

Vacuum Assisted Delivery

Self Learning Module

Southern Health–Santé Sud

L Cassan RN BN - Regional Obstetrical Education Facilitator

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OBJECTIVES

- 1) You will be able to define indications, prerequisites and contraindications to a vacuum assisted birth
- 2) You will be able to identify the proper technique for the procedure
- 3) You will be able to list the risks/complications to the procedure
- 4) You will know what do if the vacuum attempt fails
- 5) You will be able to appropriately document a vacuum assisted delivery

DEFINITIONS

Anterior Fontanelle – An open area located at the juncture of the metopic, sagittal, and coronal sutures. Its size is variable and is a diamond formation.

Assisted or Operative Birth – refers to the use of a vacuum or forceps to aid in the delivery of the fetus in the second stage of labour.

Caput – A benign caput succedaneum presents as *swelling on the presenting part* of the scalp. It *does not increase in size* after delivery but decreases gradually over a couple of days. It *extends over the suture lines*.

Cephalohematoma – A collection of blood caused by rupture of vessels beneath the periosteum (usually over the parietal or occipital bone), which presents as swelling *that does not cross suture lines*. It *rarely expands after delivery*, and does not generally cause significant blood loss.

Cephalopelvic Disproportion (CPD) – Where the fetus's size is disproportioned to the maternal pelvis and will not allow passage through. May be caused by a fetal malpresentation.

Flexion Point – Is the location on the fetal head where outward traction pulls the head to allow flexion at the neck while keeping the mentovertical diameter in the direction of the birth canal.

Intracranial Hemorrhage – (Subdural/subarachnoid/intraventricular/intraparenchymal) A hemorrhage that occurs beneath the skull plate causing increased intracranial pressure. A severe subdural hematoma may cause the fontanels to bulge and become tense when the neonate is in the sitting position and not crying. This may indicate an increased intracranial pressure. The neonate's head circumference may increase. Symptoms usually present at 24 – 48 hours of life and include respiratory depression, apnea, seizures, irritability, altered tone and LOC. Usually can be managed with conservative measures, rarely surgical.

Mentovertical diameter – From the chin to the most prominent part of the fetus's head. The chance of delivery is optimized when the diameter points in the direction of the delivering pathway.

Multiparous – A woman who has delivered a baby.

Nulliparous – A woman who has never delivered a baby.

Posterior Fontanelle- An open area that is located at the juncture of the sagittal and lambdoid sutures. It is triangle shaped.

Posterior Forchette – the fold of skin that forms the posterior margin of the vulva.

Sagittal Suture – Suture line that runs between the two parietal bones of the skull, from the anterior fontanel to the posterior fontanel.

Subgaleal Hematoma – Collection of blood between the aponeurosis covering the scalp and the periosteum. *Blood can extend over the suture lines.* The hemorrhage can extend from the brow to the nuchal ridge and from ear to ear in severe cases. Early recognition of this injury is crucial for survival. Blood loss can be life threatening.

Ventouse – Vacuum extraction

INTRODUCTION

A vacuum assisted delivery (also commonly called a Kiwi delivery as this type is commonly used), is an operative or assisted birth and refers to the use of a vacuum to aid delivery. The use of vacuums to assist delivery has steadily increased over the years, while the use of forceps to aid delivery has declined. There may be many causes, including women carrying larger fetuses than before, an increase in gestational diabetes, practitioners comfort with the tool.

However, it must be understood that this procedure is not without risks. For this reason, a careful clinical assessment must be done in order to confirm that it is safe to proceed. Vacuums have an advantage over forceps as they require less analgesia, cause less vaginal trauma and require less precise positioning than forceps do. The disadvantage to vacuums is they cause more fetal cephalohematomas and are more likely to fail than forceps. Vacuums cannot be used to rotate the fetus whereas forceps can. Vacuums may be used to correct flexion of the fetal head, with prudence and an experienced user. Studies have shown (Wegner, E., Bernstein, I. 2013) that the incidence of neonatal trauma rises to 45% after three pulls. (One pull = one contraction, even if there are three 'pulls' per contraction). If good progress is made and delivery is imminent, than it may be appropriate to do another pull rather than a caesarean section.

How it works – the vacuum creates an artificial caput, suction is applied either manually or electronically, and the physician then exerts force to pull the head of the fetus down the birth canal. This produces traction on the fetal head. It is very important that the mother is still able to help with the expulsion effort. MOET reported a study that showed 27% of fetal head positions diagnosed are incorrect. This can lead to complications or failure of the procedure.

Vacuums come in different types – a hard cup, soft cup (bell or mushroom shaped) and the kiwi Omnicup are three types. This region is stocked with the Kiwi Omnicup. There are advantages and disadvantages to each kind. The hard cup has a higher success rate but also a higher injury rate. The reverse is true for the soft cups and Kiwis – lower success but also lower injury rate. For this reason the soft cup and the Kiwi, are more frequently used.

INDICATIONS

Fetal:

- An abnormal fetal heart rate or suspicion of immediate or potential fetal compromise

Maternal:

- maternal exhaustion
- maternal inability to push effectively
- Prolonged second stage
- Inadequate uterine activity

- Maternal condition where she is unable to push (e.g. Valsalva maneuver is contraindicated due to cardiac/neurological issues)
- Inadequate progress in second stage

Critical Thinking

What constitutes inadequate progress?

CONTRAINDICATIONS

Absolute:

- Evidence/suspicion of cephalopelvic disproportion
- Not completely dilated
- Intact membranes (must do AROM first)
- Inability to assess fetal head position
- Breech presentation/ face or brow presentation
- High station, fetal head not engaged
- Known fetal disease (such as a bleeding disorder, connective tissue disease, bleeding disorders)
- Operator inexperience

Relative:

- Gestational age <34 weeks
- Unfavorable flexion of the head
- Mid- pelvic station

ASSESSMENT

- The client must be fully dilated
- The client must have ruptured membranes
- Have the client empty her bladder (or straight catheterize her)
- The pelvis must be deemed adequate
- Informed consent MUST be obtained
- The client must still be able to push
- The fetus must be estimated to be <4000 grams
- The fetus must be vertex and not a face/brow presentation
- The exact position of the fetus's head must be determined
- The fetus must be fully engaged (be careful not to determine the station with any caput that is present – station is determined by the descent of the skull. A large caput is indicative of CPD).

OPERATOR'S ASSESSMENT

- There must be adequate facilities/staff to assist
- The operator must be aware of the site's policy/guidelines in regards to vacuum pressure/pop offs/ duration of application allowed
- The operator must have knowledge and be capable of performing the procedure
- The operator must have a back-up plan in case of failure

CLASSIFICATION:

Outlet – Fetal scalp is visible without separating the labia

- The fetal skull has reached the pelvic floor.
- The fetal head is at or near the perineum.
- The sagittal suture is anterior/posterior (AP) diameter. The rotation does not exceed 45°.

Low – The station is $\geq +2$.

- The fetal skull is not on the pelvic floor.
- Two subdivisions: Rotation is $\leq 45^\circ$ or rotation is $\geq 45^\circ$.

Mid – The fetal head is engaged (Station 0 or lower).

- The leading point is above +2 station

BE PREPARED:

- Anticipate a shoulder dystocia
- Anticipate a post partum hemorrhage – remember it may be due to trauma or tone. Syntocinon will not help with trauma. Assess for both tone and trauma.
- Anticipate the need for a neonatal resuscitation

A) Fetal Complications:

- Cephalohematoma
- Neonatal Jaundice
- Retinal hemorrhage
- Intracranial hemorrhage

- Subgaleal hematoma
- Brachial plexus injury

Critical Thinking

Why would a vacuum delivery predispose a fetus to jaundice?

How can you tell the difference between a cephalohematoma and a subgaleal hematoma?

Which is the most serious complication?

B) Maternal complications:

- Cervical lacerations
- Severe vaginal/periurethral/labial lacerations
- Vaginal hematomas
- Postpartum hemorrhage
- Third or fourth degree perineal tears
- Anal sphincter injury

HOW DO WE LIMIT THE AMOUNT OF COMPLICATIONS?

- No Sequential device use (e.g. vacuum then forceps)
- Maintaining situational awareness
- Abandoning the procedure – avoid excessive/prolonged traction
- Avoidance of improper placement and use of rotational forces (the fetal head may spontaneously rotate. If so, the handle of the device should be allowed to passively turn)
- Avoidance of traumatic insertion of the device and careful placement so maternal tissue is not entrapped
- Controlled and slow descent/delivery, with little or no ‘pop-offs’
- Being a client advocate

Critical Thinking

How do you maintain situation awareness?

TECHNIQUE MNEMONIC (A-J)

A – Assess for the need for anesthesia (if available), Ask for help, Address the client

B – Bladder emptied

- C – Cervix fully dilated with ruptured membranes
- D – Determine position, station, pelvic adequacy, risk of dystocia
- E – Equipment is in working order and resus equipment is ready
- F – Flexion Point
- G – Gentle Traction
- H – Halt
- I – Incision
- J – Jaw

PROCEDURE

- 1) Assess the client, explain the procedure, obtain consent, ensure assistance is available
- 2) Have the client empty her bladder or do a straight catheterization
- 3) Confirm cervical dilation is 10 cms
- 4) Confirm the fetal position
- 5) Ensure equipment is in working order and resuscitation equipment is set up
- 6) Introduce into the posterior fourchette, using one hand to protect the maternal tissue
- 7) Find the flexion point and position the cup over it (6 cms from the anterior fontanel, 3 cms from the posterior fontanel, and on the sagittal suture line)
- 8) Sweep finger around the edge of the cup to ensure no maternal tissue is caught. Increase pressure to 100 – 150 mm Hg to hold cup in place and re sweep to ensure no tissue is caught
- 9) Increase vacuum pressure to 500 – 600 mm Hg (or green zone on manufacturer's recommendations) with a contraction
- 10) Pull with gentle traction **ON THE PROPER AXIS, with a contraction only**
 - The axis is the along the pelvic curve. The higher the station, the more downward pull is needed. As the head crowns, traction is brought up to a 45° angle to the pelvic floor. A common mistake is to extend the head too soon thereby increasing the diameter to pass over the perineum, causing trauma to the perineum and a risk of a 'pop-off'.
 - Progress of pulls - 1) Flex and descent 2) Head at pelvic floor 3) Delivery of the head
- 11) Vacuum pressure between contractions may be continued, retained with mild pressure or released completely
- 12) Halt – if *no progress* with three aided contractions, three pop offs for unknown cause or over 20 minutes application time and delivery is not imminent.

- 13) Incision – consider an episiotomy if laceration impending
- 14) Jaw – Remove vacuum when the jaw is reachable or delivery is assured

'POP-OFFS'

- Are NOT a normal part of the procedure
- Can be caused by a poor application/seal (possibly from maternal tissue caught under the cup), excessive tractions used, unrecognized CPD/deflexion, improper angle of application causing shearing
- If a 'pop-off' occurs, reassess the situation

DOCUMENTATION

- Date/Time/Physician/Indication for procedure
- Verbal consent obtained (including the risks/benefits/alternatives and that her questions were answered)
- Contraction pattern/assessment
- Fetal status (station/position/estimated weight/FHR/presence of molding or caput)
- Assessment of maternal pelvis
- Describe the procedure (instrument used/number of applications/ pulls/pop-offs/ pressure used/total time of application/type of vacuum used/analgesia)
- Describe progress with each pull
- If an episiotomy was needed or degree of tear
- If a shoulder dystocia also occurred
- Neonate post delivery (position/apgars/resuscitation needed or not/actual weight)
- Any neonatal or maternal complications noted
- Physician must complete an assisted delivery summary (or as per hospital policy)

DOCUMENTATION DURING THE PROCEDURE

- On the EFM strip – use the marker button to indicate when vacuum on/pop offs (#1, #2 etc...)
- If using IA, must document the times as they occur (e.g. on scrap paper until you can chart)

POSTOPERATIVE ASSESSMENTS

Maternal:

- Active management of the third stage
- Soft tissue injury – birth canal, cervical tears, perineal tears, anal sphincter involvement
- Deep vein thrombosis in case of a prolonged labour
- Urinary, stress or bowel incontinence
- Urinary retention

Remember – the mother must be monitored for the above in the event of a failed attempt as well

Neonatal:

INITIALLY inspect the neonate for:

- Scalp formation – molding/caput
- Scalp injuries – fractures, hematomas, lacerations
- Brachial plexus injury if vacuum was followed by a shoulder dystocia
- Retinal hemorrhage
- Subgaleal hematoma
- Do vital signs and head circumference
- Umbilical cord gases (if able)

On Going Monitoring:

- Monitoring of the head circumference (HC) (indicative of a hemorrhage/hematoma) at birth, every 1 hour x 3, then every 3 hours until 24 hours, then q shift x 48 hours. Any change greater than 0.5 cm needs to be investigated.
- Heart rate & respirations to be done with every HC check
- Monitor for signs of shock - neonate's colour, scalp and activity level (watch for lethargy) at every HC check
- Adequate Feeding

Critical Thinking

Why might a newborn not adequately feed after a vacuum delivery?

REDUCING THE RISK

Decreasing the need for an operative delivery:

- One to one support in labour
- Use of oxytocin
- Delayed pushing in women with epidurals
- Partogram use (awareness of uterine activity and if it is adequate)
- Upright maternal position
- Manual rotation of the fetus (*the vacuum cannot be used to rotate the fetus*)

Facility:

- Simulation training for staff and physicians
- Policy review
- Retrospective chart reviews

Preoperative Strategies:

- Alternative delivery strategies (e.g. changing maternal position during pushing frequently until a position is found where pushing is effective)
- Informed consent
- Rule out contraindications
- Have an exit strategy in place (why/ when to stop, plans for if it does not work, plans if PPH and a neonatal resuscitation are both required to be dealt with at the same time, inform the facility the client will be transferred to in case of an emergency or failed procedure)

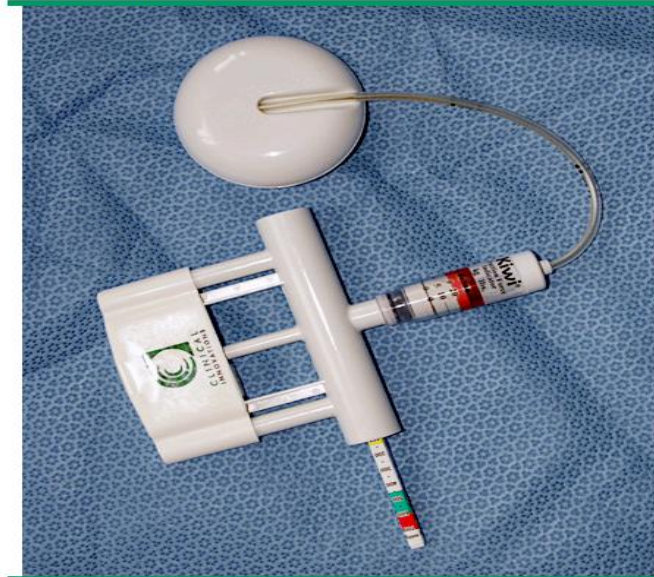
Operative Strategies:

- Only use if indicated
- Use steady traction, no rocking movements, in line with the birth canal
- Minimize duration of the application
- Maintain situational awareness
- Stop if it is difficult to apply the vacuum, descent does not easily occur, or 20 minutes have passed

Postoperative Strategies:

- Ensure everyone involved in the maternal/neonatal care is informed of the procedure
- Document it carefully
- Perform thorough maternal/neonatal assessments
- If complications arise, intervene quickly, especially with a neonatal cranial injury

Kiwi vacuum device



Courtesy of James Greenberg, MD.

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Vacuum delivery suction cups

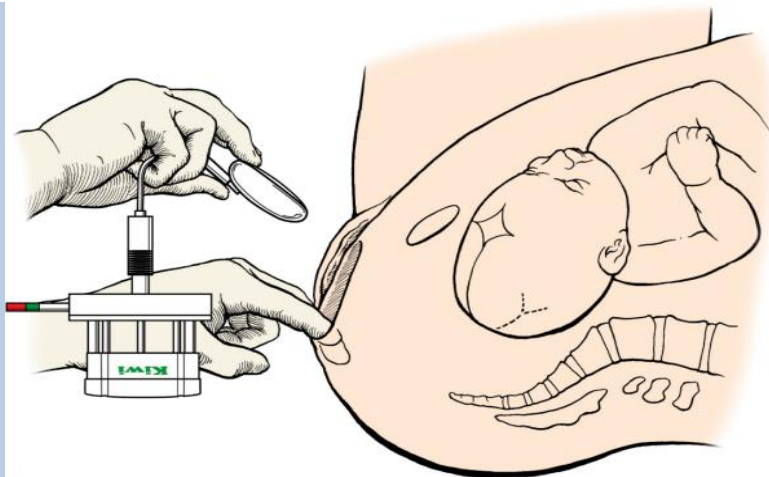
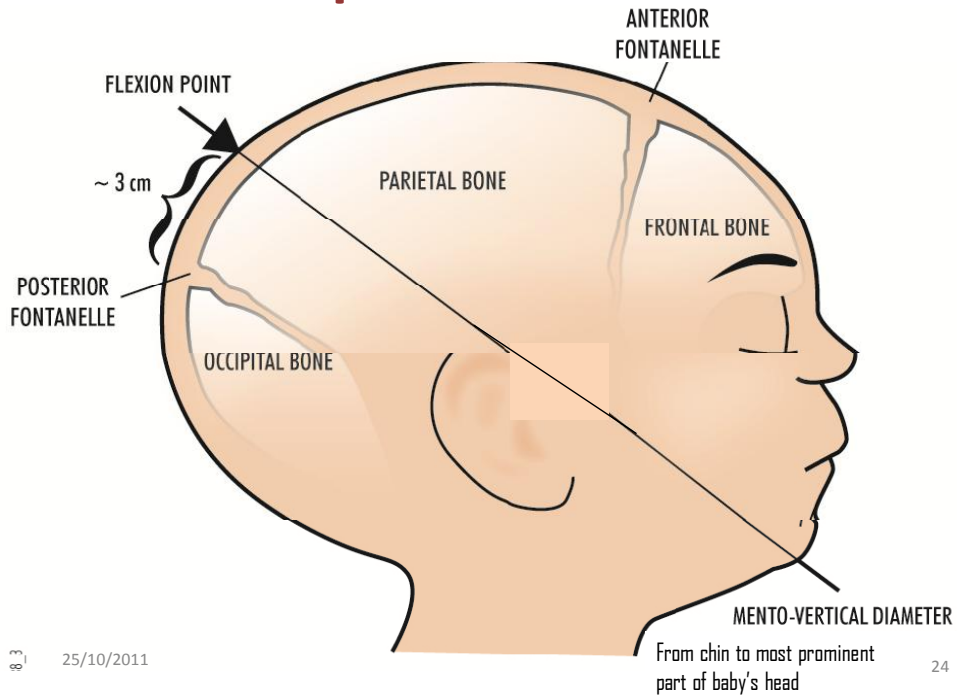


A: mushroom; B: bell.
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Cup Placement

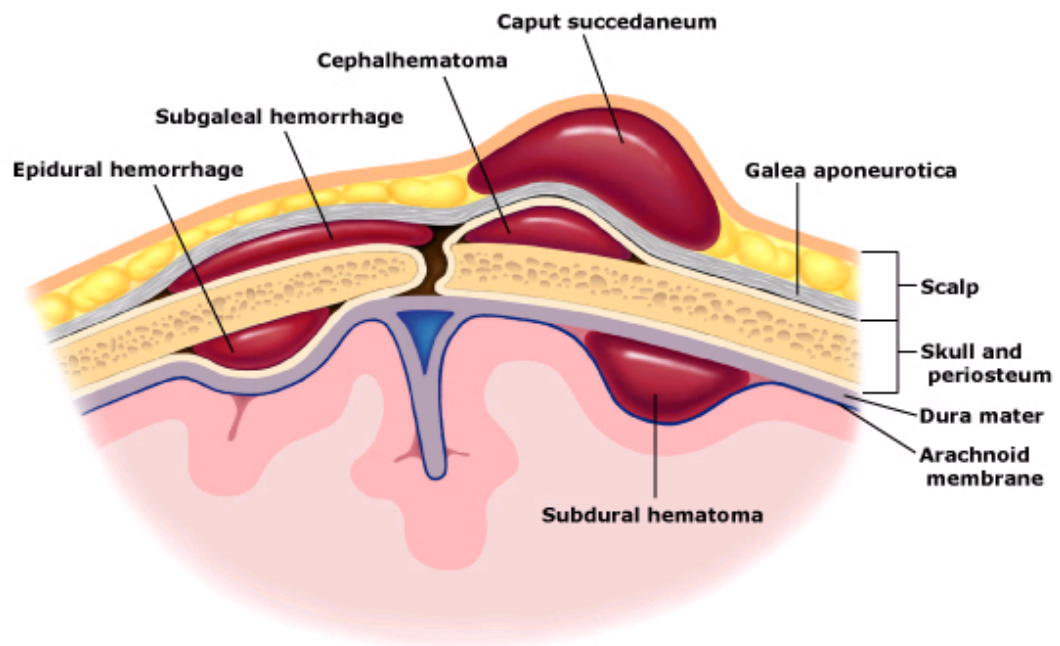


- Introduce into posterior fourchette (make space & protect maternal tissues with opposite hand)

25/10/2011

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Neonatal extracranial and intracranial birth injuries



Modified from: Volpe JJ. *Neurology of the Newborn*, 4th ed, WB Saunders, Philadelphia 2001.

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Sample Documentation:

12/08/13 – 1400 – Dr P in to assess status of client. Client has been pushing for two hours with little progress made. FHR baseline 120, with deep variables to 60 bpm occurring with pushes. Slow recovery to baseline between pushes. Variability minimal. Contractions q 2 mins, 60 seconds long, palpate strong. PV done by Dr. P. Cervix is 10 cms, Fetus still at 0 station, small amount of caput, OA position. Client ++ tired and pushing ineffectively. Options discussed with the client and her family re attempted vacuum vs caesarean section. Discussed vacuum complications such as maternal trauma, neonatal trauma, risk of jaundice, shoulder dystocia and the risk of a failed procedure. Discussed the risks of a C/S as well, including anaesthesia & infection risks. Questions answered. Decision made to proceed with a vacuum attempt. Client up to commode to void. Estimated fetal weight 3500 gms as per Dr. P. Maternal pelvis deemed adequate by the MD.

12/08/13 – 1415 – Client voided 200 mLs. To bed in the lithotomy position. Vacuum applied by DR P. at 1416, pressure to 450 mm Hg. Client instructed re importance of effective pushing.

12/08/13 – 1500 (late note) 1423 – Vacuum pop-off. Good progress made with first two pulls. Head at the perineum. Vacuum reapplied at 1424, pressure to 500 mm Hg. Head delivered at 1426, ROA, vacuum removed. Delivery completed at 1427 for a viable girl, apgars 8/9. Babe suctioned on the perineum. Tight nuchal cord x 1. Somersault maneuver done. To mom's chest STS, dried and stimulated. Lusty cry and good color noted. Parents ++ pleased with the birth of their daughter. Spontaneous delivery of the placenta at 1435, intact. No lacerations noted. No PPH at present. See PP care map.

12/08/13 – 1535 – Actual fetal weight 3435 gms. Caput and molding noted to the fetal head. Small laceration over the right parietal bone, MD aware. Will monitor for signs of hemorrhage, see newborn record.

Bibliography

- Cargill, Y., MacKinnon, C. (2004, August). Guidelines for Operative Birth. SOGC Clinical Practice Guidelines No 148. *J Obstete Gynaecol Can* 2004;26(8):747-53.
- Grady, K., Howell, C., Cox, C. (2007). "Chapter 28. Ventouse and forceps delivery." (281-293). *The MOET course manual: Managing obstetric emergencies and trauma*. (2nd ed., pp. 281-287). London: RCOG Press.
- Greenberg, J., (2013, September). Procedure for vacuum assisted operative delivery. Accessed on December 18, 2013 from www.uptodate.com/contents/procedure-for-vacuum-assisted-operative-delivery.
- McKee-Garrett, T. (2013, March 21). Assessment of the newborn. Accessed on September 6, 2013 from www.uptodate.com/contents/assessment-of-the-newborn.
- McKee-Garrett, T. (2013, August 26). Neonatal birth injuries. Accessed on December 16, 2013 from www.uptodate.com/contents/neonatal-birth-injuries.
- MORE^{OB} Taking Care of Life (2013). Assisted Vaginal Birth and Vaginal Breech Birth. Salus Global Corporation.
- Stearns, E., Ramsay, T. (2011, October). Power point presentation - Vacuum Assisted Deliveries. RHA Central Manitoba Inc..
- Wegner, E., Bernstein, I. (2013, June 26). Operative vaginal delivery. Accessed on September 6, 2013 from www.uptodate.com/contents/operative-vaginal-delivery.
- Wong, R., Bhutani, V. (2013, June 11). Pathogenesis and etiology of unconjugated hyperbilirubinemia in the newborn. Accessed on September 6, 2013 from www.uptodate.com/contents/pathogenesis-and-etiology-of-unconjugated-hyperbilirubinemia-in-the-newborn.

