Emergency Septostomy
"Golden-Hour to Septostomy"

Guidelines

Pre- and post-procedure management for bedside balloon atrial septostomy

Preparation

Geographical location:

- **Primary: Rooms 65-66**, Secondary: Room 32-33-35

Medications to be Pre-Prepared by Bedside RN Prior to Delivery:

- Intubation medications:
  - Atropine
  - Fentanyl
  - Succinylcholine
- Rocuronium, 2 doses, 1 mg/kg/dose each
- Fentanyl (12.5 mcg/ml) infusion, to start at 1 mcg/kg/hr
- PGE1 (10mcg/ml) infusion, to start at 0.02mcg/kg/min
- 4 bags/large syringes of ½ NS + heparin (for septostomy catheters, the balloon, the bowls, preparation of umbilical lines)
- Bag of D10W for infusion
- Bottle of chlorhexidine (To be kept in the RN Educator Office)

Medications to be Present at Bedside but not Pre-drawn:

- Dopamine (800 mcg/ml) for infusion
- Epinephrine (1:10 000 concentration), for resuscitation doses
- Normal saline for boluses
- (O negative blood, from birthing center, to be brought by Meds RN IF REQUIRED)

****As an emergency basis - for purposes of septostomy, consider boluses of medications as appropriate to be given in the access infusing PGE. The following medications can be given IM: atropine, fentanyl, succinylcholine, rocuronium, epinephrine***

Materials to be Brought by RN/RT to be Kept OUTSIDE of Room Prior to Delivery:

- Resuscitation/ Crash cart
- Airway cart
- NICU procedure cart
- Defibrillator
- Hot line (blood Warmer)
- Intra-osseus kit from pediatric crash cart (with drill)

Materials to be Brought by RN/RT to be Kept INSIDE the Room Prior to Delivery (refer to Figure 1 for setup of room):

- Ventilator VN500
- CMAC videolaryngoscopy (but will follow patient from delivery room)
- Large stainless-steel table and 2 smaller tables
- Regular table placement of Atrio-septostomy kit
- Plexiglass for pediatric chest compressions, to be placed on bed (behind the Pediatric crash cart)

- Heating lamp
- IV pumps/pole
- Large OR sterile drape to cover large stainless-steel table - To be kept in the RN Educator Office
- 2 small ‘’eye drapes’’ (those for the lumbar puncture) for the preparation of the femoral sites and a large OR drape for the table.
- Chlorhexidine solution in a bottle (not the prepackaged sticks)
- Sterile linens
- 2 x exchange transfusion trays (first one for the septostomy, and second for placement of umbilical lines post-procedure)
- Umbilical line box for UVL/UAL.
    - For UVL, need 5 fr (single lumen for cardiologist) AND 4 fr (double lumen for placement by NICU team afterwards)
- Sterile drapes with hole in middle x4
- IV equipment
- Extension tubing for IV
- Pre-set patient monitors for preductal lower saturation limit of 70% (no upper limit; no limits set for post-ductal)

Equipment to be brought by Cardiology and kept INSIDE the room:

- Septostomy kit - Box with all the equipment for the septostomy kit – well identified and inventory (for check-ups) to ensure adequate communication between Cardio/NICU helpers. Dedicated place in the NICU for septostomy kit in the NICU for easy accessibility. Kit on the table identified for septostomies. On the table will also be placed the Cardiac Cath tray kit.
- Ultrasound machine: **E95 from Cardiology with Hockey-Stick probe.** Two sheaths (sterile) will be in the septostomy kit. Hockey-Stick probe will be with the machine.
    - Cardiology will systematically have to prepare the umbilicus and both groins for access. The interventional cardiologist will decide which route to take depending on the clinical scenario.
    - For femoral access, ultrasound guidance will be necessary: Hockey-stick probe (mounted)
- Cath-lab kit (will be provided by cath lab and placed on the table with the septostomy kit – will be replaced once used by cath lab team). Otherwise, exchange transfusion tray contents will be used.

ROLES

Nursing (ideally n=6):

- For Cardio: RN from NICU - Helper #1 (scrubbed) for Interventional Cardiologist
- For Cardio: RN from NICU - Helper #2 (unscrubbed) for Interventional Cardiologist
- For NICU: Note taker – Vital signs gatekeeper
- For NICU: Primary nurse of the patient
- For NICU: RN - Floater (Bridge between Primary RN at bedside and RN at resuscitation cart)
- For NICU: RN - preparation of medications / resuscitation cart

MD/NNP:

- Cardio team: Interventional Cardiologist (IC)

- Cardio team: Cardiologist for bedside ECHO
- NICU team: Neonatologist as Team Leader
- NICU team: Bedside (MD/NNP)
- Radiology team: Interventional Radiologist (on standby in case need for femoral cut down)

RT:

- RT in NICU room
- RT outside for additional help

INITIAL RESPONSIBILITIES:

Initial process:

- Birthing center notifies NICU team of impending delivery

Initial Responsibilities of Neonatologist:

- Neonatologist on call contacts the cardiologist on call to trigger septostomy procedure for every confirmed TGA (prenatal) or cyanotic with suspicion of post-natal diagnosis of TGA.
- NICU medical team to notify the unit clerk and nurse team leader of impending delivery
- When aware of a d-TGA admission, NICU will inform **I-R team.** However, the presence at bedside of **I-R Staff (not technician)** only requested when Interventional cardiologist fails umbilical approach and starts attempt to femoral approach.

Initial Responsibilities of Unit Clerk:

- Unit clerk automatically attach a procedure consent and blood transfusion consent forms

Initial Responsibilities of Nursing Team Leader:

- Organize with bedside RN for materials to be brought to room and medications to be pre-drawn
- Notify nurse educator of delivery, to come to room, for assistance, if during daytime
- Back-up of nurse educator during weekdays as support to the cardiology team

Initial Responsibilities by Cardiology:

- Cardiology to contact CVT as needs to be made aware that a TGA will be born or admitted and may need a septostomy, so that they can mobilize at bedside if a cut-down is needed.
- Obtain informed consent for septostomy from caregivers if not already done pre-natally
- Cardiologist #1 and Interventional Cardiologist present and waiting inside patient room
- Interventional cardiologist scrubbed and sterile already upon patient's arrival
- Interventional cardiologist briefs the RN helpers of the NICU on the material in the septostomy kit, while awaiting for the baby's delivery and admission

ALGORITHMS FOR DELIVERY ROOM:

ALGORITHM FOR DELIVERY:

FiO2 pre-set at 0.21. CMAC in delivery room
Discussion pre-natally to assess whether delayed cord clamping indicated
Baby born.
Remind OB team to leave at least 3 cm of umbilical cord before clamping
Baby brought to resuscitation table.

Assessment of clinical status of baby by NICU team
Placement of EKG leads by Resus RN
Placement of Preductal and Postductal Saturations probes by Resus RT
Determine whether baby stable or unstable

Stable Baby - In Delivery Room:

Baby crying. May require CPAP and supplemental FiO2 (can go beyond 30%*)* if signs of TTN
Pre-ductal saturation target 70% or higher by 3 min of age
If needs CPAP, to be brought to NICU on CPAP by bagging device, held by Resus RT (do not place baby on bubble CPAP device because may need intubation for septostomy)
Weight of baby done in the delivery room
Hat placed on baby. Diaper placed on baby
Baby brought to NICU Room WITH CMAC

Unstable Baby – In Delivery Room:

Baby not crying, cyanotic. Administer PPV, initial FiO2 0.21 (may increase O2 in the delivery room beyond 30% if needed)
If not meeting pre-ductal saturation target of 70% or higher by 3 min of age (e.g. O2 saturations < 60%), intubation of infant using CMAC to ensure placement of ETT below cords (CO2 detector may not change color if poor perfusion so ideally to visualize with CMAC)
ETT secured by Resus RT
Hat placed on baby. No diaper.
Baby brought STAT to NICU. CMAC can be placed outside of NICU room
PIV should be attempted (max 2 attempts) in Resus Room, while securing material for transfer but should not delay transport into NICU

ALGORITHMS ONCE BABY IN NICU:

Baby – In NICU:

RN dedicated for note taking to stand beside neonatologist in room and keep the team aware of vital signs at regular timings (q5 minutes depending on stability)
Vital signs, including BP, q5 min and recorded until stabilization of target saturations obtained.
CMAC moved next to ventilator (on left side of patient) IF baby not already intubated
Bedside RN to turn on heating lamp
Placement of baby on plexiglass (plexiglass covered by warm blankets)
Bedside RN attaches EKG leads and pre and post ductal saturation probes to monitor and blood pressure cuff to left arm
Experienced RN attempts placement of peripheral IV (stands on right side of patient). Maximum of 2 attempts (or until bedside ECHO completed and ready to start septostomy). The RN attempting should not be the same one as the one who attempted in the delivery room.
Cardiologist #1 performs bedside ECHO to confirm need for septostomy procedure or not (stands on left side of patient)
Bedside RT continues to monitor airway/breathing of patient +/- hold CPAP as indicated or attach baby to ventilator if already intubated

UVL should not be attempted immediately since the cord needs to be left intact for the cardiologist to be used as passage for septostomy.

Need for Septostomy Confirmed:

Scenario 1: Baby stable but not intubated and IV placement successful:

Baby repositioned 90 deg for intubation, CMAC on other side of the bed for visualization
Intubation medications (**atropine, fentanyl, succinylcholine**) administered through PIV
Patient intubated by senior person (RT, senior fellow, or neonatologist)
ETT confirmed through the cords
ETT secured by second RT
Baby repositioned in normal position in bed
Extension tubing placed on IV
Rocuronium administered IV once ETT secured (leads to prolonged paralysis).
PGE infusion started (initial 0.02 mcg/kg/min)
Fentanyl infusion started (1mcg/kg/hour)
D10W infusion started at TFI 65 ml/kg/day
Baby attached to ventilator at standard settings based on gestation
DIAPER REMOVED for preparation of septostomy

Scenario 2: Baby stable but not already intubated and IV placement NOT successful:

Same protocol as Scenario 1 except use of IM route for medications.
Intubation medications (atropine, fentanyl, succinylcholine) administered through IM route
No infusions until IV placement secured post-septostomy.
Fentanyl 1 mcg/kg q5-10 minutes intermittently IM or intra-nasal until IV placed.
Rocuronium administered IM once ETT secured (leads to prolonged paralysis).

Scenario 3: Baby born unstable (critical d-TGA with no mixing):

Intubation in the delivery room and time to mixing via septostomy as soon as possible.

A) *If IV available:* Rocuronium administered IV with ETT already secured.
   PGE infusion started (initial 0.02 mcg/kg/min)
   Fentanyl infusion started (1mcg/kg/hour)
   D10W infusion started at TFI 65 ml/kg/day
B) *If no IV possible:* No infusions until IV placement secured post-septostomy.
   Fentanyl 1 mcg/kg q5-10 minutes intermittently IM or intra-nasal until IV placed.
   Rocuronium administered IM once ETT secured (leads to prolonged paralysis).
   Once UVL placed by cardiology (either after septostomy via umbilical approach, or after transitioning to femoral attempt to access) – start infusions (PGE, D10W and Fentanyl).

Note: Intra-osseus access at the discretion of the neonatologist – if other accesses or UVL not available. If blood is emergently needed, medication RN (or delegate) to bring O negative blood from Birthing Center fridge. Do not administer rocuronium without an analgesia/sedation agent (ensure fentanyl infusion and/or IM boluses). Beware of chest wall rigidity during fentanyl administration if no paralytic agent is administered. All patients undergoing septostomy need to be intubated for the procedure and patient kept very still (neuromuscular blockade) for the length of the procedure.

MEANWHILE during intubation/after confirmation of need for septostomy:

Interventional Cardiologist (I.C.) and nursing assistants preparing materials for septostomy (1 scrubbed and 1 not scrubbed for opening material)

Cardiologist #1 works with I.C. to place sterile sleeves over ultrasound probes
Cardiologist #1 cleans hands and puts on sterile gloves, takes back the sterile ultrasound probes from the sterile field to avoid them falling and to scan during procedure.

Preparation for Septostomy Procedure:

Once I.C. has necessary materials, Nursing assistant then moves to patient's left side to hold up umbilical clamp to facilitate cleaning
I.C. cleans baby from knees to nipples using chlorhexidine and sterile 2x2 gauzes
Sterile drapes placed over bottom half of baby's legs
Umbilical tie placed around umbilicus
Umbilicus cut by I.C.
Large sterile drape with hole cutout placed over baby's umbilicus

Septostomy Procedure:

1) First attempt: Through umbilicus, using guidewire exchange through 5fr UVL catheter
   If umbilical approach unsuccessful, IC to place peripheral/low lying UVL (UVL to be secured using 2 x Tegaderms) and gives it to the NICU-RN for medication/fluids.
   IC signals to Neonatologist to call IR for their presence at bedside if umbilical approach fails.
   Note – if IR is not available, 2nd line is to call CVT, 3rd line is General Surgery for cut-down

2) Further attempts: IC attempts femoral access once umbilical attempt failed
   If IC succeeds femoral access – NICU notifies / cancels back-up IR/CVT/Surgery

Steps Once Septostomy Complete:

I.C. and Cardiologist confirm septostomy procedure successful
I.C. and Cardiologist move out from patient's bedside
NICU senior team scrubs and place 4fr double lumen UVL AND a UAL
Send following labs: aBG, vBG, CBC, Cross-Match, Coombs, urea, creatinine, LFTs (blood culture if risk factors)
Secure umbilical lines and Xrays to confirm placement of lines and ETT
Run infusions PGE / medications by sterile UVL placed

ONGOING POST-OPERATIVE MANAGEMENT:

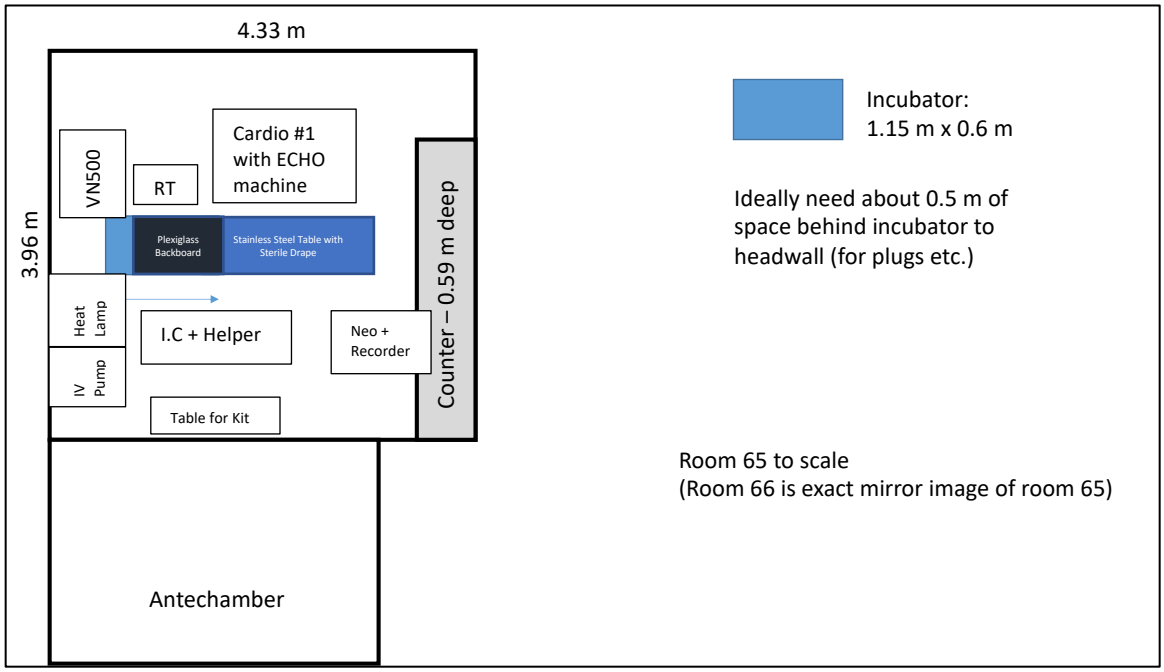
- Vital signs q15 min x1 hr, then q30 min x 2 hours, then q4 hrs
- Right upper limb target saturation: minimum 70%
- Keep NPO
- Strict ins and outs
- D10W at TFI 65 ml/kg/day
- Continue PGE infusion
- Can discontinue fentanyl infusion
- Blood gas q6 hrs. If within normal limits x2, can space out to usual laboratory routine
- If Femoral access: keep compressive dressing 6-12 hours, as ordered by cardiology.
- Ensure patient remains supine, with head of bed (HOB) less than 30 degrees and hips extended for the appropriate delay as ordered by cardiology.
- EKG within 24 hours following septostomy

- If femoral access used, ensure adequate limb perfusion monitoring with neurovascular signs (refer to MCH Cardiac Catheterization Protocol for full details).
  - Both femoral areas may have been punctured in the attempt to obtain access. Make sure to evaluate both limbs (for risk of neuro-vascular compromise, and to compare both limbs).
- Cardiologist in charge will notify the cath lab personnel (Mirjana.ramesa@muhc.mcgill.ca and Magdalena.zgolka@muhc.mcgill.ca) for refurnishing the kit, post-procedure.

IF PATIENT IS OUTBORN:

- If parents at another hospital, transport team MUST inform parents that the cardiology team will call them emergently about anticipated procedure and obtain consent
- Transport team to obtain contact information and phone numbers of BOTH parents AND direct extension of the maternal unit with room number.
- Pamphlet about possibility of septostomy given to parents.
- If UVL is placed by referring hospital, place PIV upon arrival to MCH NICU as Interventional Cardiologist may remove UVL for septostomy procedure

Room organization for equipment and personnel:



d-TGA Unstable - Algorithm

- Neonatologist contacts Cardiologist
- NICU informs I-R team. Presence at bedside of I-R Staff (not technician) only requested when Cardio fails umbilical approach and starts to femoral approach
- Cardiology to contact CVT

Algorithm for the **unstable** newborn (significantly cyanosed in the immediate post-natal life, sat<70%):

Intubate in delivery room. 2 attempts for PIV while securing ETT / organizing transfer.

Baby arrives in NICU. Only necessary personnel in Room.

Placed on ventilator.
If PIV not installed: max 2 attempts by another RN while Cardio#1 confirms with ECHO need for septostomy
Cardio #2 prepares for Septostomy by umbilical access with scrubbed helper.

If PIV available:

- Rocuronium (1mg/kg) administered IV (ETT must be secured).
- PGE infusion started (initial 0.02 mcg/kg/min)
- Fentanyl infusion started at 1 mcg/kg/hr
- D10W infusion started at TFI 65 ml/kg/day

If PIV not successful:

- Fentanyl 1 mcg/kg q5-10 minutes intermittently intramuscular.
- Rocuronium 1mg/kg administered IM (ETT must be secured)

- Cardio#2 attempts septostomy by umbilical access using UVL as sheath for guidewire.

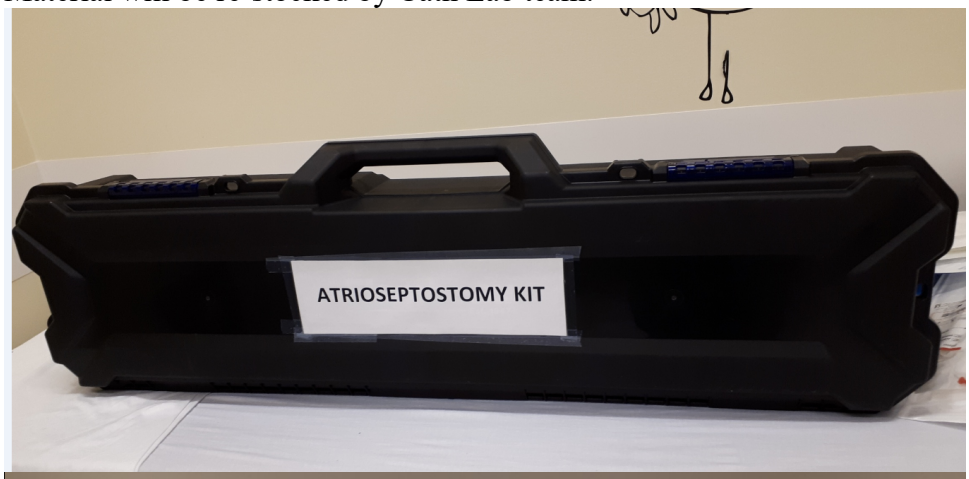
- Cardio#2 not able to get Umbilical access to right atrium
- Cardio#2 puts a double-lumen UVL peripheral, secure with Tegaderm x2 and hands to NICU team to start infusions (Fentanyl, D10W, PGE + other medications)
- NICU calls IR (first line), CVT (2nd line), General Surgery (3rd line for cut-down)
    - Cardio#2 attempts first femoral area
    - If succeeds femoral– NICU notifies / cancels back-up IR/CVT/Surgery
    - Further attempts to be done by Cardio#2 + Backup

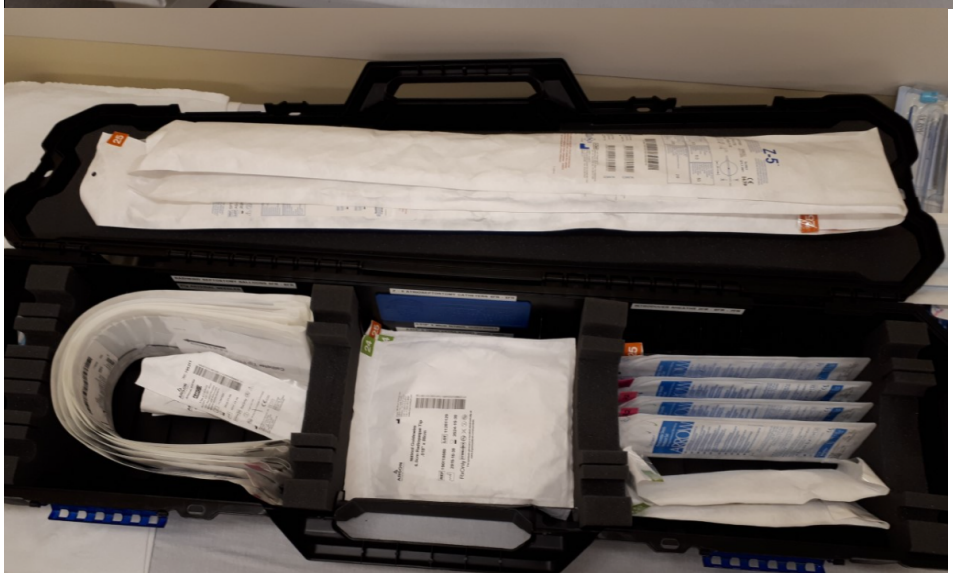
Cardio#2 able to get to through ductus venosus but cannot open septum: Discussion between NICU/Cardio for when to liberate umbilical access to obtain UVL if no PIV secured. Depends on cardio-respiratory stability and need for inotropes and fluids.

- Septostomy successful
- NICU installs clean double-lumen UVL and UAL
- Run infusions PGE / medications by sterile UVL placed
- Post-intervention monitoring

Septostomy Kit

Material will be re-stocked by Cath Lab team.





Size: 43 ½” x 12” x 7” Weight: 4.4kg

Cath lab Pack size: 14” x 14” x 5 Weight: 1.4 kg


Resource™
SAN30CLMCD
SAN30CLMCD

Septostomy Content:

HOP MONTREAL POUR ENFANTS

Contient:

1	MX	HOUSSE CHARIOT D'APPOINT	10		SERINGUE À TUBERCULINE 1ML	2		SERINGUE, 5 ML
6		SERINGUE, 10 ML	1		SERINGUE, 20 ML	1		TROUSSE,RECOUVR TRANSDUCTEUR
2	MX	CHAMP INC 16x16PO CIRC 2,5PO	2		ROBINET, 4 VOIES MÂLE PIVOT	2	CN	SERVIETTE DE COTON
1	CN	SUPPORT, AIGUILLE	1		ÉTIQUETTE, OMNIPAQUE	1		ÉTIQUETTE, XYLOCAINE 1 % ORD
1		ÉTIQUETTE, ADÉNOSINE	1		ÉTIQUETTE XYLOCAINE 2 %	1		ÉTIQUETTE, HÉPARINE SODIQUE
1		ÉTIQUETTE, HÉPARINE 1 000U/CC	1	CN	SAC-DÔME	1	VN	SAC-DÔME
1	VN	SAC-DÔME	1		SER 5ML LUER SLIP SANS PROT	2		SERINGUE, 3 ML
1		AIGUILLE, C18x1,5PO	1	MX	CHAMP SUPÉRIEUR	1	CA	SCALPEL
1	KH	BLOUSE DE CHIRURGIE						

Septostomy kit content: Once we run out of Rashkind balloons, we should revise the introducer sheaths and guide wires. Z-5 Septostomy balloons take 0.21” and 0.14” guide wires and 5fr and 6fr sheaths. In the meantime I will find a replacement for the short 6fr sheath

SEPTOSTOMY KIT

price	each	nit of iss	GRM#	QTY	STOCK	EXP. DATE MONTH	EXP. DATE YEAR
$300.00	$ 300.00	each	54032	2	Z-5 4FR ATRIOSEPTOSTOMY CATHETER SPT002	3	2023
						6	2025
$300.00	$ 300.00	each	87060	2	Z-5 5FR ATRIOSEPTOSTOMY CATHETER SPT003	6	2025
						11	2025
			discontinued	4	RASHKIND SEPTOSTOMY 5FR #007160	3	2021
						3	2021
						1	2022
						12	2021
			discontinued	2	RASHKIND RECESSED SEPTOSTOMY 6FR #008764	1	2022
						1	2021
$ 59.00	$ 5.90	bx/10	1675	3	AMC3 21 ga ARTERIAL NEEDLE #195311	11	2022
						8	2021
						11	2022
$195.00	$ 19.50	bx/10	discontinued	2	ARROW SHEATH 6 FR x 7.5CM	3	2022
						3	2022
$197.34	$ 19.73	bx/10	25702	2	ARROW SHEATH 7 FR x 11CM	1	2022
						8	2025
$665.00	$ 66.50	bx/10	79313	2	IVA 3FR X 7CM SHEATHS (BALT)	8	2024
						8	2024
$595.00	$ 119.00	bx/5	21008	2	EXTRA S'PORT GUIDE WIRE 0.014 X 190CM	4	2022
						4	2022
$247.50	$ 49.50	bx/5	55403	3	GUIDE WIRE HI-TORQUE 0.018 X 80CM	10	2024
						10	2024
						9	2025
$ 11.25	$ 0.09	bx/125	not coded	4	NON LUER-LOCK SYRINGE 5 CCS (SLIP TIP)	*	*
						*	*
						*	*
						*	*
$ 95.00	$ 0.79	bx/120	88476	1	SAFETY SCALPEL	10	2021
total:	$ 881.01						