

**Table S1 Summary of Evidence Table for identification and management of delay in the progression of first stage of labour.**

Components	Source of evidence	Recommendations/actions	Selected as a decision point (box number)	Link to other algorithms
Definition				
<b>Suspected slow progress of active first stage of labour:</b> cervical dilatation < 2 cm in 4 h or <0.5-1 cm/h or above upper limit of P95th for given cervical dilatation.	WHO 2018 <sup>1</sup> NICE 2017 <sup>2</sup> WHO 2014 <sup>3</sup> Abalos E et al. <sup>4</sup> Oladapo O, et al. <sup>5</sup>	<p><u>Active first stage of labour:</u> the active first stage is a period of time characterized by regular painful uterine contractions, a substantial degree of cervical effacement and more rapid cervical dilatation from 5 cm until full dilatation for first and subsequent labours.</p> <p>A cervical dilatation rate of less than 0.5 cm to 1 cm per hour during the active is commonly considered to be slow progress of labour, with the trigger for intervention stipulated at a variable period following such deviation. While it is widely acknowledged that labour tends to be faster among multiparous compared to nulliparous women, the same criteria often apply for identification of delay in both groups in clinical practice.</p>	1	
Monitoring				
Fetal and maternal assessment.	WHO 2018 <sup>1</sup> NICE 2017 <sup>2</sup> WHO 2015 <sup>6</sup>	<ul style="list-style-type: none"> <li>• Four-hour vaginal exam (unless clinically indicated).</li> <li>• Assessment of fetal wellbeing using doppler ultrasound or pinard. Intermittent auscultation of FHR.</li> </ul>	2	
Non-reassuring fetal heart rate?	WHO 2018 <sup>1</sup> NICE 2017 <sup>2</sup>	-Suspected fetal distress -The fetal heart rate abnormalities algorithms explain this in detail.	3-4-5	FHR link.

OR thick meconium?		-Medical review for individualized plan of care and decision on mode of birth. -Prepare for neonatal resuscitation.		Amniotic fluid link.
Management				
Initial management.	WHO 2018 <sup>1</sup> WHO 2015 <sup>6</sup>	-Provide adequate pain relief. -Ensure adequate hydration with IV fluids. Avoid oral fluids and food. -Encourage upright position and mobility. -Provide continuous companionship support.  WHO recommendations suggest that in order to have a positive childbirth experience: cervical dilatation, fetal presentation, position and attitude by digital vaginal examination and abdominal palpations by the health care provider is needed.	2	
Identify probably causes.	WHO 2018 <sup>1</sup> NICE 2017 <sup>2</sup>	Identify probable causes of delay of the first stage, a clinical reassessment of the woman, fetus and expulsive forces.	6	
Vertex or face (mento-anterior) presentation?	Williams. Obstetrics <sup>7</sup>	-Cephalic presentation: Fetus in a longitudinal lie with the head closest to the cervix. -Non- Cephalic presentation: Longitudinal, transversal or oblique lie. -Vertex position: "Vertex" diagnostic point is the occiput. -Non-Vertex position: Cephalic presentation other than vertex. -Brow: "Brow" diagnostic point is the fetal nose. -Face: "Face" diagnostic point is the chin.	7	
Are there signs of cephalopelvic disproportion/ obstructed labour?	NICE 2019 <sup>8</sup>	Presenting part with large caput, third degree moulding, cervix poorly applied to presenting part, oedematous cervix, ballooning of lower uterine segment, formation of retraction band, or maternal and foetal distress.  -Consider amniotomy if membranes intact. -Regular routine maternal observations in labour.	8-10-15-16	

		-Repeat vaginal examination in 2h.		
Malpresentation	Williams. Obstetrics <sup>7</sup>	<p>Cephalic presentation: Fetus in a longitudinal lie with the head closest to the cervix.</p> <p>-Non- Cephalic presentation: Longitudinal, transversal or oblique lie.</p> <p>-Vertex position: "Vertex" diagnostic point is the occiput.</p> <p>-Non-Vertex position: Cephalic presentation other than vertex.</p> <p>-Brow: "Brow" diagnostic point is the fetal nose.</p> <p>-Face: "Face" diagnostic point is the chin.</p> <p>-Medical review for caesarean section.</p> <p>-Consider vaginal birth for breech presentation.</p> <p>-Prepare for neonatal resuscitation.</p>	9-11	
Is labour progress adequate? 2 cm in 4 h or below upper limit of P95th for cervical dilation.	WHO 2018 <sup>1</sup> NICE 2017 <sup>2</sup> WHO 2014 <sup>3</sup> Abalos E et al. <sup>4</sup> Oladapo O, et al. <sup>5</sup>	-Normal Labour	12	Link to normal 1st stage of labour Algorithm-
Delay in progress of labour.	WHO 2018 <sup>1</sup> NICE 2017 <sup>2</sup> WHO 2014 <sup>3</sup> Abalos E et al. <sup>4</sup> Oladapo O, et al. <sup>5</sup>	<p>A cervical dilatation rate of less than 0.5 cm to 1 cm per hour during the active is commonly considered to be slow progress of labour, with the trigger for intervention stipulated at a variable period following such deviation. While it is widely acknowledged that labour tends to be faster among multiparous compared to nulliparous women, the same criteria often apply for identification of delay in both groups in clinical practice.</p> <p>Augmentation with oxytocin should be performed when indicated as treatment of confirmed delay of labour progress. The use of oxytocin alone for treatment of delay in labour is recommended.</p>	13	
3 or 4 contractions in 10 minutes	WHO 2014 <sup>3</sup>	-Inadequate uterine activity.	14-17	Link to uterine hypoactivity

each lasting 40-60 sec?				algorithm.
Cephalopelvic disproportion / Obstructed labour.	NICE 2019 <sup>8</sup>	-Cephalopelvic disproportion is defined as secondary arrest of cervical dilatation and descent of presenting part in presence of good contractions.  -Obstructed labour is defined as secondary arrest of cervical dilatation and descent of presenting part with large caput, third degree moulding, cervix poorly applied to presenting part, oedematous cervix, ballooning of lower uterine segment, formation of retraction band, or maternal and fetal distress.	8-10-15-16	
Are there signs of cephalopelvic disproportion/ obstructed labour?	WHO 2014 <sup>3</sup>	- Start oxytocin and adjust rate of infusion. - Asses contractions, pulse and fetal heart rate every 30min. - Review progress of labour.	15-18	
Inadequate progress? <2 cm in 4 h or above upper limit of P95th for cervical dilation.	Abalos E et al. <sup>4</sup> Oladapo O, et al. <sup>5</sup>	-Medical review to consider caesarean section. -Prepare for neonatal resuscitation.  - Vaginal birth	19-20-21	

## References

1. WHO recommendations: intrapartum care for a positive childbirth experience. Geneva: World Health Organization; 2018. Licence: CC BY-NC-SA 3.0 IGO.
2. NICE guidelines Intrapartum care: Care of healthy women and their babies during childbirth December 2014. Updated February 2017
3. WHO recommendations for augmentation of labour. Geneva: World Health Organization; 2014.
4. Abalos E et al. Duration of spontaneous labour in “low-risk” women with “normal” perinatal outcomes: a systematic review. Eur J Obstet Gynecol Reprod Biol. 2018;223:123–32.
5. Oladapo O et al. Cervical dilatation patterns of “low risk” women with spontaneous labour and normal perinatal outcomes: a systematic review. BJOG. 2017

6. WHO recommendations for prevention and treatment of maternal peripartum infections. Geneva: World Health Organization; 2015.
7. Williams. Obstetrics. 24e
8. NICE Pathway last updated: 29 November 2019. Delay and complications in second stage of Labour.

**Table S2 Algorithm Reference Tables for identification and management of delay in the progression of first stage of labour.**

Box N°	Box text	Annotations	Source of evidence
1.	Suspected slow progress of active first stage of labour: cervical dilatation < 2 cm in 4 h or <0.5-1 cm/h or above upper limit of P95th for given cervical dilatation.	<p><u>Active first stage of labour:</u> the active first stage is a period of time characterized by regular painful uterine contractions, a substantial degree of cervical effacement and more rapid cervical dilatation from 5 cm until full dilatation for first and subsequent labours.</p> <p>A cervical dilatation rate of less than 0.5 cm to 1 cm per hour during the active is commonly considered to be slow progress of labour, with the trigger for intervention stipulated at a variable period following such deviation. While it is widely acknowledged that labour tends to be faster among multiparous compared to nulliparous women, the same criteria often apply for identification of delay in both groups in clinical practice.</p>	WHO 2018 NICE 2017 WHO 2014 Abalos E et al. Oladapo O, et al.
2.	<p>Maternal assessment</p> <ul style="list-style-type: none"> <li>-Assess general condition: dehydration.</li> <li>-Perform maternal observations: pulse, blood pressure, temperature, urine output.</li> <li>-Palpate uterus: fetal presentation, position, engagement of the presenting part and descent. frequency, intensity and duration of contractions in 10 minutes.</li> <li>-Perform vaginal examination: asses membranes, liquor, bleeding, discharge, effacement, fetal presenting part, caput and moulding, position and descent, edematous cervix and cervix poorly applied to the presenting part.</li> </ul> <p>Fetal assessment</p> <ul style="list-style-type: none"> <li>-Asses fetal heart rate (FHR) using intermittent</li> </ul>	<p>Four hour vaginal exam (unless clinically indicated)</p> <p>Assesment of fetal wellbeing using doppler ultrasound or pinard.</p> <p>Intermittent auscultation of FHR.</p> <p>Pain management</p> <p>Oral fluid and food intake</p> <p>Encourage mobility and upright position and companionship</p> <p>WHO recommendations suggest that in order to have a positive childbirth experience cervical dilatation, foetal presentation, position and attitude by digital vaginal examination and abdominal palpations by the health care provider is needed.</p>	WHO 2018 NICE 2017 WHO 2015

	<p>auscultation or cardiotocography if available.</p> <p>Initial management</p> <ul style="list-style-type: none"> <li>-Provide adequate pain relief.</li> <li>-Ensure adequate hydration with IV fluids. Avoid oral fluids and food.</li> <li>-Encourage upright position and mobility.</li> <li>-Provide continuous companionship support.</li> </ul>		
3.	Non-reassuring fetal heart rate ? OR thick meconium?	The fetal heart rate abnormalities algorithms explain this in detail.	
4.	Suspected fetal distress	The fetal heart rate abnormalities algorithms explain this in detail.	
5.	<ul style="list-style-type: none"> <li>- Medical review for individualized plan of care and decision on mode of birth.</li> <li>- Prepare for neonatal resuscitation.</li> </ul>		
6.	Identify probable cause		
7.	Vertex or face presentation (mento anterior position)?	<p>Cephalic presentation: Fetus in a longitudinal lie with the head closest to the cervix.</p> <p>-Non- Cephalic presentation: Longitudinal, transversal or oblique lie.</p> <p>-Vertex position: "Vertex" diagnostic point is the occiput.</p> <p>-Non-Vertex position: Cephalic presentation other than vertex.</p> <p>-Brow: "Brow" diagnostic point is the fetal nose.</p> <p>-Face: "Face" diagnostic point is the chin.</p>	Williams Obstetrics 24e.
8.	Are there signs of cephalopelvic disproportion/obstructed labour?	<p>Cephalopelvic disproportion is defined as secondary arrest of cervical dilatation and descent of presenting part in presence of good contractions.</p> <p>Obstructed labour is defined as secondary arrest of cervical dilatation and descent of presenting part with large caput, third degree moulding, cervix poorly applied to presenting part, oedematous cervix, ballooning of lower uterine segment,</p>	NICE 2017

		formation of retraction band, or maternal and fetal distress.	
9.	Malpresentation	<p>Cephalic presentation: Fetus in a longitudinal lie with the head closest to the cervix.</p> <p>-Non- Cephalic presentation: Longitudinal, transversal or oblique lie.</p> <p>-Vertex position: "Vertex" diagnostic point is the occiput.</p> <p>-Non-Vertex position: Cephalic presentation other than vertex.</p> <p>-Brow: "Brow" diagnostic point is the fetal nose.</p> <p>-Face: "Face" diagnostic point is the chin.</p>	Williams Obstetrics 24e.
10.	<p>-Consider amniotomy if membranes intact.</p> <p>-Regular routine maternal observations in labour.</p> <p>-Repeat vaginal examination in 2h.</p>	When there is delay in the established first stage of labour, there is high-level evidence that the duration is shortened by amniotomy.	NICE 2017
11.	<p>-Medical review for caesarean section.</p> <p>-Consider vaginal birth for breech presentation.</p> <p>-Prepare for neonatal resuscitation.</p>		
12.	<p>Is labour progress adequate?</p> <p>2 cm in 4 h or below upper limit of P95th for cervical dilation.</p>	A cervical dilatation rate of less than 0.5 cm to 1 cm per hour during the active is commonly considered to be slow progress of labour, with the trigger for intervention stipulated at a variable period following such deviation. While it is widely acknowledged that labour tends to be faster among multiparous compared to nulliparous women, the same criteria often apply for identification of delay in both groups in clinical practice.	WHO 2018 NICE 2017 WHO 2014 Abalos E et al. Oladapo O, et al.
13.	Delay in progress of labour	Active phase partograph with a four-hour action line is recommended for monitoring the progress of labour.	WHO 2014 WHO 2018 NICE 2017
14.	3 or 4 contractions in 10 minutes each lasting 40-60 sec?	The use of oxytocin alone for treatment of delay in labour is recommended.	WHO 2014
15.	Are there signs of cephalopelvic disproportion/ obstructed labour?	<p>Cephalopelvic disproportion is defined as secondary arrest of cervical dilatation and descent of presenting part in presence of good contractions.</p> <p>Obstructed labour is defined as secondary arrest of cervical</p>	NICE 2017

		dilatation and descent of presenting part with large caput, third degree moulding, cervix poorly applied to presenting part, oedematous cervix, ballooning of lower uterine segment, formation of retraction band, or maternal and fetal distress.	
16.	Cephalopelvic disproportion / Obstructed labour	Cephalopelvic disproportion is defined as secondary arrest of cervical dilatation and descent of presenting part in presence of good contractions. Obstructed labour is defined as secondary arrest of cervical dilatation and descent of presenting part with large caput, third degree moulding, cervix poorly applied to presenting part, oedematous cervix, ballooning of lower uterine segment, formation of retraction band, or maternal and fetal distress.	NICE 2017
17.	Inadequate uterine activity	Augmentation with oxytocin should be performed when indicated as treatment of confirmed delay of labour progress.	WHO 2014
18.	- Start oxytocin and adjust rate of infusion. - Asses contractions, pulse and fetal heart rate every 30min. - Review progress of labour.	The use of oxytocin alone for treatment of delay in labour is recommended.	WHO 2014
19.	Inadequate progress? <2 cm in 4 h or above upper limit of P95th for cervical dilation.	A cervical dilatation rate of less than 0.5 cm to 1 cm per hour during the active is commonly considered to be slow progress of labour, with the trigger for intervention stipulated at a variable period following such deviation. While it is widely acknowledged that labour tends to be faster among multiparous compared to nulliparous women, the same criteria often apply for identification of delay in both groups in clinical practice.	WHO 2018 NICE 2017 WHO 2014 Abalos E et al. Oladapo O, et al.
20.	-Medical review to consider caesarean section. -Prepare for neonatal resuscitation.		
21.	Vaginal birth		