The initiation of labour at term gestation: Physiology and practice implications

Vanora Hundley a, *, Soo Downe b, Sarah J. Buckley c

a Centre for Midwifery, Maternal & Perinatal Health, Bournemouth University, Christchurch Road, Bournemouth, BH1 3LT, United Kingdom
b School of Community Health and Midwifery, University of Central Lancashire, Brook Building, Preston, PR1 2HE, United Kingdom
c Faculty of Medicine, The University of Queensland, Brisbane QLD 4072 Australia

Keywords:
Labour onset
Labour physiology
Labour experiences

ABSTRACT

Little is known about the physiology of labour onset at term, and there is a debate about what signs and symptoms should be used to define it. In low resource settings, particularly for remote and rural communities, delay in recognising labour onset may mean a delay in seeking a skilled birth attendant. This chapter presents the most recent evidence about the physiology of labour onset, including the complex neuro-hormonal, biophysical, psychological and emotional factors that contribute. The symptoms of labour onset are explored from the perspective of both pregnant women and service providers in a range of sociocultural contexts. Early labour presents challenges for pregnant women, their families, communities and health care professionals. The chapter discusses how maternity care services should be designed, and delivered to ensure that women get the optimum advice and care at the beginning of labour.

© 2020 Published by Elsevier Ltd.

Introduction

Initiation of labour is variously defined and interpreted. Almost a century ago, in the 1931 edition of a text book for obstetricians (titled ‘Midwifery by Ten Teachers’), Berkeley et al. noted ‘Why labour
comes on at the end of forty weeks gestation is unknown' [1]. The authors dismissed the then current labour onset theories of menstrual length, uterine distention, and placental infarction. Instead, they hypothesised that 'the most likely explanation is that some substance is produced in the ripe placenta which excites the labour-centre in the cord' [1].

Eighty years later, despite the extensive subsequent research, Kamel was forced to conclude that 'the mechanism by which labour is initiated in humans remains obscure' [2]. This situation has not changed. Evidence to date tends to suggest that the triggers may include inflammatory, hormonal, and mechanical factors. It is not clear how far these are imitated by foetal or maternal processes. There may also be relevant psychosocial effects via the maternal immune system or other mechanisms, though this has not been widely researched to date.

Because little is known about the physiology of labour onset at term, there is a debate about what signs and symptoms should be used to define it [3–5]. This raises questions for women and providers about when they should seek maternity care, and about the kind of care that should be made available if women present when they are not in labour. It is particularly important to make the right judgement about labour onset when women do not have rapid or easy access to maternity care, for geographical, monetary, or other reasons. The lack of clarity and agreement in this area also influences the implications and appropriate application of research studies in which length of labour is an outcome.

In low resource settings and, particularly, for remote and rural communities, delay in recognising labour onset may mean a delay in seeking a skilled birth attendant (SBA). Lack of access to SBA support is associated with a higher risk of maternal and neonatal morbidity and mortality [6]. Missing the signs of labour onset may also mean a delay in setting off for the local maternity facility, if that is the intended place of birth, or a delay in calling on local skilled birth attendants, if the birth is planned to take place at or near the woman's home [7]. However, the risk of late access needs to be balanced by the implications of early hospital admission (before active labour), including the associated 'cascade of unnecessary interventions', typically seen in both high resource [8–13] and low resource settings [14,15].

Rates of routine induction of labour for uncomplicated postmaturity are rising in many settings [16]. In addition, there are recent calls for routine induction of labour at 39 weeks gestation for healthy, low-risk women, to reduce rates of caesarean section [17], and/or stillbirth [18]. Lack of understanding about the finely tuned anatomical, biochemical, and neurohormonal processes that trigger labour onset may lead to an underestimation of the short and long term neurohormonal impacts of labour induction. This is particularly likely to occur with routine labour induction in the early term period (37 0/7 weeks to 38 6/7 weeks).

In some cases, women with term pregnancies attempt to start the labour process themselves. To be able to provide the best care possible in these cases, it is important for maternity care providers to understand why women are trying to initiate their own labour, and the techniques and substances they may use.

This chapter aims to present the most recent evidence in this area, and the implications for clinical practice. The first section addresses what is known about the physiology of labour onset. The second section explores the varying interpretations of the symptoms of labour onset, from the perspective of both pregnant women and service providers in a range of sociocultural contexts. We then consider the implications of these varying views, experiences, and interpretations in terms of the information about labour onset that should be provided for pregnant women, their families, and communities, and about how maternity care services should be designed and delivered to ensure that women get the optimum advice and care at the beginning of labour. Finally, we suggest new areas for research to address some of the continuing debates and controversies in this area.

**Current evidence on the physiology of spontaneous labour onset**

Since the hypothesis of Berkeley et al. [1], advances in knowledge have revealed that mammalian biological processes are not simple linear functions. Biological systems involve dynamic complex processes that can facilitate adaptations to internal and external changes. This is equally true of childbirth, where evolution has resulted in complex, exquisitely balanced, multi-system processes for labour onset that are likely to include psychological factors and adaptations [19]. Evolutionary
considerations suggest that the expectant female’s subjective feelings of safety versus stress and danger could be important contributing factors to labour onset, as giving birth in an unsafe environment would risk the survival of mother and offspring.

Survival at birth also requires that both mother and baby are well prepared for the stresses of labour and birth, and for the biologically extraordinary post-birth transitions. There are dynamic interactions between mother and baby to coordinate the timing of labour onset, including the completion of necessary physiologic pre-labour preparations [19,20]. The result is that spontaneous labour onset at term in healthy pregnant women usually occurs when both mother and baby are at peak biological, neurohormonal, and psychological readiness for labour, birth, and successful postpartum/neonatal transitions.

To ensure this optimal timing, changes in the mother and the foetus towards the end of pregnancy begin to shift the uterus from quiescence (phase 0) to activation (phase 1), ensuring optimum conditions for stimulation (phase 2) and involution (phase 3) [21], as illustrated in Fig. 1.

**Physiology of the uterus at labour onset**

Throughout gestation, mother and foetus communicate with each other via the placenta. This communication includes the placental production, metabolism and/or distribution of hormones, and other factors as described in this section. In the lead-up to labour, these placental processes ensure that the activation of the mother’s uterus happens in parallel with the maturation of the foetal organs.

Towards the end of pregnancy, the developing foetal adrenal glands produce increasing amounts of cortisol. This steroid acts to mature foetal organ systems, especially the lungs. The maturing foetal adrenal also produces increasing amounts of dehydroepiandrosterone (DHEA), which is an important precursor to oestrogen production in the placenta. Oestriol, the dominant oestrogen in pregnancy, increases in the mother’s circulation and promotes the uterine activation phase in readiness for labour.

Oestrogen effects include:

- **An increase in uterine gap junctions**

  Gap junctions are intercellular connections that enhance the spread of electrical signals. This essentially ‘wires up’ the uterus for effective coordinated contractions in labour. Under the influence of oestrogen and prostaglandins, gap junctions increase substantially up to labour onset.
○ **Uterine oxytocin receptors**

The uterotonic effects of oxytocin in labour depend on uterine sensitivity, which is determined by the number and activity of uterine oxytocin receptors. Uterine oxytocin receptor numbers rise around twelve-fold from mid pregnancy to term, and are even higher in early labour [22], so that only small amounts of circulating oxytocin are required to initiate and maintain labour (equivalent to 4–9 mU/min) [23]. In addition, strong, oxytocin-fuelled contractions drive a positive feedback cycle, whereby uterine sensations trigger oxytocin release from the maternal brain, causing stronger contractions and more oxytocin release. This has implications for labour induction, which is unlikely to succeed if the woman undergoing induction is not far enough into her pregnancy to have developed adequate uterine oxytocin receptor numbers to ensure optimum uterine sensitivity [24]. In addition, the increase in uterine oxytocin receptors occurs in parallel with other activating processes, as described below. These may be equally necessary for an effective labour and birth.

**Other physiological processes**

**Reduction in quiescence**

The shift to activation also involves reductions in the factors that have previously supported quiescence. These could include down-regulation in the effects of progesterone, the major pro-gestation hormone. However, the relevant functional mechanism is not fully understood as circulating levels of progesterone do not decline before labour onset [21].

**Prostaglandins and inflammation**

Recent research has highlighted the occurrence of a sterile inflammation in local foetal and maternal tissues even before labour onset [25]. Pro-inflammatory chemicals, including cytokines and interleukins, promote the production of prostaglandins, which help with collagen degradation and cervical ripening. Prostaglandins in the uterus promote contractility by increasing oxytocin receptors and gap junctions and also increasing placental production of the activating hormone Corticotropin Releasing Hormone (CRH), fuelling additional positive feedback cycles [25].

The foetal membranes and amniotic fluid may also mediate signals between the mother and baby [25]. The maturing foetal lungs secrete surfactants into amniotic fluid, which may promote local prostaglandin production and uterine contractility [25]. Loosening of the tissue interface (‘glue’) between the foetal membranes and the uterine wall results in raised levels of *foetal fibronectin* in the week or so prior to labour onset.

*Corticotrophin releasing hormones (CRH): the ‘placental clock’*

Outside of pregnancy, CRH is a high-order stress hormone produced in the hypothalamus, which triggers the release of adrenocorticotropic hormone (ACTH) from the pituitary, and subsequently cortisol from the adrenal gland. In pregnancy, large amounts of CRH are made by the placenta, with uterine activating effects in the lead-up to labour by several mechanisms. CRH stimulates foetal adrenal DHEA production and subsequent placental oestrogen production, promotes inflammation, and has direct uterine pro-contractile effects [21]. Placental CRH also reaches the baby, promoting cortisol production and organ maturation. Above-normal CRH levels in mid-pregnancy have been associated with an increased risk of preterm birth, suggesting that the ‘placental clock’ may be set too early in some women. Both CRH and prostaglandins are also involved in positive feedback loops that drive labour [21].
Impact of late pregnancy/labour initiation priming on the foetus/neonate

In addition to these foetal pre-labour preparations, the processes of physiological labour and birth further optimise the foetal-to-newborn transition. The so-called 'stress of being born' involves a late-labour surge of adrenaline and noradrenaline, which maximises newborn adaptations, including the critical respiratory transition, as shown in Fig. 2. This foetal catecholamine surge is facilitated by the prelabour upregulation in adreno-receptors in these foetal organ systems [26,27].

All of the factors listed above are part of a dynamic, integrated, multisystem interaction between mother and foetus, which come together in a finely balanced synergy to prime the mother/foetal dyad for optimal labour and birth. Additionally, there are significant benefits in waiting for spontaneous labour onset for the healthy neonate [28,29] since the foetal brain continues to grow and develop up to the moment of birth.

Imminent labour onset and early labour: signs, symptoms, and triggers

Behaviours reported by women

In a range of mammalian species, specific pre-labour signs have been observed, including restlessness [30,31] and a drop in temperature about 24 h before labour onset [32–34]. However, this area is not well studied in humans.

An in-depth qualitative study of 18 New Zealand women reported that most women experienced excitement when they believed their labour had started, as well as some apprehension and anxiety [35]. One of the respondents made reference to anecdotal reports of an increase in energy just before labour onset, associated with an urge to tidy up and prepare the house for the coming baby. This behaviour, termed ‘nesting’ behaviour [36,37], is well accepted for other mammals, including pigs [38] and rabbits [39]. However, nesting has not been extensively examined in humans.

![Fig. 2. Effects of the foetal catecholamine surge on the foetus/newborn. Figure reproduced with permission [22].](image-url)
In one of the few reports in this area, Anderson and Rutherford report on two psychological studies that developed and tested a psychometric ‘nesting’ scale, including a total of 375 women, in which human nesting was defined as ‘measurable change in behaviours and attitudes related to birth preparation that happens during pregnancy’ [36]. Associated behaviours were conceptualised broadly as either space preparation (unusually intensive cleaning and organising of the home environment), and social selectivity (choosing to spend more time with people who were more highly trusted or familiar).

The first study reported in the Anderson and Rutherford paper [36] compared behavioural reports from pregnant and non-pregnant women, and the second followed pregnant women longitudinally. The findings demonstrated that, for the included respondents, there was an increase in nesting behaviours from the first to the third trimester in comparison to non-pregnant women. The authors comment that the type of behaviours noted towards the end of the third trimester included: a focus on home renovations and completion of projects, an energy burst, and the purging and sorting of household items. Ridding the environment of unwanted items is prioritized as highly as organising the items that will remain after the baby is born. Compared to non-pregnant women, women in late pregnancy showed a preference for being close to home, a strong preference for kin and close friends, and report that new people and places are relatively unappealing. The data for both Anderson and Rutherford studies were collected in Canada from participants recruited via social media [36]. It is not clear how far these experiences and behaviours are evident across cultures, or how precisely they can be linked to imminent labour onset.

**Physical signs and symptoms of labour onset**

In terms of physical signs and symptoms, women experience the initiation of labour in a variety of ways, including pain (usually back pain), watery or blood-stained loss, gastrointestinal symptoms, emotional changes, and altered sleep patterns [35,40,41]. Most women can identify approximately when their labour started, and the literature suggests that they usually experience it as a continuous process of increasing intensity [35,40]. In contrast, health care providers tend to focus on the somewhat arbitrary phases of labour defined by Friedman and Kroll, who described labour as being either latent or active [42]. The latent phase labour was defined as the period “from onset of labour to a degree of cervical dilatation after which the rate of dilatation significantly increases”. The active phase labour was defined as being “from the point in time at which the rate of change of cervical dilatation significantly increases to the approximate onset of second, expulsive, stage”. The point of dilatation that divided these phases was originally classified as 2.5 cm [42]. The division between the latent and active phases of labour has gained importance because of the move to hospital birth [43], and the impact of admission to hospital in latent labour on women [4]. There is strong evidence that women admitted to hospital in the latent phase of labour are more likely to experience a cascade of unnecessary intervention that increases the risk of both maternal and neonatal morbidity [8–15].

**Triggers for labour onset noted by women**

Bovbjerg et al. undertook a secondary analysis of data from 663 women who participated in the USA Third Pregnancy, Infection, and Nutrition cohort and who did not have a clinical induction of labour [44]. Sixty percent reported no specific triggers for labour onset. For the 40% who believed there was a specific cause, 49 different triggers were recorded in a free-text response box. The group of activities noted by the largest number of respondents was categorised as physical activity or other physical triggers (n = 87), including formal exercise, such as swimming or walking, non-formal activity such as housework, sexual activity, or ‘baby did something’. Apart from a ‘clinician induced’ set of activities (n = 65), the next most prevalent group was coded as ‘natural phenomena’ (n = 52), and included cramping, a bloody show, or rupture of membranes. Other categories were maternal illness, ingesting something, and emotional triggers.

There appear to be no similar studies of women’s accounts of labour triggers from low or middle resource settings.
Techniques women use to stimulate labour onset

Around the world, some women in late pregnancy use techniques to initiate labour if they feel their pregnancy has gone on too long. The prevalence of this phenomenon is hard to quantify, though in one specific (US) setting it has been reported to be 22% of pregnant women [45]. The decision to initiate labour may be made because women are anxious about the wellbeing of the baby and/or themselves due to financial, social, or personal reasons, or to avoid scheduled clinical induction for postmaturity. Often, health care providers will not know that women have stimulated labour onset, but it is important to be aware of the reasons why this may be done, and of the rare but sometimes critical side effects. From a primarily US perspective, Bovbjerg et al. note that:

rumors of “conventional” ways of inducing labor abound in the popular literature and include nipple stimulation, acupuncture, acupressure, massage, sexual intercourse, raspberry leaf tea, spicy food, balsamic vinegar, walking, castor or cod liver oil, enema, black or blue cohosh, heavy exertion, dehydration, starvation, stress, fear, and mechanical agitation such as riding in a car along a bumpy road [44]

By ‘conventional’ they mean ‘not clinical’. Similar means of self-initiating labour have been reported in a number of settings [46–48]. Some herbal preparations that are used to initiate labour are associated with case reports of harm [49]. This includes blue cohosh, which has been associated with acute cardiac episodes [50]. There are reports of maternal use of herbs in pregnancy in an African context, with warnings about potential severe side effects, including postnatal bleeding, but these do not appear to be primarily employed to self-initiate labour [51]. Peprah et al. report the use ginger, peppermint, thyme, chamomile, aniseeds, green tea, tea leaf, raspberry, and echinacea leaf in rural Ghana, for a range of reasons [52], and these and other preparations are reported in other African studies of remedies used in pregnancy to aid labour, though not specifically for labour initiation [48]. Participants in Peprah et al.’s study also had a strong belief in herbal remedies and a parallel conviction that most clinical medication was ineffective [52]. The authors reported that some participants would not tell their health care provider that they were using herbal remedies during pregnancy.

Kamatenesi-Mugisha and Oryem-Origa reported the use of over 75 different herbal plants to induce labour in Uganda, some of which are reported to have oxytocic properties [53]. The authors warn that some of the plants listed could have adverse effects on the mother and/or baby, though these specific plants, and the events that they are associated with, are not reported in the paper.

In contrast, in a recent systematic review of non-pharmacological remedies to induce labour, only two substances identified as being used regularly for this purpose (raspberry leaf tea and castor oil) [47]. This review of ten papers focused only on high income countries. No evidence of harm was reported, though the authors note the paucity of evidence in this area.

Recognition and diagnosis of labour onset, and consequences for access to care provision

For all women and staff, recognition of the onset of labour is important to ensure the best support and care for the mother and baby. Where access to labour care is difficult for financial or geographical reasons, it is particularly important for women to be able to identify labour onset accurately. In some settings, it is usual to wait until labour is felt to be established before accessing any external support, or beginning to move to a facility. However, where women live very far from the place they intend to give birth, or where there are few local care providers, women need to be able to convince other family or community stakeholders that they are in early labour, in order to be able enlist their help and (financial or other) support to access maternity care, either locally, or at a distance. This may take time, so contact with such stakeholders needs to happen as early as possible in the labour process.
Tests for the diagnosis of labour onset

At present, there are no definitive diagnostic tests for labour onset. The diagnosis can only be made retrospectively, once labour is established. Although tests such as the evaluation of the presence of foetal fibronectin have been proposed, there is little evidence of its efficacy for routine use for women with term pregnancies [54]. Recent studies have focused on pro-inflammatory factors, including telomere loss and increased cell-free foetal DNA (cffDNA) levels [55]. However, to date, no tests have high specificity and sensitivity for labour onset at term, and they are expensive for use in a low resource context. It is of interest that the observations noted above about a drop in temperature in horses, dogs, and sheep within 24 h of labour onset do not seem to have been followed up in humans, given the potential simplicity and inexpensiveness of such a measure if it is found to be a reliable indicator.

Even if there were highly accurate tests, the issue of what to do for women who have travelled a long way to a facility, and are then subsequently found not to be in labour, remains. In the absence of a definitive test, maternity care providers should pay close attention to women's accounts of what they are experiencing, and of what they believe this means for them and their labour. Even if what women say does not fit with the 'standard' account of labour onset used by local health care providers, it could still be a good indicator of labour onset in a particular woman, especially if she has experience of labour onset from previous pregnancies. The decision about whether to provide her with labour support includes listening to her emotional and social reasons for wanting to enter a maternity unit and/or to be visited by a skilled birth attendant.

Labour onset cues used by women and health care providers

The success of women's attempts to access skilled support in labour depends on the extent to which their accounts of being in labour are believed by gatekeepers of maternity care. The messages and cues about labour onset that health care providers hear from a woman help them to decide whether or not she is likely to need skilled labour care (in a facility or in the community) in the near future. A mismatch between the way women experience and report labour onset and the way that health care providers expect it to be experienced and reported risks delaying a correct diagnosis and may lead to inaccurate decision making.

There appear to be no studies of the views, experiences, and beliefs of health care providers with medical backgrounds in terms of what initiates labour, or of signs and symptoms related to this process [3–5]. However, research undertaken with midwives indicates that health care providers use a range of cues in deciding whether a woman should be formally acknowledged to be in active or established labour [56,57]. These include signs relating to the woman (physical symptoms, distress and coping, expectations, and social factors), but also conditions relating to the institution (organisational factors, midwifery care, and justifying actions) [56,57]. These were summarised pictorially by Cheyne et al. [56], see Fig. 3 below.

While there are similarities between the labour onset cues reported by women [40,41,44] and those reported by health care providers [56,57], there are also some differences. These differences can be a source of friction. For example, there is some evidence to suggest that women perceive health care providers to be the gatekeepers to hospital care because they have the ability to define active labour [58]. The result is an ‘asymmetric power relationship’ [59], whereby the woman must determine the right time to seek hospital admission or risk being sent home ‘not in labour’ [60]. However, this confidence in professional knowledge could well be misplaced. Defining labour onset is a cause of considerable uncertainty among midwives and other health care providers [3,4,57,61] and clinicians frequently have difficulty distinguishing between the phases of labour [62]. In addition, the process has been described as cyclical and dynamic in nature, rather than something achieved through a one off assessment [57].

A mismatch between women’s and health care providers’ perceptions of labour onset can result in significant discomfort and/or distress for both parties. For women, there is the uncertainty regarding when to seek care and support. Women must balance a need to know how ‘far along’ in labour they are, risking arriving too early, with the fear that they might give birth en route to the hospital [59,63,64].
Arriving too early and being sent away makes women feel that their labour experience is not valued and, although health care providers may see this as protecting women from unnecessary interventions, it is not a person-centred approach to care. Terminology such as ‘false diagnosis’ of labour further disempowers women.

In all cases, if the woman’s account of her labour is dismissed or even ridiculed by health care providers, there are potentially serious implications for the quality of maternity care. This includes her emotional and psychological wellbeing and, in extreme cases, the physical safety of the mother and/or baby may be at risk if the mother is turned away and does not return. The implications of disrespectful care are further considered in chapter 12 of this volume.

Health care providers feel equally uncomfortable and constrained by existing services. They recognise a need to support women in latent phase labour, while at the same time protecting them from the potential use of unnecessary interventions associated with hospital admission. The balance is particularly acute in low resource settings where women have travelled a long distance to access care.

**Potential new approaches to recognition, diagnosis, and management of labour onset**

Information from local women’s accounts of labour onset could be integrated into community-specific information leaflets and advice provided by SBA and others such as Traditional Birth...
Attendants (TBA) and Accredited Social Health Activists (ASHA). Many local beliefs about the signs and symptoms of labour onset have been developed based on years of experiential knowledge. Given how little is known scientifically in this area, it would be sensible to pay attention to experiential knowledge, especially when it is biologically plausible.

New solutions might include solar powered mobile devices that have video capacity, and that are made available in rural and remote communities to enable pregnant women to make rapid remote contact with care providers. The link could either be to local SBAs or to more remote facilities if that is where women are intending to give birth. Studies from high resource countries suggest that home visits to establish if women are in labour do not significantly improve diagnosis or women’s experiences [71]. Telephone contact between pregnant women who think they are in labour and midwives based in a local facility has been explored [72]. There were mixed results, which appeared to depend on whether the midwives concerned saw this as a way to keep women out of hospital as long as possible, or whether they saw the telephone contact as a way of personalising care, advice, and hospital entry to the needs and expectations of the individual woman. The authors concluded that telephone contact with women in relation to early labour should be undertaken by health care providers dedicated to this task. A recent review of studies of telephone triage for a range of situations in maternity care concluded that there is not enough primary research in this area to reach a firm conclusion about its benefits or disadvantages [73]. The authors note that the findings are in line with previous research [56,72] which indicated that negotiating with women about facility entry in early labour is a complex process in which midwives have to balance the needs of the woman and moment-to-moment changes in labour ward conditions.

One of the problems in this area is that women who are told they are not in labour find it hard to determine when that situation has changed, and when they should either re-visit a facility to try to seek entry, or when they should phone back health care providers whom they know are busy [64]. In Papua New Guinea, mobile phones and a free-call emergency number (the ‘maternal health phone line’) are being used to overcome the communication issues associated with delay in seeking care in labour [74]. There is evidence that mHealth interventions targeted at pregnant women can increase service utilisation [75], but no studies have looked at the impact in relation to early labour care. Future research could assess the effects of regular mobile phone contact between SBAs and women who think they might be in early labour as a basis for optimum decision making about transportation or skilled birth provider attendance. Given women’s reluctance to call a busy facility, if an earlier call has resulted in advice to stay at home, such research should enable healthcare providers to initiate regular follow-up calls until the woman is finally admitted in labour. Other solutions include the placement of the phone line. In some maternity services in the UK, the 24 h ‘labour line’ has been moved from the maternity ward to an ambulance control centre. Calls are triaged by a dedicated midwife enabling women to receive support and advice [76].

For those who live too remotely to travel in early labour, but who are willing and able to move closer to facilities in late pregnancy, maternity homes or hotels that are affordable, comfortable, and safe could be situated near to the hospital to provide a supportive and reassuring environment before labour onset. Such homes have been associated with significant improvements in maternal and neonatal mortality in low income settings [77] and have been associated with positive maternal experiences [78]. However, women should never be compelled to attend such centres, as there is evidence that this can be traumatic for some, due to separation from family and friends, isolation, and loss of income if the woman cannot work [78–81]. The quality of the waiting home may also be a factor in their effectiveness in improving subsequent skilled birth attendance rates and outcomes [82].

Research gaps, challenges, and controversies

These include the need to:

- Systematically examine the state of the art and research gaps in this area from a clinical, behavioural, neurohormonal, psychological, social, and emotional perspective.
- Undertake primary science studies to address the identified gaps, taking account of the complex interconnectivity between the maternal and foetal dyad and including pre-labour priming, the
triggering mechanisms, and the consequences of these physiological process for the optimal postnatal adaptation of mother and newborn.

- Consider women's accounts of labour onset as a point of departure for basic science studies and for care provision in this area, including an assessment of temperature changes in late pregnancy.
- Explore the views and experiences of women in LMICs regarding the nature of labour onset, and what they should do once they believe they are in labour (research to date has focused primarily on HICs).
- Agree the criteria for labour onset; such a definition would provide the basis for research studies that examine the impact of interventions on length of labour.
- Provide more clarity for women and health care providers around latent phase labour (in terms of both the definition and the support offered) in order to deliver care that is both woman centred and evidence-based.
- Examine the utility, affordability, acceptability, and effectiveness of mobile technology solutions to agreeing labour onset between pregnant women, family, and other stakeholders, and maternity care providers.
- Learn from the best in terms of provision of high quality, effective, and acceptable maternity waiting homes.

Challenge:

- To ensure that the development of any clinical tests in this area is balanced with the individual experiences and situations of women, so that the tests do not become the only assessment tool used to determine labour onset.
- If more precise measures of labour onset are established, to balance women's needs and right to health care provider advice and support with the risks of early hospital admission, and to ensure that women (and their foetus) have access to appropriate care as and when they need it without being exposed to the cascade of unnecessary interventions which is known to be associated with early admission to facilities.
- To provide remote advice to women to ensure that they set off at the most opportune time in early labour and that facilities are able to support women who arrive before labour is established, particularly in settings where access to health care facilities is difficult, dangerous, and/or relatively expensive for women and families.
- To understand what the implications might be of routine labour induction in the absence of pathology, in the light of the neurophysiology of labour priming and initiation, and the consequences of these processes for maternal and newborn adaptation in the postnatal period.

Summary of the content of the chapter

A growing body of evidence suggests that the foeto-maternal dyad is finely tuned to ensure that both the mother and the foetus are prepared, physically and neurohormonally, for labour onset, and, as a consequence, for optimal labour, birth, and early postnatal wellbeing. Practitioners working in maternity care need to understand the interrelationships between spontaneous labour onset and effective safe labour progress in healthy women and babies, and to respect these finely tuned processes. Maternal behaviours can be indicators of imminent labour onset. Respectful and appropriate attitudes of health care providers in response to maternal reports of signs of labour onset are essential to ensure that women are taken seriously; that they are supported in finding a place to wait for labour to establish which enables them to cope in the early stages, and that routine provision and standardisation does not misinterpret or interrupt the physiological process for individual women. This is particularly important when women have to travel far to access health care facilities, at high relative cost to them and their families.
Increasing levels of routine labour induction at earlier and earlier gestations run the risk of interrupting these essential preparatory foetal and maternal processes, making it hard to initiate labour and resulting in more pain and distress for mother and baby, with as yet unknown longer term consequences. Getting the professional and institutional response to labour onset right is likely to result in a higher chance of a smooth and successful labour and postpartum period that is safe for mother and baby, and results in a positive experience for them and their birth companions and professional attendants.

Declaration of Competing Interest

None.

Practice points

- Early labour presents a significant challenge for pregnant women, their families, communities, and health care professionals. There is debate about which signs and symptoms should be used to define labour onset. A mismatch between women's and health care providers' perceptions of labour onset can result in significant discomfort and/or distress for both parties.
- Deciding when to seek care in early labour is a challenge for women. Hospital admission in the latent phase (before active labour) has been shown to result in a cascade of unnecessary intervention. Women are often advised to wait at home until labour is established. However, missing the signs of labour onset may result in a delay in seeking skilled care.
- Optimal maternity care should balance women's needs and right to health care provider advice and support with the risks of early hospital admission, ensuring that women (and their foetuses) have access to appropriate care as and when they need it, without being exposed to the cascade of unnecessary interventions.

Research agenda

- Further empirically driven research is urgently required to reach a consensus on the criteria for labour onset (in terms of both the definition and the support offered). This includes systematically examining labour onset from a clinical, behavioural, neurohormonal, psychological, social, and emotional perspective.
- Primary science studies are required to address the identified gaps, taking account of the complex interconnectivity in the maternal and foetal dyad, and including pre-labour priming, the triggering mechanisms, and the consequences of these physiological processes for the optimal postnatal adaptation of mother and newborn.

Acknowledgements

This work did not receive any funding.

The authors acknowledge the support, in terms of time, provided by their institutions, and are grateful to the reviewers for feedback that has improved the manuscript.

References


*35. Childbirth 2014;14:68.


*45. Childbirth 2014;14:68.


*55. Childbirth 2014;14:68.


*60. Childbirth 2014;14:68.


*70. Childbirth 2014;14:68.


[65] Lowik RM, Moftat A. Every labor is unique, but “call when your contractions are 3 minutes apart”. Mot Cycle News (MCN) 2006;31:307–12.


