



GUIDELINE

**Central Venous Access Device:
Umbilical Venous Catheter (UVC) Insertion and Management**

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NICU KEMH, NICU PCH, NETS WA

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this [disclaimer](#)

Contents

Aim 2

Risk..... 2

Background..... 2

Indications for Insertion 2

Prior to Procedure..... 3

Equipment..... 4

Procedure 5

Post Procedure Management 10

Nursing Management 10

UVC Removal 10

Appendix 1: Relevant Anatomy and Position..... 13

Appendix 2: PICC Placement Kit..... 14

Appendix 3: Alternative method for securing umbilical lines 15

Appendix 4: Removal of UVC 16

Aim

Outlines the indications, insertion and management of umbilical venous catheters for the neonatal population.

This guideline is to be followed in conjunction with the [Central Venous Access Device Bundle](#) for consistency of care.

Risk

Invasive devices always carry potential risk which increases when processes and management are not followed. Some of the identified complications associate with umbilical lines include:

- Infection
- Thromboembolism
- Mal-positioned catheter in heart or great vessels: pericardial effusion, cardiac arrhythmias, thrombotic endocarditis, haemorrhagic pulmonary infarction, hydrothorax
- Catheter mal-positioned in portal system: NEC, peritoneal effusion, colon perforation, hepatic necrosis

Background

The umbilical vein is a relatively safe and pain free option for intravascular access in the newborn. Insertion of an umbilical venous catheter (UVC) seen as a simple procedure that is often used in emergency situations at birth.

Indications for Insertion

Decision to insert a UVC is on a case-by-case basis after discussion with consultant/ senior registrar. Consider the following indications:

- Preterm neonates < 800 grams or < 26 weeks
 - Consider for higher gestation / birth weight infants if they are out born, inadequate antenatal steroid cover and being retrieved from rural and regional WA.
- Critically unwell infant e.g. prematurity, surgical infants or HIE
- Administration of multiple medications including inotropes and/or infusions
- Administration of hypertonic solutions
 - e.g. glucose solutions >12.5%, hypertonic saline, sodium bicarbonate, calcium gluconate.
- Cardiac infants requiring a prostaglandin infusion

- Exchange transfusion
- **In a resuscitation situation**, it is safe to advance a UVC whilst aspirating frequently until blood return is seen. Inserting the catheter 1-2 cm beyond this point is an appropriate position for emergency use without radiographic confirmation of position
- Use of umbilical venous catheters for greater than 5-7 days is associated with an increased risk of central line associated bloodstream infection (CLABSI). If it is anticipated that central venous access is likely to be necessary for longer than 5-7 days, the UVC should be replaced with suitable central venous access device

Prior to Procedure

- The clinician performing the procedure must have appropriate training or supervision during the procedure
- Documented clinical indication
- Adequate cardiac and saturation monitoring of the infant

Refer to Appendix 1 for Relevant Anatomy and Position

- Refer to Neonatal Intravascular Device Insertion Record (MR422) for procedural checklist.
- UVC are, at times, inserted in conjunction with [Umbilical Arterial Catheters](#).
- Refer to [CVAD Bundle](#) for further information on insertion preparation.

Catheter Size and Insertion Distance

<1500g	3.5F- double lumen catheter
>1500g	5F- double lumen catheter

- Shoulder-to-umbilicus distance should be measured prior to the procedure.
- Remember to measure from the skin at the base of the stump where it connects to the anterior abdominal wall, add the length of the umbilical stump to the distance inserted.
- The catheter can then be inserted to the appropriate distance according to the table below:



UVC Insertion distance	
Shoulder - Umbilicus Distance (cm)	UVC insertion length
9	5.5
10	6.5
11	7.0
12	8.0
13	8.5
14	9.5

Equipment



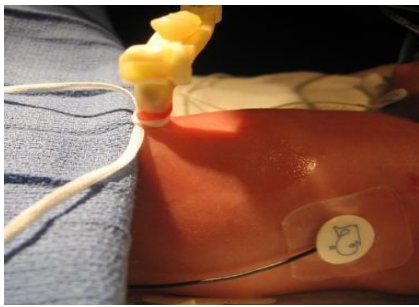
Common equipment	UVC specific
<ul style="list-style-type: none"> • Surgical gown x 1 • Sterile pair of gloves x 2 • Mask x1 • Face Shield (as required) x1 • Antiseptic solution: <ul style="list-style-type: none"> ○ >27 weeks gestation: 1% chlorhexidine solution ○ ≤27 weeks gestation: Povidone-iodine 10% solution/swab • PICC placement kit (see picture & contents below) • Sterile 0.9% Sodium chloride ampoules x2 • Sterile absorbent towel x 1 • 3-way taps x 3 • Smartsite™ valves x2 (for each 3-way tap) 	<ul style="list-style-type: none"> • Appropriate size UVC for gestation • Suture- 3.0 Prolene / 3.0 Silk • Instrument pack • Cord tie • Fluid administration set

- Fluid
 - 27 weeks - Starter Pack 5% Glucose or Glucose 5% + 0.5 u/mL Heparin
 - 27 to 29⁺⁶ weeks - Starter Pack 8% Glucose
 - 30 to 33⁺⁶ weeks - Glucose 7.5% + Sodium Chloride 0.22% + 0.5 u/mL Heparin
 - ≥34 weeks - Glucose 10% + 0.5 u/mL Heparin

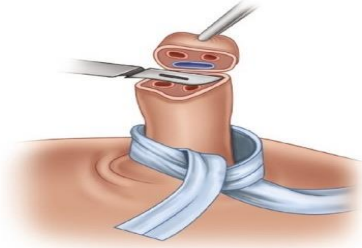

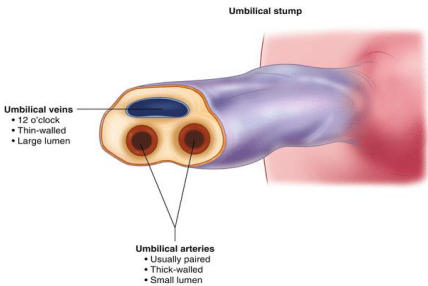
Procedure

Steps	Additional Information
<ol style="list-style-type: none"> 1. Arrange all the equipment on the procedure trolley in a systematic manner. 2. Ensure a three way tap is connected to all lumens of the catheter 	
<ol style="list-style-type: none"> 3. Draw up 10 mL of 0.9% sodium chloride into syringe and attach a three-way tap to the catheter. Flush through both the three-way tap and the catheter with the saline (both lumens of the catheter) ensuring that there is no air in the catheters. <p>Sodium Chloride for priming of catheters is to be drawn up directly from ampule (not to be squirted into tray then drawn up).</p>	
<ol style="list-style-type: none"> 4. Turn the three-way tap off or clamp the line to prevent any entry of air into the catheter 	<p>To reduce the risk of air embolism whilst the catheter is being inserted.</p>

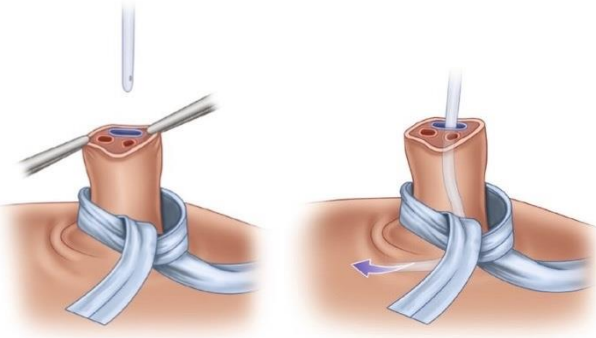
Central Venous Access Device:
Umbilical Venous Catheter Insertion and Management

Steps	Additional Information
<p>5. Position the infant comfortably and drape the bed with a sterile towel on the side where the operator is standing</p> <p>6.</p>	
<p>7. Hold the cord clamp with the sterile forceps and hand that over to the assistant.</p>	
<p>8. Clean cord and peri-umbilical area with disinfectant appropriate for the age and gestation Allow to dry for 60 seconds</p>	<p>Avoid excess application and any spillage as this may cause burns to very preterm skin.</p>
<p>9. Wash off with sterile water and pat dry</p>	<p>Prevent potential chemical burns and skin irritation</p>
<p>10. Tie umbilical tape around the base of the cord tightly enough to minimise blood loss but loosely enough to allow the catheter to be passed through.</p>	

Central Venous Access Device:
Umbilical Venous Catheter Insertion and Management

Steps	Additional Information
11. Make a clean horizontal cut in cord under the clamp with a scalpel blade (or scissors) preferably leaving 1cm of cord above the skin junction	 <p>Adapted from: Swan T.B. (2018) Neonatal Delivery and the Acutely Ill Neonate. In: Zeretzke-Bien C., Swan T., Allen B. (eds) Quick Hits for Pediatric Emergency Medicine. Springer, Cham. https://doi.org/10.1007/978-3-319-93830-1_6</p>
12. Cover the baby with the large clear plastic drape, with the pre-cut hole in the centre of the drape over the site of insertion	
13. Identify the umbilical vessels Vein: single, large, thin-walled Artery: two, smaller, thick wall, generally constricted so that the lumen may appear pinpoint.	 <p>Adapted from: Lucas J.K. (2016) Umbilical Venous Catheters (Insertion and Removal). In: Ganti L. (eds) Atlas of Emergency Medicine Procedures. Springer, New York, NY. https://doi.org/10.1007/978-1-4939-2507-0_121</p>
14. The cord stump should be stabilised which can be done with artery forceps.	

Central Venous Access Device:
Umbilical Venous Catheter Insertion and Management

Steps	Additional Information
<p>15. Place the tip of the catheter into the lumen of the vessel and gently advance to 5 cm into the vein.</p> <p>16. Turn the three-way tap so that the catheter is open to the syringe and assess smooth back flow of blood</p>	 <p>Adapted from: Swan T.B. (2018) Neonatal Delivery and the Acutely Ill Neonate. In: Zeretke-Bien C., Swan T., Allen B. (eds) Quick Hits for Pediatric Emergency Medicine. Springer, Cham. https://doi.org/10.1007/978-3-319-93830-1_6</p>
<p>17. If there is good backflow, continue inserting to the predetermined length and aspirate to verify blood return.</p>	<p>Remember that the vein goes up towards the heart unlike the arteries which descend first, therefore, the catheter should be passed upwards</p> <p>Directing the catheter to the left shoulder often helps to navigate through the ductus venosus</p>
<p>18. If no blood is aspirated at this point either advance the catheter 1 cm at a time or withdraw catheter 1 cm at a time until blood can be aspirated.</p>	<p>Note: UVCs placed during neonatal resuscitation also require demonstration of adequate back sampling of blood before use.</p>
<p>19. If there is any resistance and you cannot advance the catheter to the desired depth or there is a bobbing motion of the catheter, it may have entered the portal vein or be wedged in the intra-hepatic branch of the umbilical vein. The catheter will either be retracted or removed and replaced.</p>	<p><i>Some authors have described a technique involving insertion of another smaller bore catheter alongside which may then pass into the ductus venosus before removal of the original catheter. However, there is insufficient evidence to support the technique of double cannulation at the present time. This practice may increase the risk of umbilical vein trauma and should be considered only under adequate supervision</i></p>
<p>20. Secure the catheter with an anchoring suture that is close to the catheter and goes through Wharton's jelly and taking a small bite through the skin.</p>	<p>For alternative methods of securing the UVC- refer to the appendix 2</p>

Central Venous Access Device:
Umbilical Venous Catheter Insertion and Management

Steps	Additional Information
21. Anchor the knot close to the catheter.	Tie suture around the UVC tight enough to prevent slippage but still allowing easy drawback and flushing of the line.
22. Infusion giving set to be opened onto sterile field, assistant to spike bag or attach to syringe for priming of line. Primed giving set to be attached to umbilical catheters using sterile aseptic technique.	Commence infusions at 1.0 mL/hr through the catheter prior to xray placement confirmation to avoid blocking of the line.
23. Remove excess skin prep with sterile water or saline.	Residual cleaning solutions on the infant's skin can be a potential for chemical skin burns.
24. Apply a 2.5cm piece of brown tape around catheter and suture material as close as possible to umbilical stump/catheter.	UAC & UVC should be secured separately.
25. Clear away all equipment and ensure that any needles or scalpel are safely disposed of into a sharps bin.	To safely dispose the sharps, post procedure
26. Check that the infant is clean and dry and assess temperature	
27. Infant to be nursed supine for a minimum of 1 hour post insertion to observe for ooze/blood loss around umbilical stump	

Post Procedure Management:

1. Confirm the catheter tip placement with an X-ray:
 - Refer to [Central Line Imaging in Neonates: Radiographic Views, and Acceptable Line Positions](#)
2. A repeat x-ray is to be performed following catheter adjustment to confirm tip position. Adjustments to be documented in medical notes.
3. Clinician performed ultrasound may be used in conjunction with X-ray to ensure safe placement and adjustment of UVC.

Nursing Management

- Infants with umbilical lines in situ should not be wrapped or have nappies or booties on. The pelvic area and feet should be always visible to check for adequate circulation.
- At least hourly inspection of umbilical site for any signs of infection, ooze and catheter position (distance of brown tape from umbilical stump). Document on MR489.
- At least hourly inspection of colour, temperature and perfusion of the lower extremities. Any changes should be reported immediately to medical staff.

UVC Removal

- Review the need for UVC on clinical rounds every day. Consider removal as early as clinically possible with maximum of 7-10 days
- Removal of an umbilical catheter is a 2-person aseptic technique, where staff have received training and deemed competent
- If intravenous access is still required, ensure that there is another patent intravenous access prior to the removal of umbilical catheters.
- If only one umbilical catheter is to be removed, a nurse may remove the catheter if they have been stitched in separately. If the catheters have been stitched in together then it is the responsibility of medical staff to remove the catheter.
- Once the decision to remove the catheter has been documented, it should be performed within an hour of the medical order. If delays occur, please document and inform medical staff.
- Refer to Appendix 3 Removal of UVC procedure

Related CAHS internal policies, procedures and guidelines

Neonatology Clinical Guidelines

- [Central Line Imaging in Neonates: Radiographic Views, and Acceptable Line Positions](#)
- [Central Venous Access Device Bundle](#)
- [Sepsis Neonatal](#)
- [Umbilical Arterial Catheter](#)

CAHS Infection Control Policies

- [Hand hygiene](#)

References and related external legislation, policies, and guidelines (if required)

1. O'Grady, N.P., Alexandr, M. Burns, L.A., Dellinger, E.P., Garland, J., Heard, S.O., et al. for the Healthcare Infection Control Practices Advisory Committee (HICPAC). Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011. Centers for Disease Control and Prevention. (<https://www.cdc.gov/hai/pdfs/bsi-guidelines-2011.pdf>).
2. Butler-O'Hara M, D'Angio CT, Hoey H, Stevens TP. An evidence-based catheter bundle alters central venous catheter strategy in newborn infants. *Journal of Pediatrics* 2012; 160: 972-7
3. Cloherty, J., Eichenwald, E., & Stark, A., (Eds.). 2012. *Manual of Neonatal Care*, 7th Ed., Ch. 66, Ringer, S.A. & Gray, J.E. Common Neonatal Procedures, pp. 858-865. Philadelphia: Lippincott Williams & Wilkins.
4. Umbilical Artery Catheterisation Protocol, Southern Health Care Network - Monash Medical Centre, Newborn Services venous catheters in newborns. *J Pediatr* 2000;136:837-40.
5. Shukla H, Ferrara A. Rapid estimation of insertional length of umbilical catheters in newborns. *American Journal of Diseases in Childhood* 1986; 140: 786-8.
6. Reynolds PR, Banerjee S, Meek JH. (2005) Alcohol burns in extremely low birthweight infants: still occurring. *Archives of Disease in Childhood Fetal and Neonatal Edition*. January;90(1):F10.
7. Barrington KJ. Umbilical artery catheters in the newborn: effects of position of the catheter tip. *Cochrane Database of Systematic Reviews* 1999, Issue 1. Art. No.: CD000505. DOI: 10.1002/14651858.CD000505.
8. Thummala MR, Raju TNK, Langenberg P. Isolated single umbilical artery anomaly and the risk for congenital malformations: a meta-analysis. *J Pediatr Surg* 1998;33:580-5.
9. Parilla BV, Tamura RK, MacGregor SN, Geibel LJ, Sabbagha RE. The clinical significance of a single umbilical artery as an isolated finding on prenatal ultrasound. *Obstet Gynecol* 1995;85:570-2.

10. Michel F, Brevaut-Malaty V, Pasquali R, Thomachot L, Vialet R, Hassid S, Nicaise C, Martin C, Panuel M. Comparisons of ultrasound and X-ray in determining the position of umbilical venous catheters. Resuscitation 2012; 83: 705-709.

11. Seigel, A., Evans, N. and Lutz, T. (2020), Use of clinician-performed ultrasound in the assessment of safe umbilical venous catheter tip placement. J Paediatr Child Health, 56: 439-443. <https://doi.org/10.1111/jpc.14658>



12. Wallenstein MB, Stevenson DK. New technique for umbilical artery catheter placement in the neonate. J Pediatr. 2015 Feb;166(2):501. doi: 10.1016/j.jpeds.2014.10.027. Epub 2014 Nov 18. PMID: 25453247.

Useful resources

[PCH Insertion Bundle](#)

[PCH Maintenance Bundle](#)

This document can be made available in alternative formats on request.

Document Owner:	Neonatology		
Reviewer / Team:	Neonatology Coordinating Group		
Date First Issued:	February 2022	Last Reviewed:	February 2022
Amendment Dates:	April 2022	Next Review Date:	22 nd February 2025
Approved by:	Neonatology Coordinating Group	Date:	22 nd February 2022
Endorsed by:	Neonatology Coordinating Group	Date:	
Standards Applicable:	NSQHS Standards:   Child Safe Standards: 1,10		

Printed or personally saved electronic copies of this document are considered uncontrolled



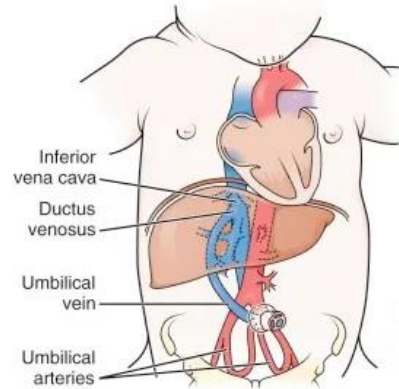
Healthy kids, healthy communities

Compassion Excellence Collaboration Accountability Equity Respect

Neonatology | Community Health | Mental Health | Perth Children's Hospital

Appendix 1: Relevant Anatomy and Position

The umbilical vein is 2-3cm long and 4-5mm in diameter. From the umbilicus, it passes cephalad and a little to the right. It joins the left branch of the portal vein after giving off several large intrahepatic branches. The ductus venosus arises from the point where the UV joins the left portal vein and bypasses the liver, joining the inferior vena cava just distal to its entry into the atrium.



Adapted from: *From Robert and Hedge's Clinical Procedures in Emergency Medicine*

- The ideal position for a UVC is in the inferior vena cava, just outside of right atrium, at T9, which correlates to 0.5cm above the diaphragm on the lateral image.
- Position should be verified with anteroposterior and lateral chest-and-abdominal radiographs. [Central Line Imaging in Neonates: Radiographic Views, and Acceptable Line Positions](#)
- It can be difficult to pass the catheter through the ductus venosus. There are some manoeuvres that can assist in placement. These include:
 - Pulling the catheter back to about 4-5cm, then advancing the catheter whilst rotating the catheter clockwise.
 - Pulling the umbilical cord stump in a downward direction with the forceps while inserting the UVC.
- In an emergency, a UVC that remains in the portal circulation may be withdrawn until it lies in the umbilical vein. Hypertonic solutions can be infused through this for a short period of time until more suitable access is obtained.
- In a resuscitation situation, it is safe to advance a UVC whilst aspirating frequently until blood return is seen. Inserting the catheter 1-2 cm beyond this point is an appropriate position for emergency use without radiographic confirmation of position.
- Any UVC pulled back after an X-ray should be re-X-rayed to confirm the correct position or confirmed by bedside clinician performed ultrasound.
- Clearly document the line length, tip position and any adjustments made to the line after X-Ray.

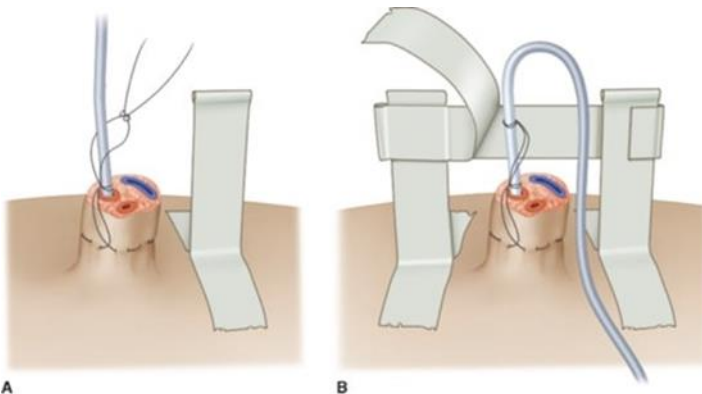
Appendix 2: PICC Placement Kit



- 1 x outer wrap
 - 2 x drape towels (absorbent/impermeable)
 - 2 x blue prep forceps
 - 2 x measuring tapes (60cm)
 - 2 x Tegaderm dressings (4cm x 4cm)
 - 1 x 10ml luer lock syringe
 - 1 x silicone neonatal tourniquet
 - 4 x ball swabs
 - 2 x hand towels
 - 1 x peelable transparent drape with 'easy peel' 50cm x 50cm (opening 4cm)
 - 1 x straight Reynolds scissors 9cm
 - 1 x straight Iris forceps 10cm
 - 1 x curved Iris forceps 10cm
 - 5 x swabs, 4 ply (7.5cm x 7.5cm)
 - 2 x gallipots 60ml
 - 1 x tray 20cm x 15cm x 4cm
 - 1 x pack of small steri-strips (6 x 38mm, x 6)
- **Note:** PICC placement kit is preferred, in-line with the PCH CVAD guideline. However, suitable sterile reusable instrument kits may be used when PICC kits are not available.

Appendix 3: Alternative Methods for securing umbilical catheters

- **Cut 2 pieces of Comfeel®** and adhere to skin at either side of the umbilical stump which protects the skin and provides a barrier against epidermal stripping.
- Fix tapes as illustrated
- Ensure tape is secure and catheter is looped so that accidental tension to line will not displace catheter
- UAC & UVC should be secured separately
- This method is not routinely used in the preterm population (<32weeks) due to the fragility of their skin.



Source: Lisa B. Zaoutis, Vincent W. Chiang:
Comprehensive Pediatric Hospital Medicine, Second Edition
Copyright © McGraw-Hill Education. All rights reserved.




Appendix 4: Removal of UVC

Equipment required:

- Umbilical catheter removal kit
- Dressing pack
- Gauze
- Gloves (sterile gloves not required)
- >27weeks gestation 1% Chlorhexidine solution
- ≤27weeks gestation or Povidone Iodine 10% swab
- 0.9 % Sodium Chloride

Procedure:

Steps	Additional information
1. Perform hand hygiene and prepare equipment	Aseptic Technique/Infection Prevention
2. The nurse assisting should gently hold the legs of the infant	Consider sucrose as pain relief
3. Perform hand hygiene and don sterile gloves	
4. Remove the tape around the catheter if the suture is not visible.	If coagulated blood around suture material and umbilical stump, moisten gauze with sodium chloride and wrap around umbilical stump for 1-2minutes. Clean area prior to commencing procedure.
5. Cleanse umbilical area with appropriate skin prep as per gestation as above.	Reduce risk of infection
6. Apply artery forceps below the sutures prior to cutting the suture (to prevent migration of the catheter internally in the advent of the catheter being accidentally cut)	
7. Cut suture.	
8. Place gauze pad directly over the umbilicus, apply gentle pressure in an upward direction for UVC	

Central Venous Access Device:
Umbilical Venous Catheter Insertion and Management

9. Remove catheter in a slow continuous motion to promote vasoconstriction. Check that catheter is intact. Continuous pressure should be applied for a minimum of 5 minutes. Ensure the peripheries stay pink and well perfused.	
10. Clean skin prep from skin with sodium chloride.	
11. Leave infant in the supine position with the stump uncovered for one hour.	To observe for any blood loss
12. Perform hand hygiene.	
13. Document procedure.	Document removal on the Neonatal Intravascular Insertion Record MR422, and in the patient's progress notes. Document estimated blood loss (if any)