# Women's & Newborn Health Program
# Policy & Procedure

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|---|---|---|---|
| **TITLE:** | Intrauterine Pressure Catheter (IUPC)/ Amnioinfusion | **NUMBER:** | 7095 |
| Sponsor**:** | Manager – Birth Unit | Page: | 1 of 18 |
| Approved by: | Childbirth Care Team<br>Policy and Practice Committee | Approval Date:<br>Effective Date: | March 9th, 2021<br>April 1st, 2021 |
| Applies To: | Birth Unit Registered Nurses, Physicians, and Midwives | | |

## PREAMBLE

Internal uterine monitoring is done via an intrauterine pressure catheter (IUPC). IUPC's provide a reliable, quantitative measure of uterine activity with minimal artifacts in laboring person/persons (Pauli, 2020).

The IUPC may also be used as a conduit for performing amnioinfusion. During an amnioinfusion, Normal Saline or Ringer's Lactate solution is introduced into the amniotic cavity through the IUPC and is infused either by gravity or by an infusion pump. Amnioinfusions can be helpful in the treatment of recurrent variable decelerations in fetal heart rate (FHR) caused by oligohydramnios during the first stage of labour.

This policy outlines the procedure for insertion of an IUPC, how to care for a patient with an IUPC and the performance of an amnioinfusion.

## POLICY STATEMENTS

1. Intrauterine pressure catheters (IUPC) will not be used for routine monitoring of uterine activity during spontaneous labour, induction, or augmentation.

2. Insertion of an IUPC can be considered when:
    - External tocodynamometry which measures the frequency and duration of contractions, does not provide a clear tracing or when contraction strength is difficult to assess by palpation (e.g. persons who are frequently changing position, maternal obesity).

- The precise relationship between the start/end of fetal heart rate decelerations and the start/end of contractions is not clear on the external tracing and is necessary for interpreting the fetal heart rate pattern (Pauli, 2020).
- Objective calculation of contraction strength is needed for titrating oxytocin rates to provide optimal contractions while preventing tachysystole.
- An amnioinfusion is required.

3. Intrauterine pressure catheters are inserted by obstetrical resident or obstetrician/physician.

4. The relative risks and benefits associated with the use of an IUPOC must be carefully considered by the inserter in the presence of undiagnosed vaginal bleeding or intrauterine infection.

5. Amnioinfusion requires a physician's order that contains the following:
    - The type of fluid Ringers lactate or 0.9% normal Saline
    - The amount of fluid to be infused for bolus and infusion rate
    - The amount of fluid and rate for maintenance infusion

6. All registered nurses in the Birth Unit will receive education during unit specific orientation on the care and management of a patient with an IUPC and amnioinfusion
    6.1. The RN is accountable and responsible to self-assess their competency in the care and management of a patient with an IUPC and amnioinfusion.
    6.2. If this is beyond the RN's level of knowledge, skill and expertise, the RN is required to take action to address any knowledge gaps to ensure the delivery of safe care. This could include notifying the Team leader, Clinical Leader of Development/ Clinical Leader of Operations for assistance.

## GUIDING PRINCIPLES AND VALUES

1. An IUPC can be inserted once membranes are ruptured and the cervix is at least 2-3 centimeters dilated.
2. IUPC's should not be routinely used for monitoring uterine activity during spontaneous labour, induction, or augmentation, because routine use does not improve maternal or fetal outcomes (Pauli, 2020).
3. An amnioinfusion may significantly resolve patterns of moderate to severe variable decelerations but does not affect late decelerations or patterns with absent variability.
4. Amnioinfusion is no longer a recommended treatment for meconium stained fluid as it has not been shown to decrease the risk of moderate to severe meconium aspiration syndrome or perinatal death.

5. Amnioinfusion should be limited to the treatment of recurrent variable decelerations during first stage labour which have not resolved with maternal position changes.

## PROTOCOL

1. The use of an IUPC should be carefully considered in terms of relative risks and benefits.

2. IUPC may be used in the following clinical situations for accurate assessment of the frequency, duration, and strength of uterine contractions:
   2.1. to assist with and direct the appropriate dose titration of the oxytocin infusion:
      2.1.1. During augmentation for a trial of labour after a Caesarean birth (TOLAC).
      2.1.2. For augmentation when dystocia or obstructed labour is suspected.
   2.2. With grand multiparity (greater than five deliveries) and when uterine tone is in question.
   2.3. When patient obesity interferes with/prevents external assessment of contractions by palpation.
   2.4. When amnioinfusion is required to treat variable decelerations due to cord compression.
   2.5. An amnioinfusion may resolve atypical FHR patterns where variable decelerations exist. Amnioinfusion does not affect late decelerations or patterns with absent variability.
      2.5.1. An amnioinfusion is no longer recommended as a treatment for meconium stained fluid because it did not decrease or reduce the risk of moderate to severe meconium aspiration syndrome or perinatal death.
      2.5.2. Amnioinfusion should be limited to the treatment of recurrent variable decelerations during first stage labour which have not resolved with patient position changes.

**Indications for amnioinfusion include oligohydramnios and/or variable decelerations related to suspected cord compression.**

3. It is the responsibility of the physician inserting the IUPC to assess for the presence of contraindications. Contraindications include, but are not limited to:
   - Insufficient cervical dilation
   - Vaginal bleeding of unknown origin
   - Placenta previa
   - Active maternal infections (i.e. maternal HIV seropositivity, active genital herpes, hepatitis B or C)
   - Umbilical cord prolapse
   - Chorioamnionitis

- Severe fetal distress, late decelerations
- Impending birth

4. Complications following IUPC placement are rare, and most are believed to be related to improper placement in the extramembranous space. This can lead to placental abruption, laceration of the placenta or uterine perforation.

## PROCEDURE

### IUPC Insertion

1. The Obstetrician/Obstetrical Resident must obtain and document verbal informed consent (See IWK Policy #124.1 – *Consent to Treatment*).

2. The Registered Nurse gathers and prepares the following equipment:
   - Reusable transducer cable and patient module cable
   - Disposable IUPC monitoring kit
   - Sterile gloves

3. The RN confirms the fetal monitor is on and functioning.

4. The RN assists the patient with positioning for vaginal exam and IUPC insertion.

5. The obstetrical resident or obstetrician/physician performs a thorough pre-insertion clinical assessment, including: dilation, fetal presentation, station, membrane status and placenta location.

6. The physician inserts the IUPC as per the product instructions Refer to Appendices B & C for details.

7. The RN secures the IUPC to the patient's leg following insertion with tape.

8. The RN plugs the reusable transducer cable into the fetal monitor. The monitor is automatically zeroed. The IUP (intrauterine pressure) display shows "0".

9. The RN connects the reusable cable to the IUPC connection site.

10. Ask the patient to cough following IUPC insertion, and observe for an increase in pressure that reflects correct positioning of the IUPC.

### IUPC Ongoing Management by the RN/Physician

1. The RN assesses the following:

1.1. Contraction pattern frequency; number of contractions in 10 minute window averaged over a 30 minute period
1.2. Resting uterine tone or baseline in mmHg. Normal resting tone is 5 -25 mmHg.
1.3. Strength in mmHg of peak uterine pressure. Adequate contraction strength is 50-60 mmHg above the resting tone.
1.4. Adequacy of labour calculated by Montevideo units (MVUs). MVUs are calculated by measuring the peak uterine pressures in mmHg then subtracting the baseline rate or resting tone from the peak uterine pressure and adding up the values in a 10 minute period. (SOGC, 2020) *See Appendix D for example of how to calculate MVU*.

**NOTE: Adequate uterine activity is a contraction pattern that generates greater than 200 MVUs (SOGC, 2020). Variance may occur depending on the placement of the catheter and positioning of the patient. . 200-250 MVUs is considered adequate and expected to result in a normal rate of cervical change and fetal descent.**

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2. The RN observes the patient for signs and symptoms of uterine rupture, and notifies the physician immediately if they exist. Signs and symptoms include:
   2.1. Hypertonic uterine activity pattern
   2.2. Vaginal Bleeding
   2.3. Sudden severe uterine pain
   2.4. Chest or shoulder pain
   2.5. Atypical/abnormal fetal heart rate tracing

3. If at any time a high resting value greater than 25 mmHg is noted and the uterus feels relaxed on palpation, the system must be re-zeroed by:
   3.1 Disconnecting the IUPC cable from the monitor cable
   3.2 Re-zeroing the monitor
   3.3 Waiting 10 – 15 seconds before reconnecting the catheter to the cable

4. If waveform is dampened and IUPC is in the amniotic space (amniotic fluid was seen in the catheter during insertion) then:
   4.1 Disconnect the catheter from the cable
   4.2 Rotate or retract the catheter a few centimeters to try and find a pocket of amniotic fluid
   4.3 Wait 10 – 15 seconds then reconnect the catheter to the cable
   4.4 If the waveform continues to be dampened the catheter may be flushed with normal saline

5. The RN/Physician performs additional troubleshooting of IUPC as necessary (See Appendix D for details).

6. When the IUPC is no longer required, the RN may disconnect the IUPC from the transducer cable and remove it by applying light pressure and pulling away from the introitus.

7. The patient may ambulate with an IUPC in situ. Simply disconnect the IUPC from the reusable cable. When the patient returns the monitor may need to be re-zeroed.

**IUPC Documentation**

1. Document the following on the patient's permanent health record:
   1.1. Insertion of IUPC
   1.2. Indications for IUPC placement
   1.3. Resting tone baseline following insertion
   1.4. Uterine activity (as per IWK Policy #7070 – *Intrapartum Fetal Health Surveillance*) including:
      1.4.1. Frequency
      1.4.2. Duration
      1.4.3. Strength/Intensity in mmHg
   1.5. Patient physical and/psychological tolerance of procedure

**Amnioinfusion Initiation & Ongoing Management**

1. Informed verbal consent must be obtained prior to initiation of amnioinfusion (See IWK Policy #124.1 – *Consent to Treatment*). Consider language barriers and/or fear when discussing procedure. Inform patient of what to expect with amnioinfusion i.e. leaking of fluid.

2. The Registered Nurse (RN) gathers and prepares the following equipment:
   - Room temperature 1000mL Normal Saline(NS) or Ringer's Lactate (RL) IV solution
   - Appropriate IV tubing (gravity or pump tubing)

3. Prime IV tubing with NS/RL and connect to IUPC port.

4. Infuse the amnioinfusion by gravity or an infusion pump.

5. Administer initial 250-500 mL bolus of fluid over 20-30 minutes or as ordered by the physician.
   5.1. Review the FHR pattern to determine whether the amnioinfusion bolus has improved fetal status.
   5.2. If no improvement noted, contact the physician for next steps i.e. repeat bolus, continue with maintenance infusion and observe
   5.3. As a general consideration, if 250 mL of fluid has been infused with no return, the amnioinfusion is discontinued until the fluid is returned.

6. A maintenance infusion rate of 100-150 mL/hr by gravity may be ordered. Refer to the physician's order for specifics. If using an infusion pump, program accordingly.

7. Reassure patient that an increase in leaking fluid is expected.

8. Continually assess the patient for signs and symptoms of complications, including:
    - Uterine over-distention
    - Uterine rupture
    - Infection
    - Prolapsed cord

9. Continually monitor the following during amnioinfusion:
    - Uterine contraction duration, intensity, and frequency. Monitor closely to identify uterine over distention or increased uterine tone.
    - Fluid leakage per vagina
    - Change in status of the fetal heart rate pattern
    - Intake and output of uterine fluid

**NOTE: The uterine resting tone may appear higher than normal during the procedure (from 25-40mmHg). If there is a concern about an elevated resting tone (greater than 40mmHg), temporarily discontinue the infusion to attempt more accurate assessment. If the uterine resting tone exceeds 25 mmHg while the infusion is temporarily discontinued, consider discontinuing the infusion and**

10. Document the following on the patient's health care record:
    - Indications for amnioinfusion
    - Type and amount of fluid for amnioinfusion
    - Infusion initiation time
    - Method of infusion (gravity or infusion pump)
    - Total amount of fluid infused
    - FHR response to amnioinfusion
    - Contraction intensity and frequency and pressures before, during and after the amnioinfusion.
    - Amount, colour, and odor of fluid leaking from vagina
    - Vaginal exam findings
    - Maternal position during and after amnioinfusion
    - Patient physical and/or psychological tolerance (i.e. comfort or pain during amnioinfusion)

## REFERENCES

Pauli, J. M. (2020). Use of intrauterine pressure catheters. Retrieved on November 17th, 2020 from https://www.uptodate.com/contents/use-of-intrauterine-pressure-catheters/print?search=Vasa%20previa&source=search_result&selectedTitle=10~19&usage_type=default&display_rank=10

Phillips (2020). Philips Disposable Intrauterine Sensor Tip Catheter (M1333a) Instructions for Use.

Society of Obstetricians and Gynecologists of Canada (SOGC) Council (2020). Fetal Health Surveillance: Intrapartum Consensus Guideline. *JOGC, 42(*3): 316-348.

## Additional References Reviewed:

BC Women's Hospital (2016). Intrapartum Amnioinfusion. Fetal Maternal Newborn and Family Health Policy & Procedure Manual.

BC Women's Hospital (2016) Intrauterine Pressure Catheter. Fetal Maternal Newborn and Family Health Policy & Procedure Manual.

Champlain Maternal Newborn Regional Program (2014) Intrauterine Pressure Catheter – Assisting with Insertion and Monitoring Guideline

## RELATED DOCUMENTS

### Policies

IWK Health Centre Policy #7070 Intrapartum Fetal Health Surveillance

IWK Health Centre Policy #7114 Intellispace Perinatal (IPN)

IWK Health Policy #124.1 – Consent to Treatment

IWK Health Policy #7172 – Vaginal Examination

### Appendices

Appendix A – Definitions

Appendix B – IUPC Set Up and Insertion

Appendix C – Philips Disposable Intrauterine Pressure Sensor Tip catheter (M1333A) instructions for Us4e (Adapted from Philips Koala manufacturers packaging November 2020).

Appendix D –Troubleshooting IUPC

# Appendix A – Definitions

**Amnioinfusion-** the installation of fluid (Ringer's Lactate/Normal Saline) into the amniotic cavity to increase the volume of fluid cushioning the umbilical cord when oligohydramnios is present.

**Contraction frequency –** is measured from the beginning of one contraction to the beginning of the next and is described in minutes. Number of contractions assessed in a 10 minute window is averaged over 30 minutes. Assessing uterine activity helps identify tachysystole.

**Contraction Duration –** is the length of contraction from beginning to end and is described in seconds.

**Contraction Intensity –** refers to the strength of the contraction and is described as mild, moderate, or strong by palpation or in millimeters of mercury (mmHg) or Montevideo units (MVUs) if an IUPC is used.

**External tocodynamometry or "toco"-** a device that monitors and records uterine contractions before and during labour. It consists of a pressure transducer that is placed over the fundus area of the uterus using a belt, and then records the duration of the contraction and the intervals between them on a monitor or on graph paper.

**Extramembranous Space –** located between the uterine wall and fetal membranes

**Intrauterine pressure catheter (IUPC) -** a device placed through the cervix into the uterine cavity that transmits pressure changes in mmHg via a transducer. An IUPC accurately records uterine resting tone, intensity, duration and frequency of contractions. The IUPC is an accurate direct measurement of intra-amniotic pressure. It requires ruptured membranes for insertion and technical difficulties with insertion or setup requiring troubleshooting are not uncommon.

**Peak of a contraction –** with an IUPC, the peak is indicated on the fetal monitor as the actual strength of the contraction measured in mmHg pressure within the amniotic cavity. Normal values for peak IUP are 40-80 mmHg. This is derived by subtracting the peak IUP from the resting tone.

**Uterine resting tone –The baseline tone of the uterus in the** absence of contractions or between contractions. By direct palpation, resting tone is described as soft or hard and via IUPC in terms of mmHg or MVUs. Acceptable baseline resting pressures are 5 – 25 mmHg. It is important that resting tone by palpation be validated.

**Dampened wave form –** low amplitude contractions that are poorly defined.

**Montevideo units –** a measurement that is calculated by subtracting the baseline uterine pressure from the peak contraction pressure of each contraction in a 10 minute period when

using an IUPC and adding the pressures generated by each contraction. The value of MVUs have been established in the literature and demonstrate that in normal pelvic conditions, a reasonably sized fetus in the correct position descend into the pelvis and effect vaginal birth in a spontaneous, augmented or induced labour with MVUs ranging from 200-250 mmHg. (CMNRP, 2014, SOGC 2020)

**Tachysystole (uterine) –** more than 5 contractions in 10 minutes averaged over a 30-minute window; contractions lasting longer than 90 seconds in duration, or resting tone lasting less than 30 second or a uterus that remains firm (greater than 25mmHg) between contractions. Tachysystole should always be qualified as the presence of a normal, atypical, or abnormal fetal heart rate tracing. Tachysystole also applies to spontaneous and stimulated labour.

**Deceleration-** A decrease in the FHR that is abrupt or gradual and is termed early, late or variable.

**Variability-** refers to the fluctuations in the FHR baseline that are irregular in amplitude and frequency. It measures the bpm difference between the lowest and the highest FHR. The difference is the range/amplitude of variability. Variability is a normal characteristic of the FHR largely controlled by the effect of the vagal nerve on the heart. Moderate variability may indicate the absence of fetal metabolic academia at the time this is observed.

**Meconium Aspiration Syndrome –** is respiratory distress in a newborn who has aspirated a dark green, sterile fecal material called meconium into the lungs before or around the time of birth. Even though fetuses do not eat, their intestines contain a sterile substance called meconium.

# Appendix B – Equipment Required for IUPC Placement

Illustration ① shows the complete connection chain from the IUP catheter to the fetal monitor using the patient module:

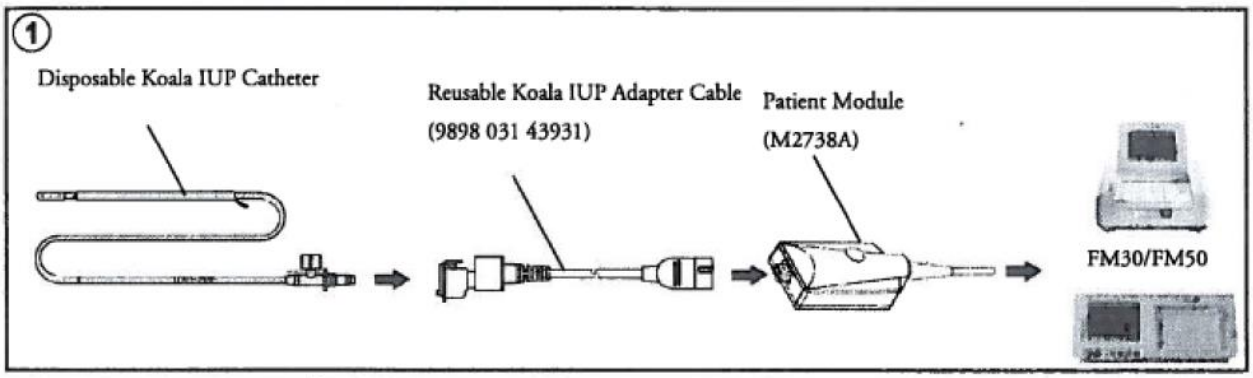
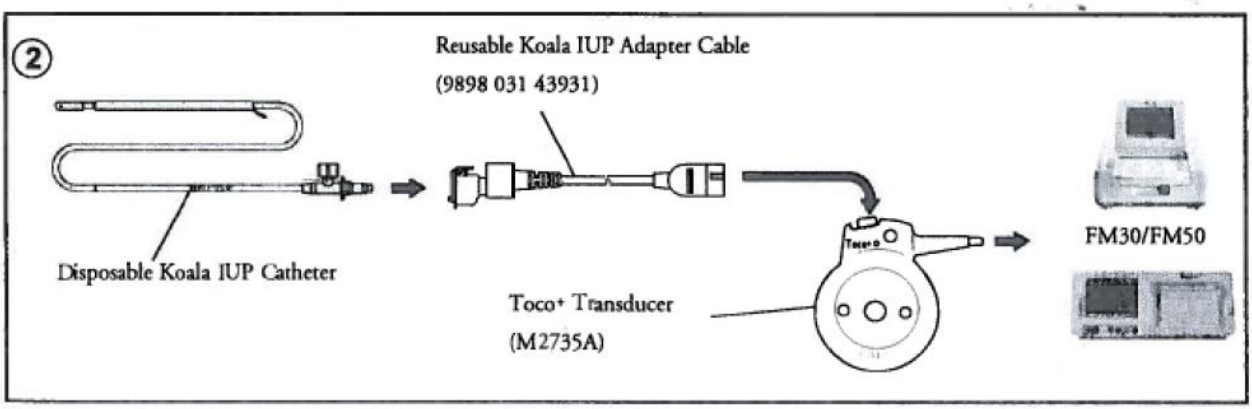



Illustration ② shows the complete connection chain from the IUP catheter to the fetal monitor using the Toco+ transducer:




*Philips (2007) Avalon Fetal Monitor: Instructions for Use Manual.*

# Appendix C

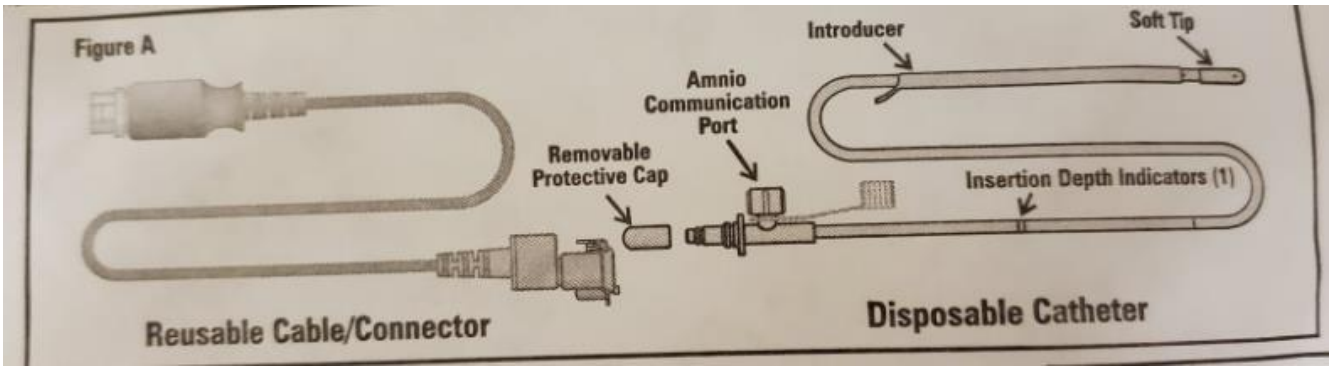
## Philips Disposable Intrauterine Sensor Tip Catheter (M1333a)

## Instructions for Use

(Adapted from Philips Koala Manufacturers packaging November 2020)

### Catheter Preparation

1. Gather necessary supplies: Koala catheter, appropriate cable for connection to the fetal monitor and infusion fluid with IV fluid if performing amnioinfusion. See Figure A.




2. Turn fetal monitor on (if not already on).
3. Plug cable/connector into fetal monitor outlet
4. Open the sterile package. The inner pouch may be used for sterile transfer.
5. According to the standard protocol using sterile technique, remove the catheter from the package and prepare for insertion.

### Catheter Insertion, Zeroing and Removal

6. Ensure membranes are ruptured and cervix is adequately dilated.
7. Perform vaginal exam and with index finger, palpate the presenting part to determine optimal position for placement.
8. Ensure the amnioport is vented by confirming the filtered vent cap is in place on the amnioport.
9. Insert introducer and catheter through vagina up to the cervical os. Secure introducer between examining fingers adjacent to present part. **DO NOT EXTEND INTRODUCER BEYOND FINGERTIPS.**

10. Advance Koala 10 -14 centimeters into uterus by inserting catheter until bottom of introducer is at text “Pause for flashback”. (See Figure B)

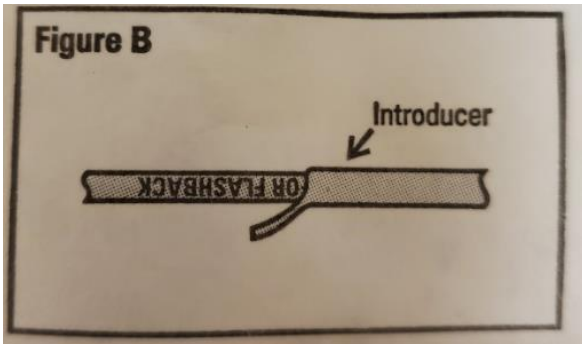
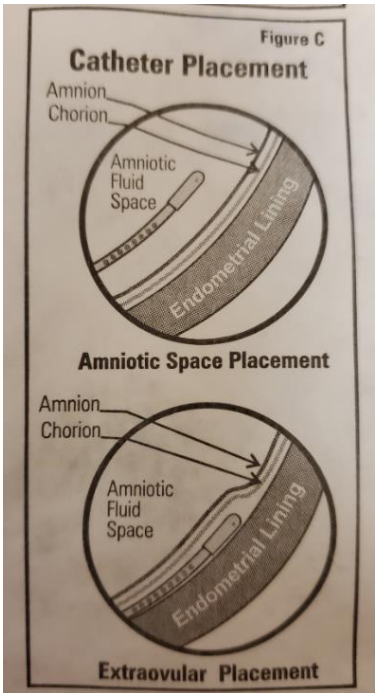



Figure B

11. Ensure the catheter has been placed in the amniotic space by watching for amniotic fluid flowing through catheter length. **EVIDENCE OF BLOOD INDICATES EXTRAOVULAR PLACEMENT. See Figure C.**

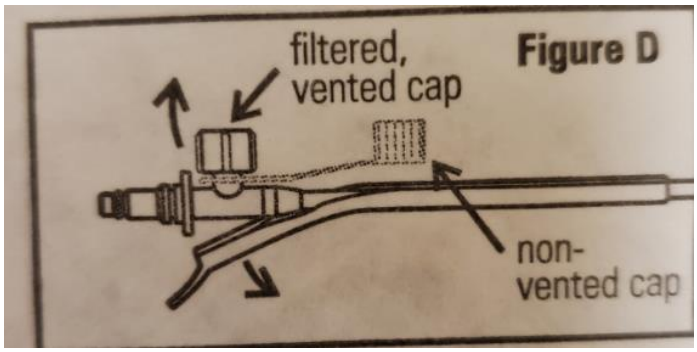



12. If catheter placement does not proceed easily:
    a. Pull back the catheter tip to the introducer and alter the catheter direction by changing the angle of the introducer
    b. Determine alternate position for placement and proceed with insertion. Repeat steps 10, 11, and 12 until you are comfortable the catheter is properly placed. **DO NOT USE EXCESSIVE FORCE OR CAUSE PATIENT TRAUMA**.

13. Advance the catheter until the double insertion depth indicator marks reach the introitus. This indicates that the tip of the catheter has progressed 30-45 centimeters

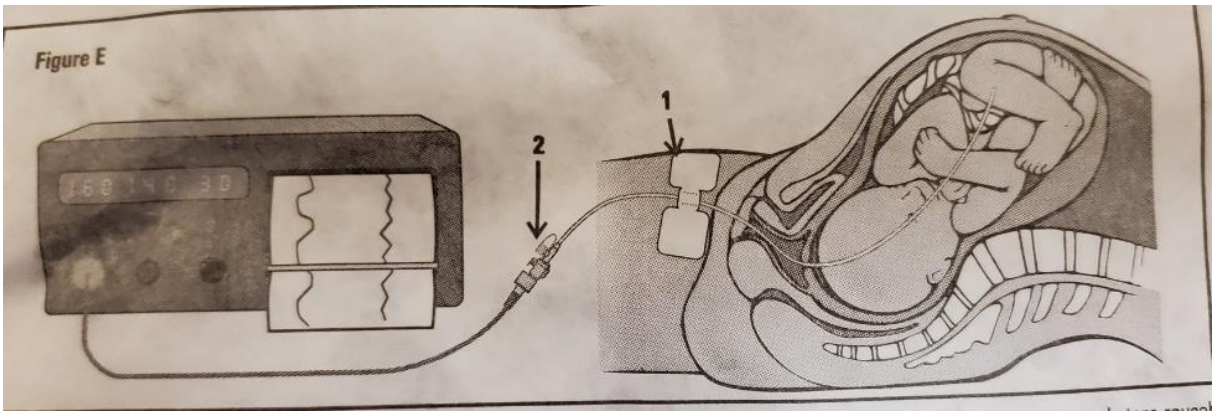
into the uterus and should be positioned at the fundus of the uterus. **The "STOP" MARKING SHOULD STILL BE VISIBLE OUTSIDE THE VAGINA. (**See Figure A)

14. Following insertion and verification of placement carefully slide introducer back along catheter. Push the introducer along ramp or pull catheter through introducer slot for removal.




15. The hydrophobic filtered vent cap may be removed and replaced by tethered cap or left in place.

16. To secure the IUPC remove paper from center portion of adhesive pad and secure catheter or cable/connector to center of pad (pinch adhesive pad around it). Remove remaining paper from adhesive pad and secure to patient's thigh as close to introitus. This prevents the IUPC from working itself out of the uterus when the catheter is flexed.




17. Zero the fetal monitor. For true zero, ensure catheter is disconnected from cable/connector and zero monitor. Do not zero monitor while holding cable button (if present).

18. Remove yellow protective cap from catheter. Connect cable/connector to catheter. Connection to catheter must be performed after placement into the uterus.

19. Verify that the catheter is properly placed by encouraging patient to cough and confirming a sharp spike on uterine activity tracing.

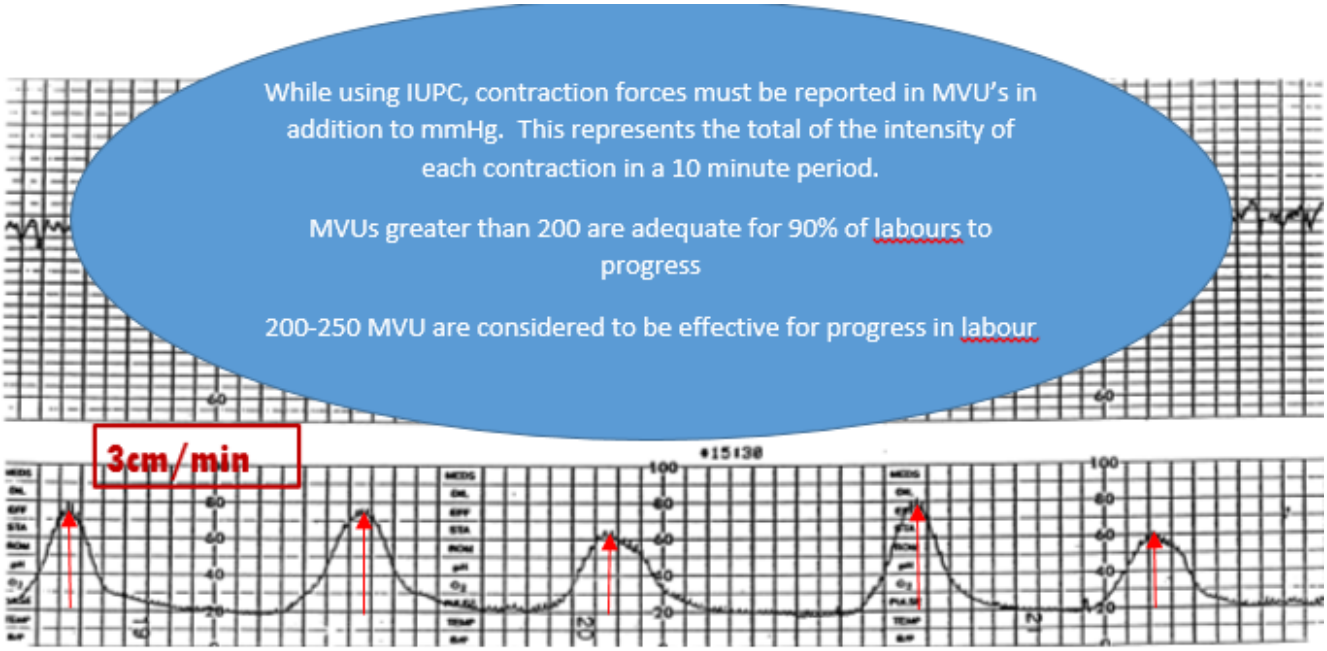
20. Document insertion in patient's permanent health record.

21. If IUPC does not respond:
    a. Confirm cable/catheter is correct for monitor
    b. Disconnect catheter from cable/connector, flush with 10-20cc through amnio port and reconnect
    c. Disconnect catheter from cable/ connector, rotate, retract, or advance catheter, wait15 seconds then reconnect.

22. To remove the IUPC, grasp the catheter and pull gently until withdrawn completely. Disconnect catheter from cable/monitor. Discard catheter.

23. Clean and store reusable cable/connector for future use.

## Appendix D Calculating Montevideo Units (MVUs)




55 + 55 + 40 + 60 + 40 = 250 MVUs

(Note that the baseline pressure was subtracted from each reading to get your number)

**Example:**

Baseline tone = 20 mmHg

Number of uterine contractions in 10 minutes = 5

Intensity of each uterine contraction = 75, 75, 60, 80, 60 mmHg

Subtract the intensity of each uterine contraction from the baseline tone:

(75-20) 55 + (75-20) 55 + (60-20) 40 + (80-20) 60 + (60-20) 40 = 250 MVU

*(Permission for use from Dr. R. McQuarrie & S. Pittman 2021)*

## Appendix E: Troubleshooting the IUPC

| Problem | Possible Causes | Solutions |
|---|---|---|
| No change in pressure during contractions | Dry environment or possible extraovular placement of sensor tip | Flush with sterile solution or reposition sensor |
| Only pressure peaks can be visible | Zero adjustment is incorrect | Assess placement of catheter. If the trace does not show up and down movements, the physician must insert a new transducer. |
| | Catheter blocked | Flush with 10-20 mL of sterile solution |
| Trace is superimposed with noise | End of catheter is in the uterine wall | Retract the catheter a little, wait 15 seconds and reconnect and/or flush with 10 – 15 mL of sterile solution. |

## District Health Authority/IWK Policies Being Replaced

(Please List)

## Version History

(To Be Completed by the Policy Office)

| Major Revisions (e.g. Standard 4 year review) | Minor Revisions (e.g. spelling correction, wording changes, etc.) |
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