 41 or 42 weeks versus expectant management



Gülmezoglu et al. Cochrane Database of Systematic Reviews 2006, Issue 4

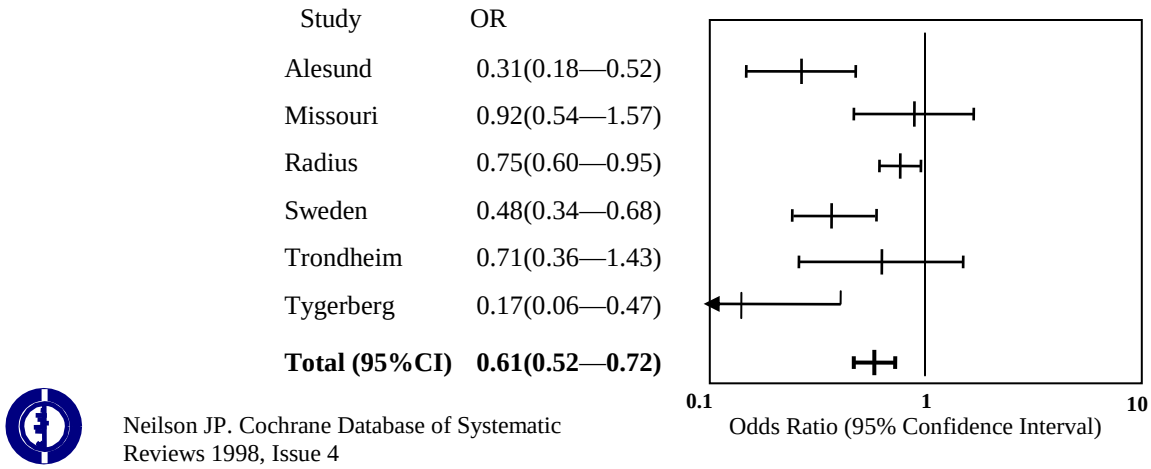
Therefore, where the resources are available, a policy of induction at 41+ or more weeks' gestation is recommended to avoid the risks associated with post-term pregnancy. If, after discussion with the woman, induction is not chosen, then twice weekly fetal surveillance is strongly recommended. As a minimum, fetal monitoring should consist of an assessment of amniotic fluid volume twice weekly. Other forms of fetal monitoring of the fetus may be added to this including fetal movement counts, biophysical profile, non-stress test.

Strategies to Reduce the Need for Induction for Post-Dates

Appropriate use of ultrasound to establish accurate due date

There is evidence to support offering ultrasound at 18 to 19 weeks' gestation to every pregnant woman, where the technology is available. Ultrasounds at this time may detect up to 50% of fetal anatomical defects, establishes gestational age, detects multiple gestations, and reliably determines placental location. An earlier ultrasound may be indicated in cases that have uncertain menstrual dates or in certain early pregnancy complications. A 1998 Cochrane review reported reduced rates of induction of labour for post-term pregnancy (odds ratio [OR] 0.61, 95% CI 0.52–0.72) with routine early pregnancy ultrasound imaging (Neilson, 1998).

Figure 2 - The effect of routine versus selective ultrasound in early pregnancy on induction for post-term pregnancy



Neilson JP. Cochrane Database of Systematic Reviews 1998, Issue 4

Sweeping (stripping) of membranes

Sweeping of membranes may promote the onset of labour by increasing local production of prostaglandins. A Cochrane meta-analysis has found that when sweeping is performed in at-term women, it is associated with a reduced duration of pregnancy and reduced frequency of pregnancy continuing beyond 41 weeks (RR=0.59; 95% CI=0.46 to 0.74**)** (Boulvain et al, 2005). Sweeping of membranes must be performed in eight women (number needed to treat = 8) to avoid one formal induction of labour. For women who are at increased risk of requiring induction, sweeping may be useful in decreasing the need of formal induction.

Discomfort during vaginal examination and other adverse effects (e.g. bleeding, irregular contractions) were more frequent in women who had the procedure performed. The reviewers concluded that when membrane sweeping is used, the subsequent reduction in the need for more formal induction methods needs to be balanced against women's discomfort and other adverse effects. One study has found that sweeping membranes at the initiation of formal induction increased the rate of spontaneous vaginal delivery, reduced the induction to delivery time and increased maternal satisfaction (Tan, 2006).

Risks of Induction

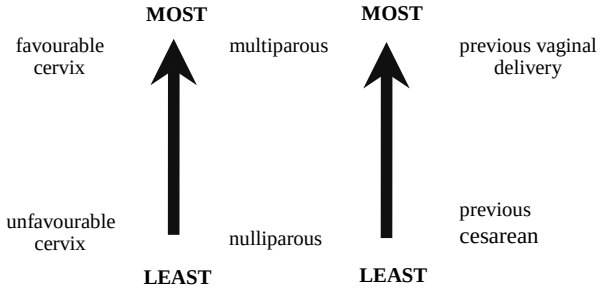
- Failure to achieve labour
- Uterine hyperstimulation with fetal compromise
- Increase risk of operative vaginal delivery and cesarean section
- Risk of uterine rupture may be increased in certain situations

If the attempted induction does not achieve labour, the need, urgency, and method for induction should be re-evaluated in light of the original indication and observed fetal response.

Labour Induction Methods

Methods of labour induction include mechanical and pharmacologic means. Optimal choice of these depends on the pre-induction status of the cervix. The three factors most likely to lead to success include favourable cervix, multiparity, and prior vaginal delivery. The less compelling the indication for induction, the more favourable the cervix should be before proceeding.

Figure 3 - Likelihood of successful vaginal delivery



The cervix is considered unfavourable if the Bishop score is ≤6 and favourable if it has a Bishop score of > 6. Many studies have used other Bishop score values to separate the data.

Table 1 - Bishop scoring system

Factor	0	1	2	3
Dilatation (cm)	0	1–2	3–4	>5
Effacement (%)	0–30	40–50	60–70	>80
Consistency	Firm	Medium	Soft	
Position	Posterior	Mid	Anterior	
Station	Sp –3 or above	Sp –2	Sp –1 or 0	Sp +1 or lower

The condition of the cervix at the start of the induction is an important predictor of success, with the modified Bishop score being a widely used scoring system (maximum score of 10, 2 points per category, noting that a score of 9 or 10 is associated with an increased likelihood of delivery within 2 hours of rupture of membranes.) The most important element of the Bishop score is dilation followed by effacement, station, and position, with the least useful element being cervical consistency. Xenakis et al. clearly demonstrated that women who had a Bishop score of three or less at onset of induction had significantly higher rates of failed induction ((9.4 versus. 0.7%, *P* <.01) and of cesarean delivery (29 versus 15.4%, *P* <.01) than those with a Bishop score above 3 (Xenakis et al, 1997). Nova Scotia's Atlee database also shows that the risk of cesarean section in low-risk nulliparous patients is highest in those undergoing labour induction when compared to those entering spontaneous labour (Allen et al, 2006).

Options for cervical ripening and induction with an unfavourable cervix

It is important that cervical ripening be considered prior to labour induction in women with an unfavourable cervix. Many methods for cervical ripening are effective. Amniotomy and oxytocin are not effective cervical ripening methods.

Mechanical methods

- Balloon devices, Foley catheter
  Technique
- No. 14–18 Foley
- Sterile technique, insert past internal os
- Inflate to 30–80 cc water
  - Use caution in the presence of :
- antepartum bleeding
- rupture of membranes
- low-lying placenta
- evidence of genital tract infection
- Hydroscopic dilators (laminaria or artificial tent)
  - May be associated with increased risk of infection

The use of balloon catheters and laminaria or artificial tents may affect cervical softening, effacement, and dilatation with fewer or no systemic effects. The probable mechanism of action is local prostaglandin production.[7] Balloon methods have the advantages of cost effectiveness and presumed safety in the presence of a uterine scar. Mechanical methods are not likely to be effective in inducing labour on their own and often require oxytocin for induction or augmentation. A meta-analysis by Boulvain et al. (2001) has found that compared with vaginal prostaglandins, the use of a balloon catheter is not as effective in achieving vaginal delivery within 24 hours.

Pharmacologic options

Options include either intracervical prostaglandin E_2 (PGE_2) or vaginal PGE_2. Vaginal gels or preparations are easier to administer than mechanical methods and cause less discomfort to the woman. **Avoid intracervical application of vaginal gels because the dosage is much higher than the intracervical preparation**.

Prostaglandin E_2

Route and Dose

- Vaginal
  - Prostin® 1 or 2 mg into posterior fornix
  - Cervidil® 10 mg into posterior fornix
- Either formulation may be used for cervical ripening
- Initial application may be followed by repeat PGE_2 or oxytocin, as per the manufacturer's recommendation.

Protocols have been developed to increase the chance of a successful outcome and enhance safety.

- Women should be cared for in a controlled setting
  - By experienced staff
  - Where resuscitation and delivery capabilities are available
- Normal fetal heart rate
- PGE_2 applied by an experienced health care provider
- Monitor fetal heart rate and uterine activity, generally for periods of 1 to 2 hours
- If labour develops, manage as appropriate
- If no labour, reassess and repeat as necessary or choose an alternative induction method

There is limited information on Cervidil® regarding on its use with ruptured membranes, and further research is needed. The manufacturer suggests that it should be used with caution in these women and that uterine activity and fetal status should be carefully monitored.

The American College of Obstetricians and Gynecologists recommend continuous monitoring with the use of Cervidil®. A Canadian study of 300 women (Biem et al, 2003) that evaluated outpatient versus in-patient induction with Cervidil® found that maternal satisfaction was increased with outpatient management. There was, however, one case of uterine rupture in the in-patient group in a woman with an unscarred uterus.

There are no current national guidelines for the outpatient use of prostaglandins, but many centres do use outpatient prostaglandin. Fetal well-being and the absence of significant uterine activity must be assured prior to discharge. When induction is being undertaken because of suspected fetal compromise such as intrauterine growth restriction or a poor biophysical profile, outpatient management is inappropriate.

Advantages of prostaglandin E_2

- Patient acceptance
- Lower operative vaginal delivery rate than with oxytocin alone
- Less need for oxytocin induction
- May be used in prelabour rupture of membranes (vaginal preparations only)

Disadvantages of prostaglandin E_2
- Possible uterine rupture with previous cesarean section
- Side effect include nausea, vomiting, diarrhea
- Gel preparations are difficult to remove when hyperstimulation of the uterus occurs

Considerations for prostaglandin use
When considering prostaglandin use, the acceptance and preference of women is important. Although the medication itself is more expensive than oxytocin, the total cost of an induction with an unfavourable cervix is potentially less using prostaglandins. Cost savings may be realized through a reduction in operative vaginal delivery rates or length of hospital stay.

Prostaglandin E_2 is a bronchodilator and is not contraindicated in asthmatics. Adverse cardiovascular events are rare, idiopathic and usually occur almost immediately after the gel or preparation has been inserted.

Certain **precautions** must be used with prostaglandins:
- The vaginal gel (Prostin®) should NOT be placed in the cervical canal.
- Prostaglandins should NOT be used as augmentation agents.
- Prostaglandins should NOT be used in women with a previous cesarean section due to the increased risk of uterine rupture.

Adverse reactions may occur. These include uterine hyperstimulation, gastrointestinal side effects, and vaginal irritation. Prostaglandin gels are uterine stimulants whose effects may not easily be reversed. The incidence of hyperstimulation is similar to oxytocin, as is the risk of fetal hypoxia.

Prostaglandin E_1
Misoprostol, a prostaglandin E_1 analog originally marketed for the prevention and treatment of gastric ulcers, has been found to cause uterine contractions and induce labour. A meta-analysis of vaginal misoprostol for cervical ripening or induction of labour found that, compared to placebo, vaginal misoprostol was associated with reduced failure to achieve vaginal delivery within 24 hours (RR=0.36; 95% CI=0.19–0.68) (Hofmeyr et al, 2003). Excessive uterine activity without fetal heart rate changes was increased (RR=11.66; 95% CI=2.78–49), and case reports of uterine rupture are rare. Compared with vaginal prostaglandins, oxytocin augmentation was reduced with vaginal misoprostol (RR=0.65; 95% CI=0.57–0.73), as was failure to achieve vaginal delivery within 24 hours (RR=0.80; 95% CI=0.73–0.87). Uterine hyperstimulation was more frequent with misoprostol (RR=2.04; 95% CI=1.49–2.80), as was meconium staining of amniotic fluid (RR=1.42; 95% CI=1.11–1.81). The ideal dose, route or frequency of administration is not firmly established, and at this time the Society of Obstetricians and Gynaecologists of Canada recommends that this agent only be used under research protocols, unless the fetus is non-viable.

Excessive Uterine Activity

Definitions
Hypertonus: Contraction >120 seconds
Tachysystole: More than five contractions in a 10-minute period (for two consecutive 10-minute periods)
Hyperstimulation: Non-reassuring fetal heart status associated with either hypertonus or tachysystole

Management of hypertonus
- If hyperstimulation of the uterus occurs, try to remove the prostaglandin from the vagina. Cervidil® is readily removed from the vagina if hypertonus develops. If intracervical gel has been used, removal is not helpful.
- Perform intrauterine resuscitation of the fetus as required.
- The use of a tocolytic may be considered IV nitroglycerin 50μg, push to a maximum of 200μg. The evidence for efficacy and safety is inconclusive. Although nitroglycerine spray has been used, it has not been adequately evaluated in clinical trials.

Every health care facility offering maternity care would benefit from a hyperstimulation treatment protocol.

Options for induction with a favourable cervix

Amniotomy
- Creates a commitment to ensure delivery within a specified time period
- Effective with favourable cervix
- Trials indicate it should be used in conjunction with oxytocin in most instances.
- Care must be taken in cases of high presenting part due to an increased risk of cord prolapse.
- After amniotomy, note the amount, colour, and consistency of the fluid and assess fetal well-being.

Oxytocin
- IV infusion of oxytocin has been the most common method of induction and remains valuable for properly selected women.

Effects of oxytocin
- Oxytocin receptors are found in the myoepithelial cells of the breast, the myometrium, and the deciduas.
- Myometrial smooth muscle
  - rhythmic contraction at low dose
  - increased sensitivity as term approaches (insensitive at <20 weeks)
  - infusions of 6 milliunits per minute (mU/min) give the same oxytocin levels that are found in spontaneous labour; most women will have a clinical response at 8–10 mU/min at term
- Cervix
  - no direct effect
- Vasoactive
  - very minimal vasopressor response
  - hypotension possible with bolus IV administration
- Antidiuretic activity
  - water intoxication possible with high dose oxytocin (>40 mU/min)

Oxytocin protocol
- Cervix should be favourable.
- Experienced care providers and adequate resources available to manage dystocia and other emergencies
- Administration
  - given by infusion pump into a mainline IV
  - describe dosage as mU/min
  - concentrations vary, but avoid large free-water load. Do NOT give dextrose 5% (D5W)
  - institutional protocols should be utilized which include a recommended starting dose (12mU/min), incremental increase in dose (1–2mU/min**),** and the time interval for increases in dose (30-minute interval is preferred).
- There are no randomized clinical trials comparing different timing of the use of oxytocin after prostaglandin gel. Many studies have used a 6-hour interval.

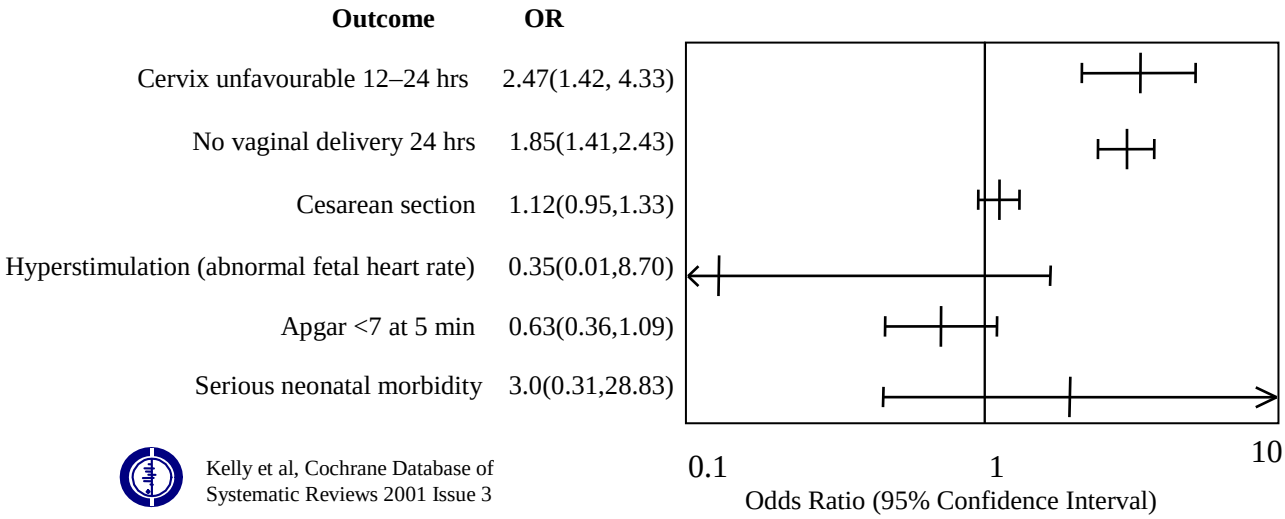
Management of hyperstimulation
Discontinue oxytocin and institute hyperstimulation protocol.
Restarting oxytocin:
- Remember that the half-life of oxytocin is 2–5 minutes. If oxytocin is restarted, consider beginning at a lower dose.

Postpartum considerations
If oxytocin has been used in the labour, anticipate postpartum hemorrhage and take appropriate preventative action. Use active management of the third stage. An infusion of 20 U/L at >100 ml/h for 1 or 2 hours is an effective way to prevent uterine atony. The use of oxytocin infusions >20 U/L has not been proven more effective.

Comparison of pharmacologic methods

Kelly and Tan compare efficacy of oxytocin vs. vaginal prostaglandin for the induction of labour. The odds ratios for a persistently unfavourable cervix after 12 to 24 hours and failure of vaginal delivery in 24 hours fall to the right of 1.0, and indicate an advantage for prostaglandins.

Figure 4 - Oxytocin alone versus vaginal PGE_2 for induction of labour



Conclusions

1. The reasons for induction must be compelling, convincing, and documented.
2. The woman must give fully informed consent.
3. The method should match the situation by considering the degree of urgency of the indication and the status of the cervix.
4. The cervix should ideally be favourable before amniotomy.
5. The woman's preference must be considered.
6. Induction, particularly in nulliparous women, frequently is unsuccessful.

Key Messages

1. There is no one way to induce labour. The method of induction is always based on the individual woman's condition.
2. Labour should be induced only when medically indicated.

Suggestion for Applying the Sexual and Reproductive Rights Approach to this Chapter

Take the time to explain to women the indications why you recommend that labour be induced. Describe the various methods of induction, and list the benefits and risk to each type of induction. How does she feel about being induced? Are there alternatives? Does she have any choices about what happens to her body?

Resources:

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