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# Induction of Labor: A comprehensive review

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*ABSTRACT*
***Labor induction rates have more than doubled in the United States over the last two decades. Indications and risk factors for induction of labor are also gaining in popularity. Professional organizations such as the American College of Obstetricians and Gynecologists and The Joint Commission have taken steps to discourage elective induction of labor prior to 39 weeks' gestation and have defined new terms such as early-term, full-term, late-term, and postterm gestation to assist clinicians in determining the appropriate timing of birth for specified indications. Induction of labor carries the risk of harm to both the mother and her fetus. The cost of inducing labor and its influence on the health care system are a major source of worry. Women's education and the shared decision-making process used to get informed permission are critical elements in lowering early elective deliveries. The use of scheduling forms, hard stop procedures, induction of labor indication tools, and informed consents may assist the provider in reducing overdiagnosis, overtreatment, and disease creep. This article discusses induction of labor trends, medical indications and criteria, related dangers, cost and health system impact, and measures to reduce induction of labor.***
***Keywords: birth; cost; decision making; induction of labor; informed consent; labor; patient education; trends; women.***

## 1. Induction of labor

Induction of labor (IOL) is to use artificial initiation of labor before its spontaneous onset in order to deliver the fetoplacental unit **[1].**

Induced labor may have an impact on women birth experience. It may be less efficient, and it is more painful than spontaneous onset of labor. It is also more likely to require epidural analgesia and assisted vaginal birth. IOL is a relatively common procedure. In 2004–05, 19.8% of all deliveries in the UK were induced including induction for all medical reasons. Where labor was induced by drugs, less than two-thirds of women gave birth without further intervention, about 15% having instrumental births and 22% having emergency cesarean sections (CS) **[2].**

The incidence of IOL varies from one region to another, ranging from approximately 6% in developing countries such as Nigeria to approximately 20% in the United Kingdom. IOL is now one of the most common interventions in obstetrics, but it is risky and should be taken seriously **[3].**

Recent randomized controlled trials involve IOL for several indications such as large for gestational age or pre-eclampsia at 37 weeks' gestation suggest that IOL is not associated with increased CS rates. It is necessary to put in mind however, that mode

of delivery in these studies is not only influenced by the induction process itself, but also by the underlying cause for which the induction was procedured. Studies have showed that majority of women (>70%) would prefer not to have IOL by any means. It is therefore important that women be counseled appropriately antenatal regarding the risks, benefits and alternatives to IOL **[4].**

### 1.1. Indications of Induction of labor

***Post-date pregnancy:***

Except one guideline that did not address timing, these guidelines consistently, recommend IOL between 41- and 42-weeks' gestation. Two guidelines specifically recommend IOL by 41 + 5 weeks or by no later than 41 + 3 weeks. Seven guidelines emphasized that IOL timing should be informed by women's preferences and a process of shared decision-making. Four of these guidelines stated that if a woman chooses not to have IOL that her decision should be respected. There is some variation in the guidelines in terms of when increased fetal monitoring for women with prolonged pregnancy should commence, ranging from 41 + 0 weeks, 41 + 3 weeks, to 42 weeks **[5].**

***Premature rupture of membranes (PROM) – at term (at or over 37 weeks):***

There are conflicting recommendations in relation to PROM at term. Some guidelines state that IOL is indicated (as soon as possible or within 24 h), other guidelines state that women should be offered a choice of IOL or expectant management. Some guidelines differentiate between women with PROM at term who are positive for group B streptococcus versus those who are negative. Women who tests positive should receive an IOL with greater urgency than those who are not, and should be induced 'as soon as possible, within 6 h or within 24 h **[6].**

***Twin pregnancy:***

Related guidelines recommend IOL for women with an uncomplicated twin pregnancy (i.e. first twin cephalic), with slight variation in recommendations around timing. Some guidelines recommend it at 37 weeks, at 38 weeks or between 37 and 38 weeks without differentiating between monochorionic or dichorionic pregnancies. "Guidelines that differentiate between monochorionic or dichorionic pregnancies, recommend IOL for monochorionic pregnancies at 36 or 37 + 0 weeks and for dichorionic pregnancies at 37 or 38 + 0 weeks". The (WHO**[7]** guideline does not provide a recommendation, stating that there is insufficient evidence to issue a recommendation on IOL in women with an uncomplicated twin pregnancy at or near term **[8].**

***Breech presentation***

Guidelines that states IOL for breech presentations, refers that IOL is not recommended. only two guidelines say that if a woman insists to have a vaginal breech birth and planned birth is indicated, IOL can be presented after discussing the associated risks **[9],**

***Cholestasis of pregnancy:***

Cholestasis of pregnancy is an indication for IOL 37 weeks varying due to individual circumstances with a little different recommendation around the best time. Most of them state that IOL can be presented from 37 weeks, and earlier (at 36 weeks) for

severe cases. The (RCOG **[10]**) guideline is more specific in its recommendation and says that IOL should be offered after 37 + 0 weeks depending on the severity and the circumstances and preferences of the woman **[7].**

***Antepartum hemorrhage:***

Antepartum hemorrhage is identified as an indication for IOL by three guidelines. Two of them put this as an indication without any additional information. The (RCOG **[11]**) guideline indicates that IOL may or may not be indicated depending on degree of severity and whether the hemorrhage is associated with maternal and/or fetal problems. This guideline states that the perfect time of birth for females presenting with unexplained antepartum hemorrhage and not associated with maternal and/or fetal compromise is not well established **[12].**

***Hypertension and pre-eclampsia***

All the guidelines that imply IOL for pregnant females with hypertension or pre-eclampsia recommend IOL, with slightly different variations around the timing. In terms of chronic hypertension, most of them recommend IOL from 37 weeks. As for gestational hypertension, some guidelines indicate IOL from 37 weeks while others recommend waiting till between 38 and 39 weeks. Only one states that women with hypertension (without pre-eclampsia) can be offered IOL from 37 weeks or expectant management. For pre-eclampsia, there is steadiness across multiple guidelines that women with onset of pre-eclampsia at 37 weeks should be offered IOL. Recommendations in terms of the timing of IOL for women with pre-term (<37 weeks) pre-eclampsia vary," in particular for the management of pre-eclampsia with mild to moderate hypertension''. Some of them recommend it for women with preeclampsia with mild to moderate HTN to be delayed until 37 weeks while others recommend it from 34 weeks **[13].**

***Maternal Diabetes:***

Some guidelines recommend that, if there is no other indication, IOL must not be carried out (before 42 weeks) others indicate that IOL can be offered from 40 weeks, 40 + 6 weeks, or 41 weeks. Guidelines that address gestational diabetes with maternal or fetal complications (e.g. suspected macrosomia or women who require insulin) indicates that IOL between 38 and 39 weeks may be needed. A few guidelines say that gestational diabetes is an indication for IOL, without mentioning its timing, or stating more broadly that timing depends on individual risks and preferences and local circumstances **[14]**. While for Type I or type II diabetes, guidelines says that IOL is recommended for type I and type II diabetes, with only one of these providing guidance around timing. This guideline recommends IOL for women with type I or type II diabetes between 37 and 38 weeks, and to be earlier if there are any metabolic or other maternal or fetal complications. One of the guidelines specifies the significance of shared decision- making with women in decision around timing of IOL for diabetes **[15].**

***Maternal Cardiac disease:***

Guidelines indicate that if a planned birth is required, IOL is preferred over CS, but where possible women should be allowed to labor spontaneously **[16].**

***Maternal request:***

IOL should not be routinely under maternal request, it can be offered only under certain exceptional circumstances (undefined) after 39 weeks **[17].**

## 2. Methods of induction of labor

### *2.1. Mechanical methods:*

The introduction of a catheter (Foley single balloon, Atad/Cook double balloon or other type), inside the cervix to the extra-amniotic space, with or without traction.

Introduction of laminaria tents, or their synthetic equivalent (Dilapan), into the cervical canal.Use of a catheter to inject fluids, usually saline water, in the extra-amniotic space (EASI)

### *2.2. Pharmacological methods:*

Prostaglandins.

Relaxin.

Progesterone antagonists.

Oxytocin.

Hyaluronidase.

## 3. Risks associated with IOL:

The majority of women who undergo IOL will have a successful vaginal delivery of a healthy infant. However, complications may arise following IOL including:

*Hyperstimulation* of the uterus that may occur following administration of Prostaglandin gel. Also, women with high Bishop score and multiparous women with previous successful vaginal deliveries might be more susceptible to hyperstimulation of the uterus [18].

*Uterine rupture*: Women might be at risk of rupture if there was a history of previous uterine surgery including CS [19].

*Fetal immaturity* is a risk of IOL, especially if an accurate gestational age has not been well established.

*Cesarean sections*: The latest evidence suggests that there is no evidence that IOL is accompanied by increase in rates of CS [20].

*Artificial rupture of membranes* via amniotomy has the rare but fatal risk of umbilical cord prolapse. Other risk factors such as polyhydramnios, prematurity, and a high presenting head. This requires immediate urgent delivery by CS [21].

*Failed induction of labor:*

Failed induction is defined by the NICE guidelines as ‘’labor not starting after one cycle of treatment’’. If labor doesn’t start after one cycle of treatment the clinician should do reassessment of the woman’s condition, assess fetal wellbeing with electronic fetal monitoring, provide support and make decisions along with the woman’s wishes and clinical circumstances. Options following failed IOL include a further attempt to induce labor after reconsultation with the patient or having a CS [22].

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