

Neural Tube Defect (Myelomeningocele) Postnatal Management

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What is a Clinical Pathway?



An evidence-based guideline that decreases variation in care and helps promote safe, effective, and consistent patient care.

Objectives of Pathway



- Standardize delivery room and NICU-based management of neonates with open neural tube defects
- Reduce infection rate through the appropriate use of antibiotics, as well as standardized wound care / dressing changes
- Standardize monitoring for hydrocephalus and criteria for CSF diversion
- Clarify the consults that should be placed and the subspecialists involved in inpatient and outpatient care

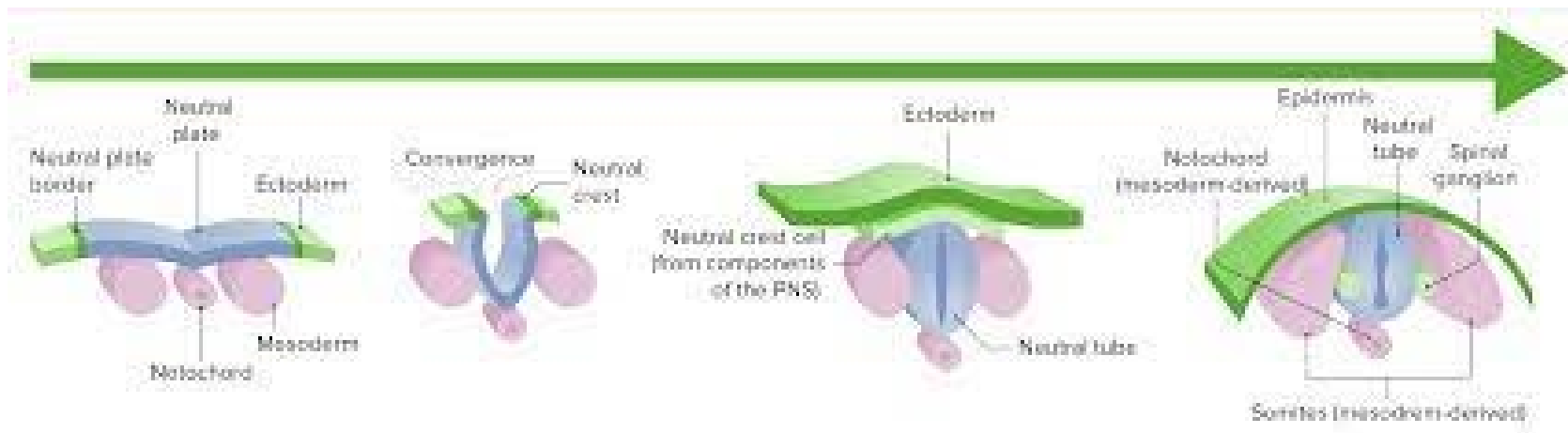
Why is This Pathway Necessary?



- With the opening of the Fetal Care Center, there is an increasing number of patients with open neural tube defects
- With previously low volumes, there was significant variation in practice and uncertainty about certain aspects of the medical care – had to “recreate the wheel” each time

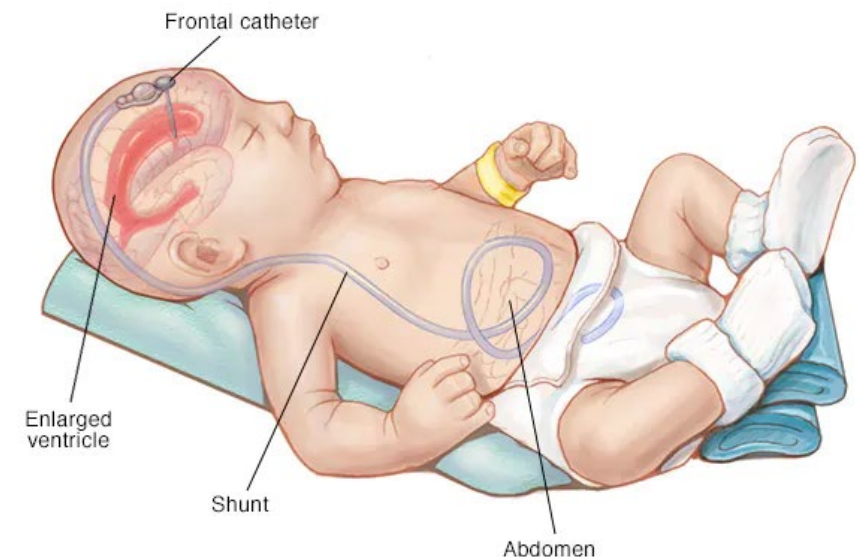
Background

- Open neural tube defects result from a failure of primary neurulation, leading to abnormal development of the spinal cord at and below the level of the defect.
- Secondary injury can occur from mechanical and chemical trauma, as well as infection. Defects that are open at birth should be covered with sterile, moist dressings and the defect should be closed within 48 hours to prevent desiccation, heat loss, and infection [1-3].



Background

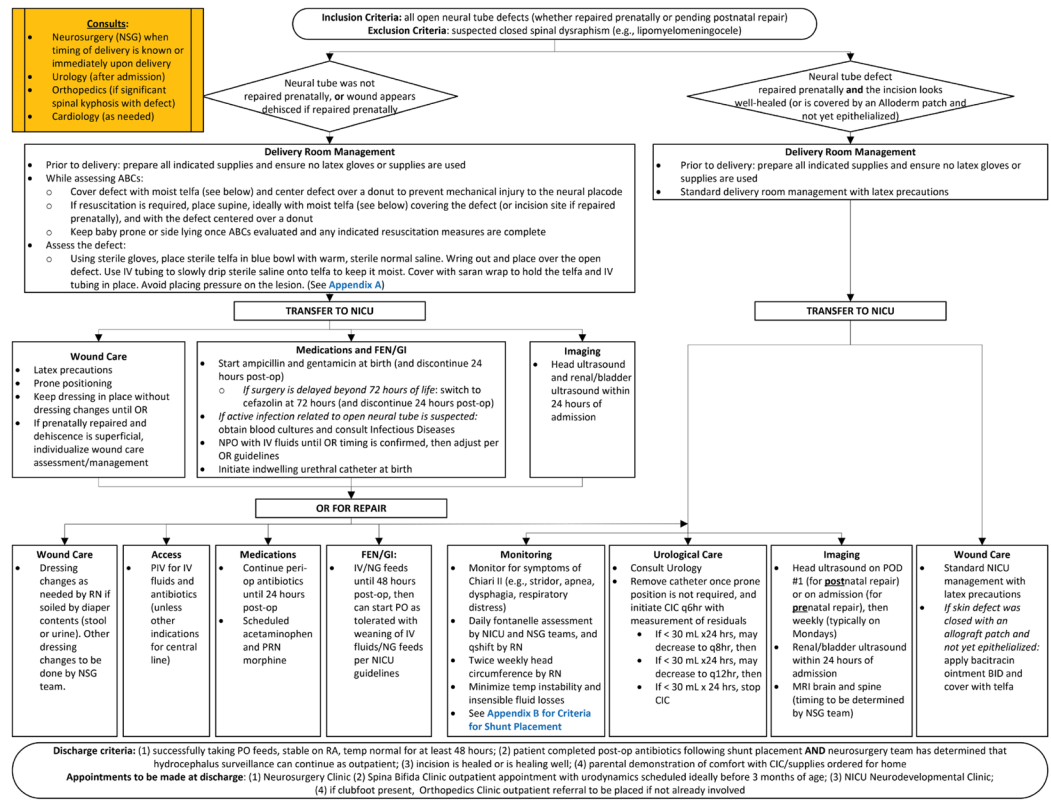
- Approximately 40% of patients undergoing prenatal repair and 80% of those undergoing postnatal repair will meet criteria for VP shunt placement [4]. Close surveillance is necessary in the postnatal period.
- Neurogenic bladder is common among patients with open neural tube defects; appropriate urological care is critical for improving long-term quantity and quality of life [5].



CLINICAL PATHWAY:
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This is the **Open Neural Tube Defect (Myelomeningocele) Clinical Pathway.**

We will be reviewing each component in the following slides.



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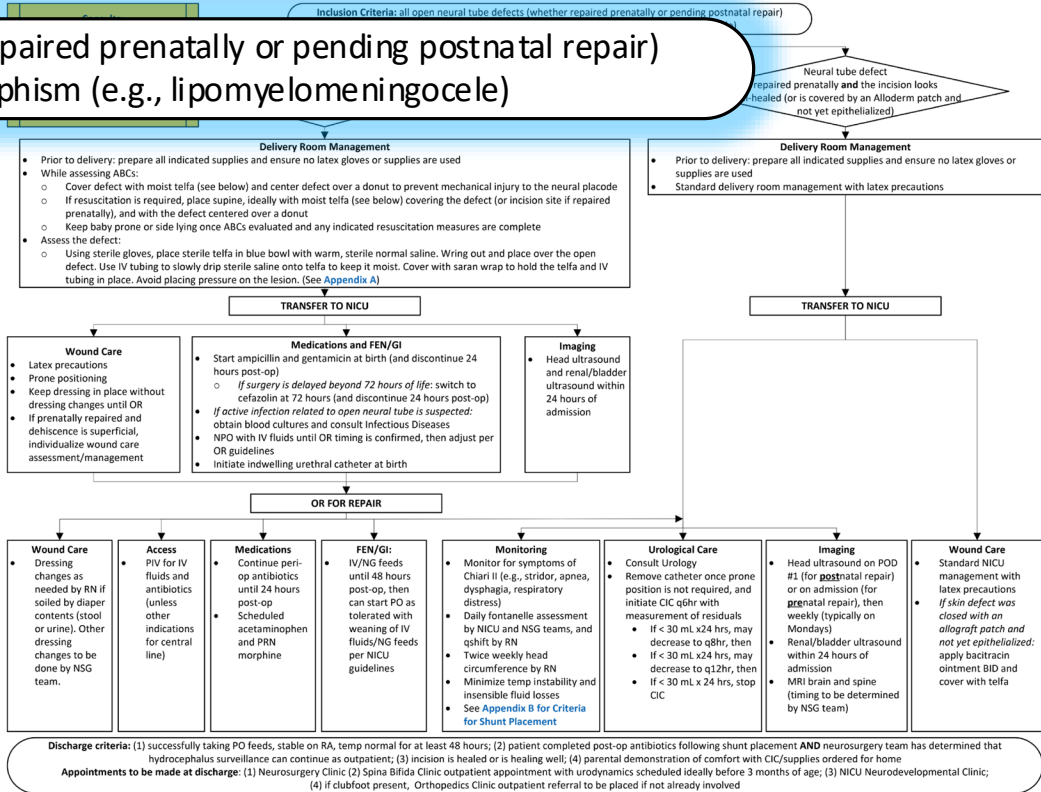


CLINICAL PATHWAY:
Neural Tube Defect (Myelomeningocele) Postnatal Management

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 JUDGMENT

Inclusion Criteria: all open neural tube defects (whether repaired prenatally or pending postnatal repair)
Exclusion Criteria: suspected closed spinal dysraphism (e.g., lipomyelomeningocele)

All open neural tube defects will follow the pathway, whether or not they were repaired prenatally



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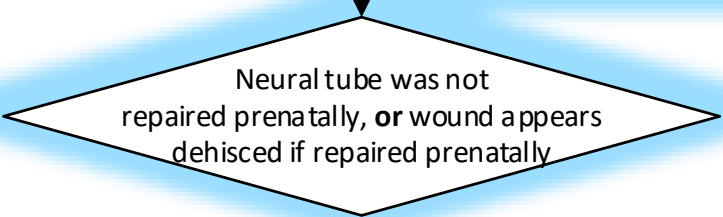
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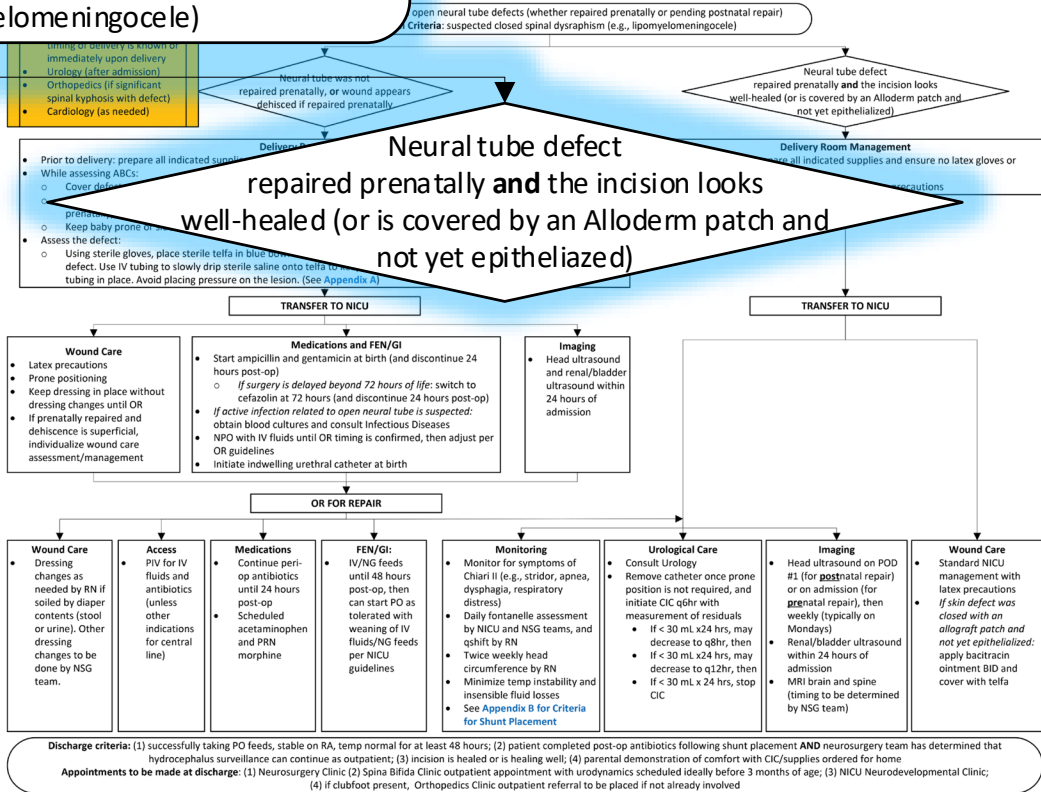
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Management depends on if the neural tube was repaired prenatally and on the appearance of the wound



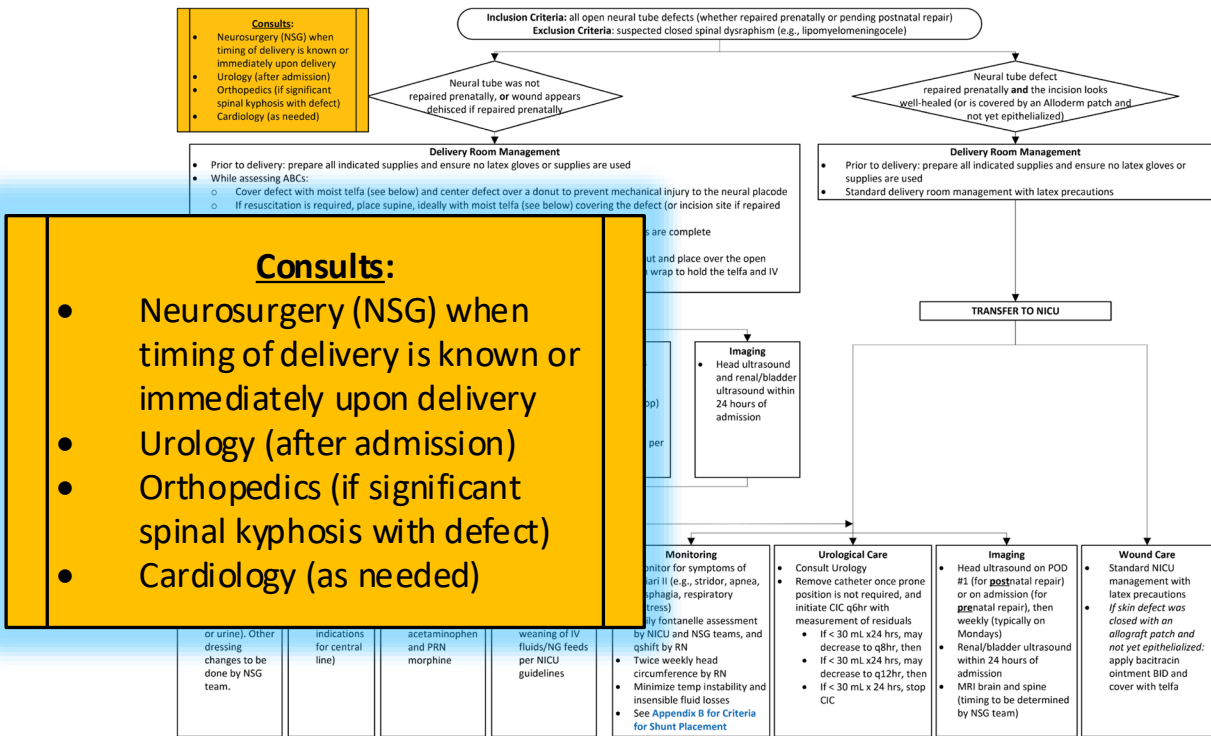
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CLINICAL PATHWAY: Neural Tube Defect (Myelomeningocele) Postnatal Management

For both groups, subspecialty consultation and timing are listed here.



Discharge criteria: (1) successfully taking PO feeds, stable on RA, temp normal for at least 48 hours; (2) patient completed post-op antibiotics following shunt placement AND neurosurgery team has determined that hydrocephalus surveillance can continue as outpatient; (3) incision is healed or is healing well; (4) parental demonstration of comfort with CIC/supplies ordered for home

Appointments to be made at discharge: (1) Neurosurgery Clinic (2) Spina Bifida Clinic outpatient appointment with urodynamics scheduled ideally before 3 months of age; (3) NICU Neurodevelopmental Clinic; (4) if clubfoot present, Orthopedics Clinic outpatient referral to be placed if not already involved

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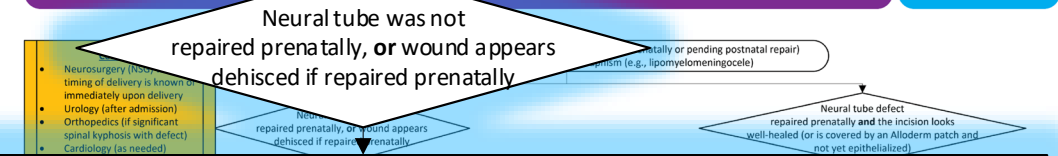
Neural tube not repaired prenatally or wound appears dehiscenced if repaired prenatally

Delivery room management is outlined.

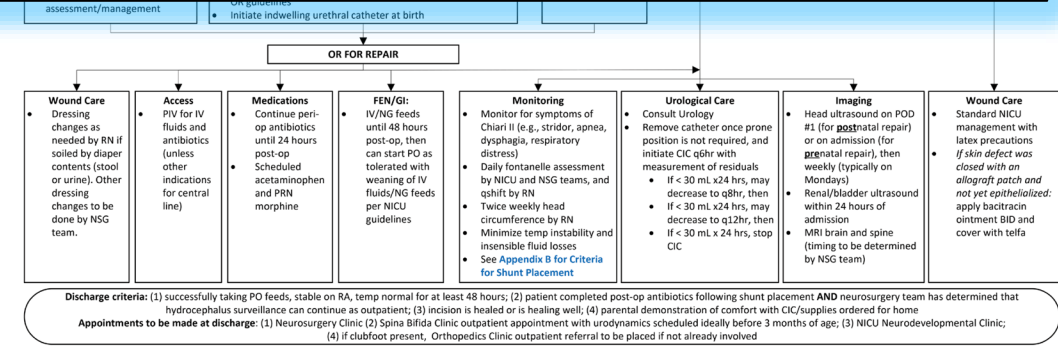
It is important to keep the defect protected at all times to prevent injury to the neural placode. Avoid placing pressure on the lesion.

CLINICAL PATHWAY: Neural Tube Defect (Myelomeningocele) Postnatal Management

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- ### Delivery Room Management
- Prior to delivery: prepare all indicated supplies and ensure no latex gloves or supplies are used
 - While assessing ABCs:
 - Cover defect with moist telfa (see below) and center defect over a donut to prevent mechanical injury to the neural placode
 - If resuscitation is required, place supine, ideally with moist telfa (see below) covering the defect (or incision site if repaired prenatally), and with the defect centered over a donut
 - Keep baby prone or side lying once ABCs evaluated and any indicated resuscitation measures are complete
 - Assess the defect:
 - Using sterile gloves, place sterile telfa in blue bowl with warm, sterile normal saline. Wring out and place over the open defect. Use IV tubing to slowly drip sterile saline onto telfa to keep it moist. Cover with saran wrap to hold the telfa and IV tubing in place. Avoid placing pressure on the lesion. (See [Appendix A](#))



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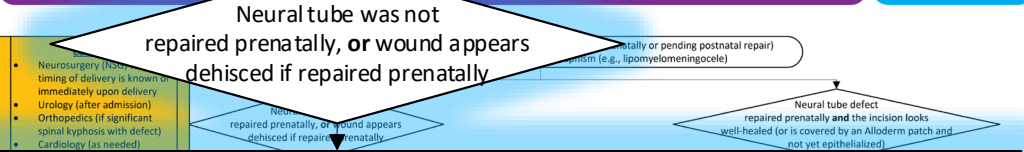
Neural tube not repaired prenatally or wound appears dehisced if repaired prenatally

Appendix A provides sample images of how the defect should be covered and cared for.

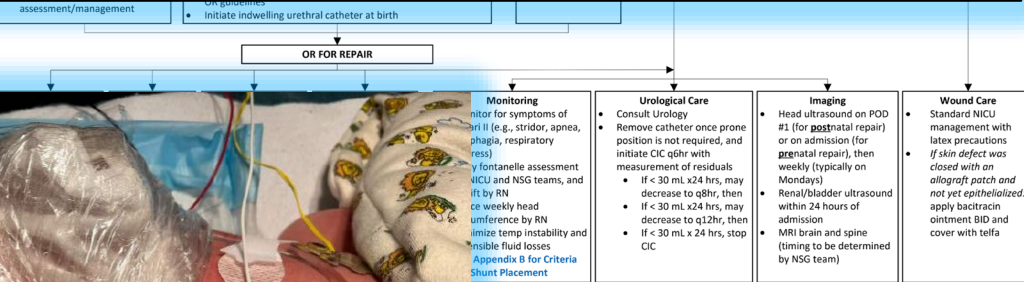


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- ### Delivery Room Management
- Prior to delivery: prepare all indicated supplies and ensure no latex gloves or supplies are used
 - While assessing ABCs:
 - Cover defect with moist telfa (see below) and center defect over a donut to prevent mechanical injury to the neural plate
 - If resuscitation is required, place supine, ideally with moist telfa (see below) covering the defect (or incision site if repaired prenatally), and with the defect centered over a donut
 - Keep baby prone or side lying once ABCs evaluated and any indicated resuscitation measures are complete
 - Assess the defect:
 - Using sterile gloves, place sterile telfa in blue bowl with warm, sterile normal saline. Wring out and place over the open defect. Use IV tubing to slowly drip sterile saline onto telfa to keep it moist. Cover with saran wrap to hold the telfa and IV tubing in place. Avoid placing pressure on the lesion. (See [Appendix A](#))



Notes: (2) patient completed post-op antibiotics following shunt placement AND neurosurgery team has determined that wound is healing well; (4) parental demonstration of comfort with CIC/supplies ordered for home; (5) appointment with urology scheduled ideally before 3 months of age; (3) NICU Neurodevelopmental Clinic; (6) clinic outpatient referral to be placed if not already involved

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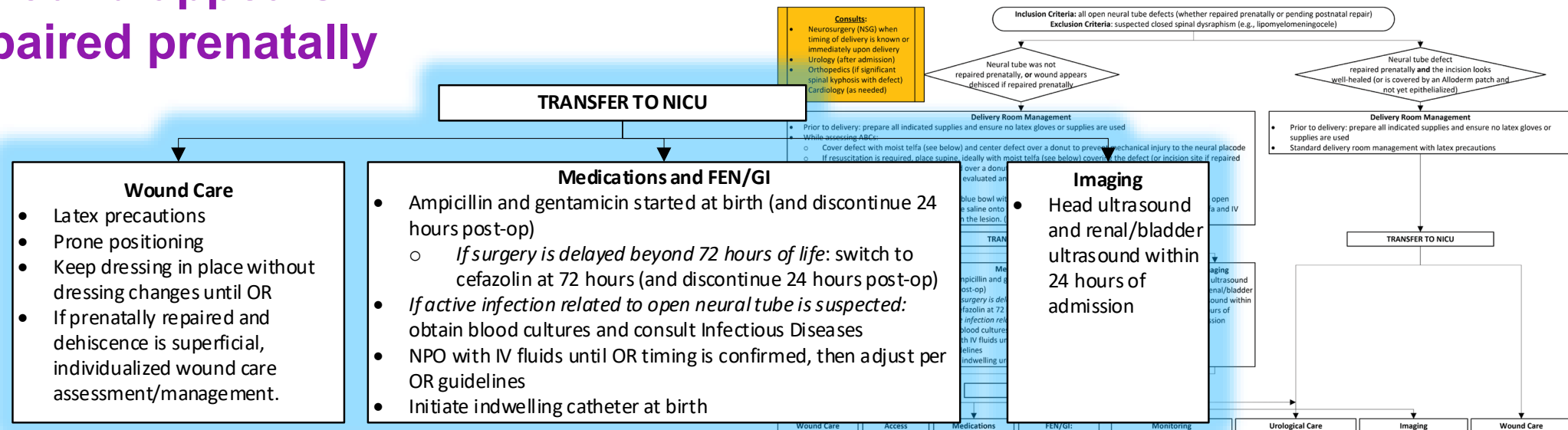
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Neural tube not repaired prenatally or wound appears dehisced if repaired prenatally

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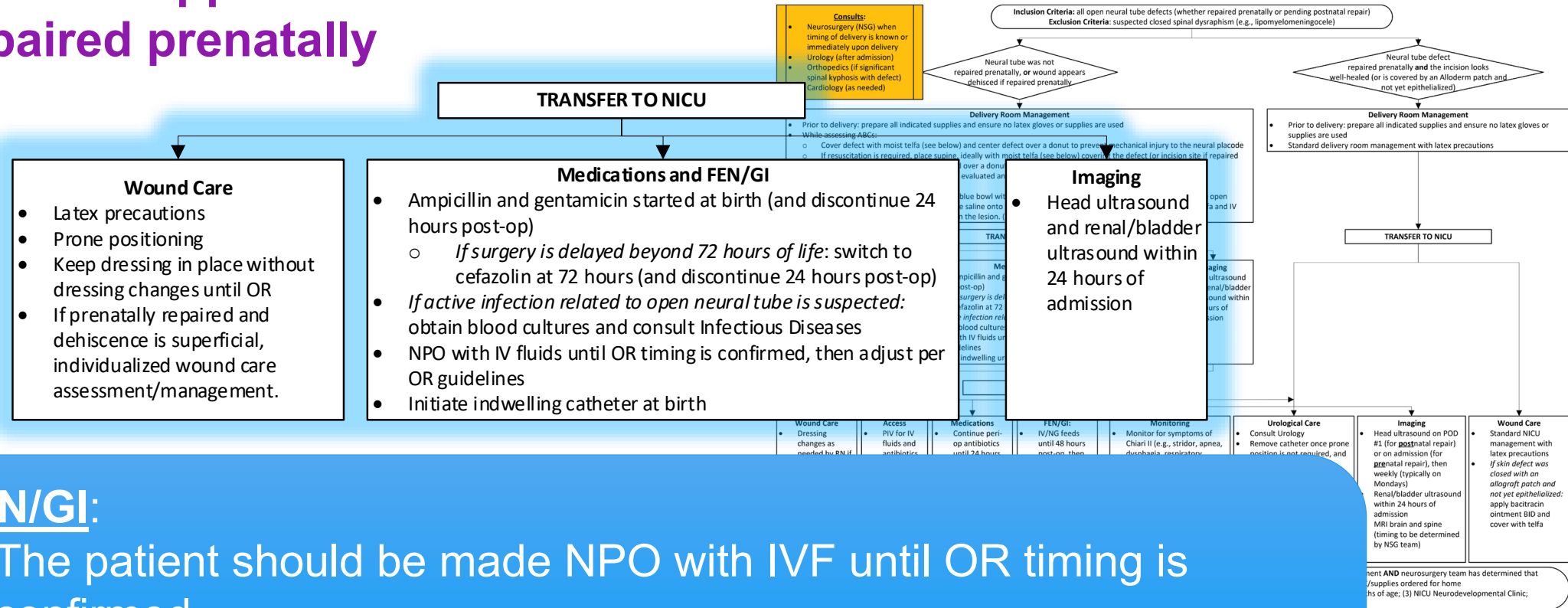
Antibiotics:

- Antibiotic prophylaxis should be started at birth and only continue for 24 hours post-op.
- Ampicillin + gentamicin provide coverage for GBS, enteric Gram negatives, and *enterococci*
- The most common bacteria to cause site infections >48-72 hours of life include *Staph. aureus*
- Cefazolin should be used beyond 72 hours of life to cover the most common organisms.
- A wound culture should be obtained to direct therapy if there are clinical signs of deterioration, or if pus is present. Consult Infectious Diseases to help manage.

Neural tube not repaired prenatally or wound appears dehisced if repaired prenatally

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FEN/GI:

- The patient should be made NPO with IVF until OR timing is confirmed.
 - Not only will this prep the patient for the OR, but the ideal positioning for the patient is prone, making PO feeds difficult.
- Initiate an indwelling urethral catheter at birth

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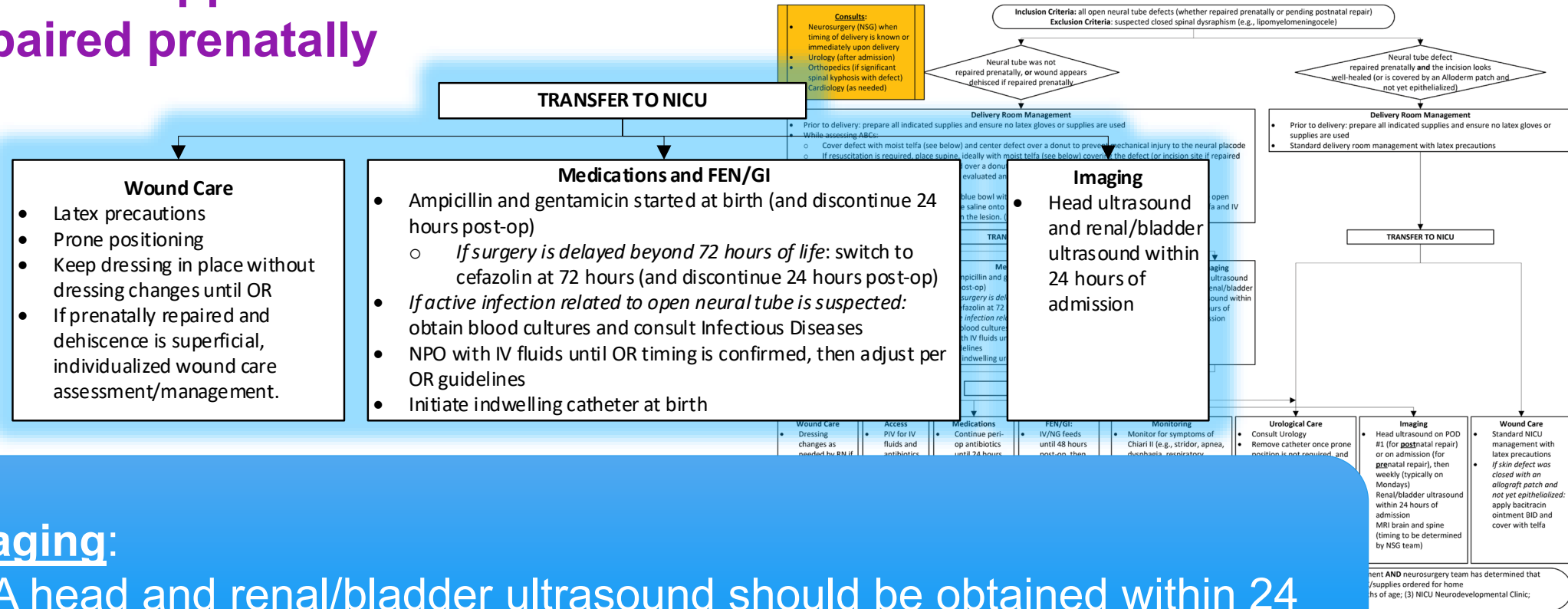
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Imaging:

- A head and renal/bladder ultrasound should be obtained within 24 hours of admission.

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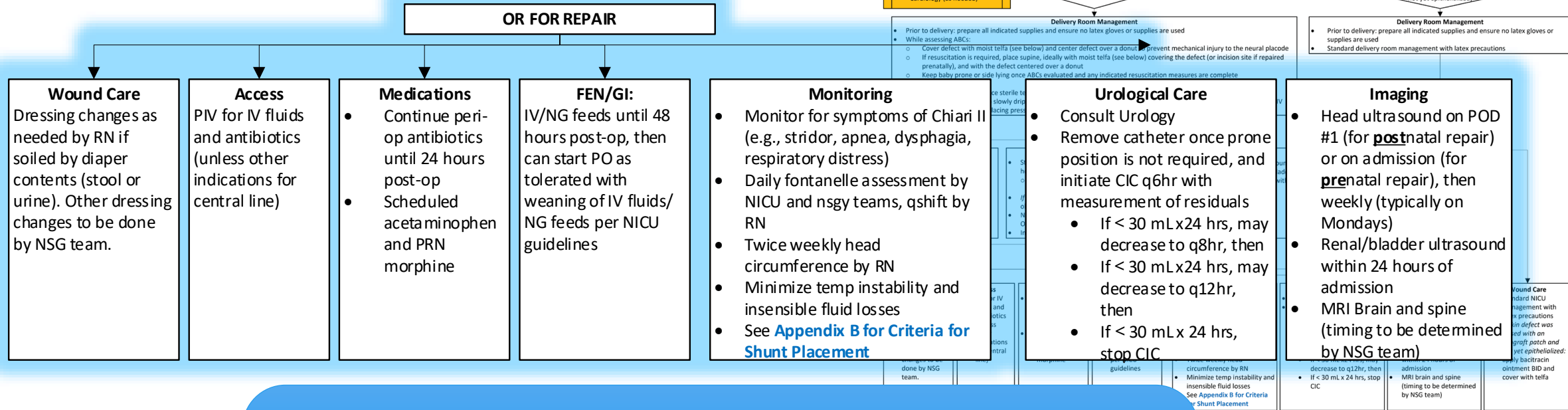
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Post-operative management includes wound care, access, medications, FEN/GI, monitoring, urological care, and imaging.

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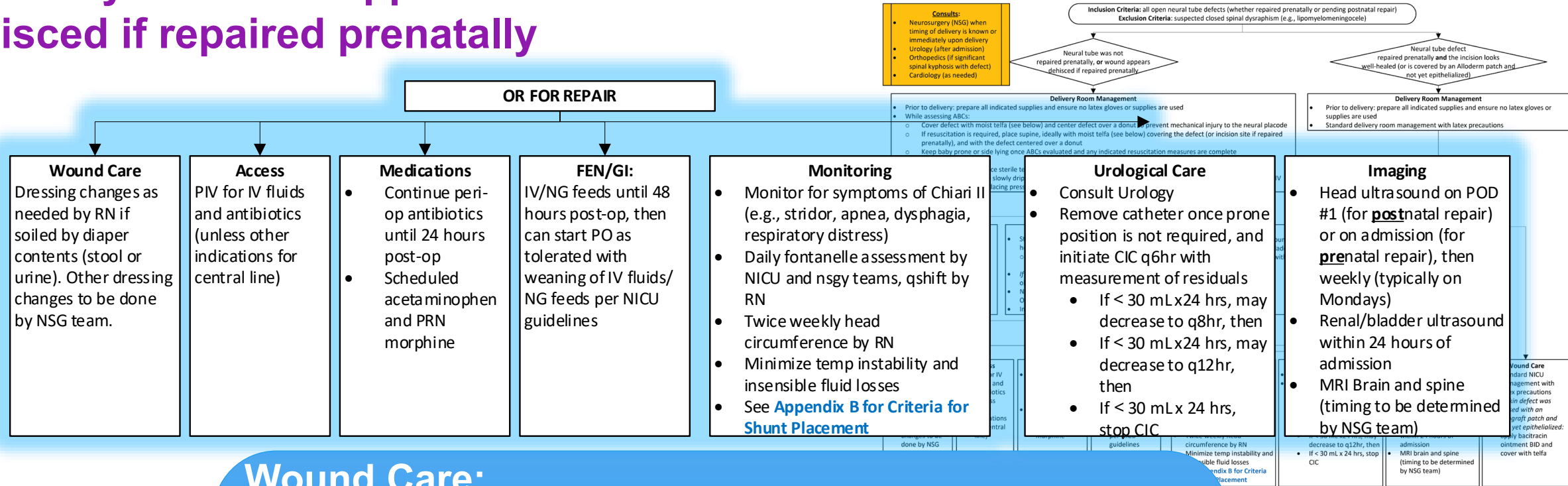
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Wound Care:

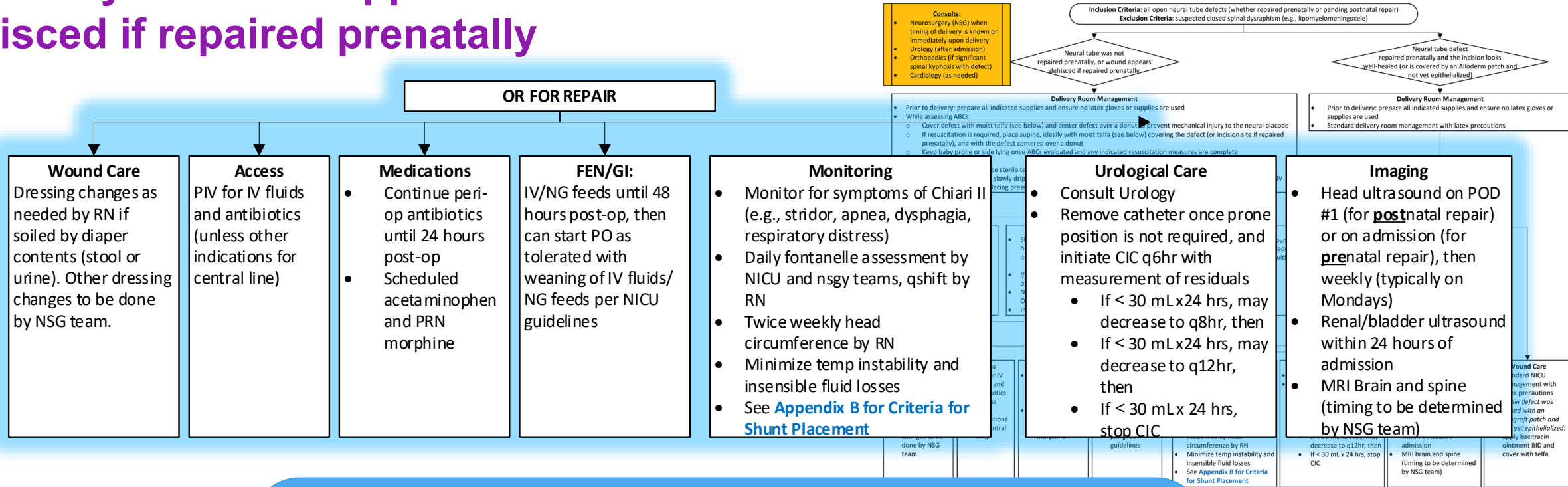
- Dressing changes should be done by the neurosurgical team unless it is soiled by diaper contents.
- The wound should not be exposed to a moist environment post-operatively.
- If the dressing is soiled by urine, it would be difficult to tell if there is a CSF leak.

patient completed post-op antibiotics following shunt placement AND neurosurgery team has determined that patient is doing well, (4) parental demonstration of comfort with CIC/supplies ordered for home management with urodynamics scheduled ideally before 3 months of age; (5) NICU Neurodevelopmental Clinic; patient referral to be placed if not already involved

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Monitoring:

- Watching for symptoms of Chiari II is important.
- A daily fontanelle assessment should be done, as well as twice weekly head circumferences, to monitor for hydrocephalus.

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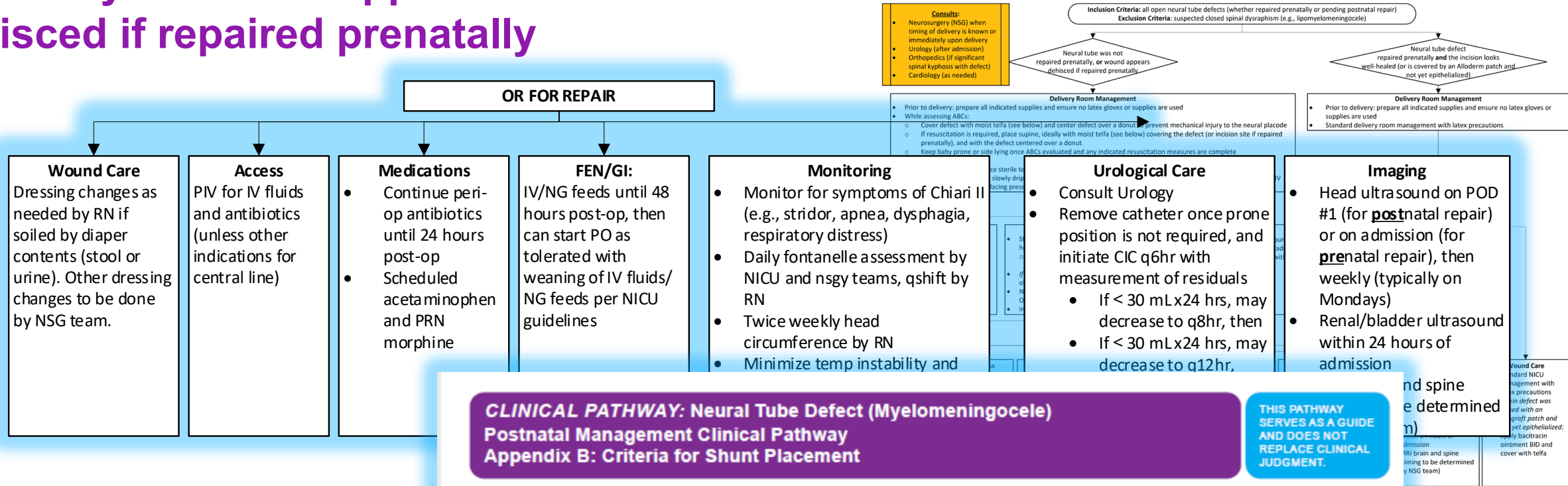
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Monitoring: Appendix B has criteria for shunt placement.

Appendix B: Criteria for Shunt Placement

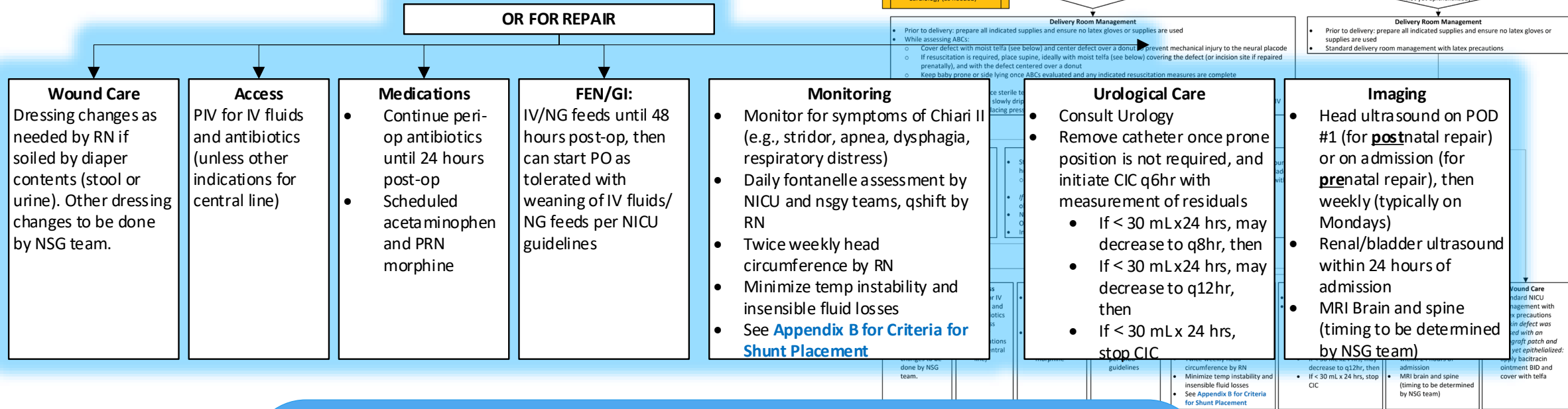
- Criteria for shunt placement include any one of the following:
- Bulging fontanelle, split sutures, or sunsetting eyes and one of the following:
 - An increase in head circumference/crossing percentiles
 - Increasing hydrocephalus on consecutive imaging studies
 - Head circumference >95th percentile
 - Syringomyelia with ventriculomegaly
 - Ventriculomegaly and symptoms of Chiari II malformation
 - Persistent CSF leakage from the myelomeningocele wound or bulging at the repair site



Neural tube not repaired prenatally or wound appears dehiscenced if repaired prenatally

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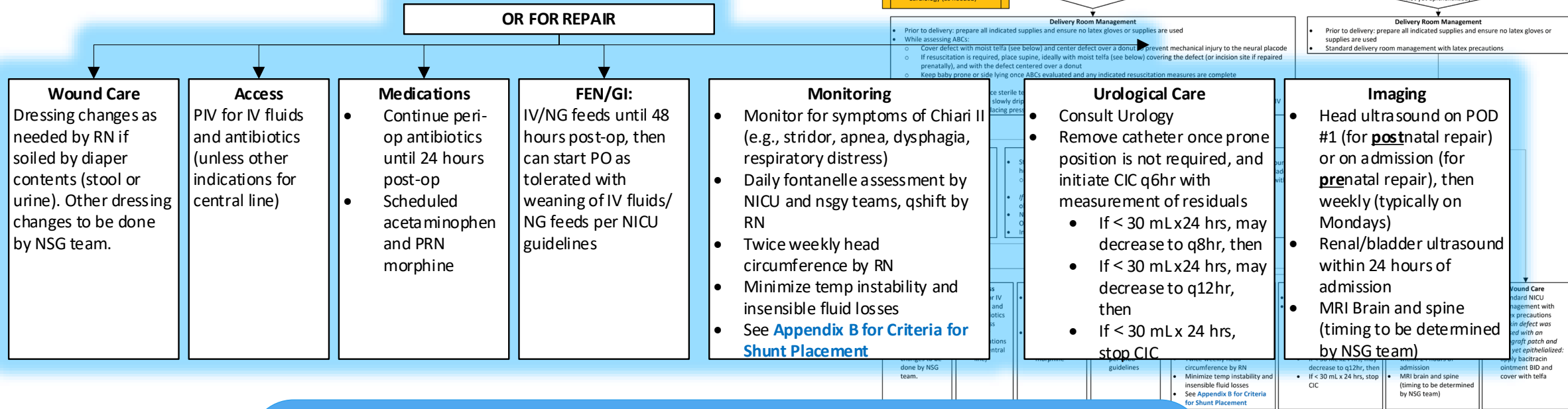
Urological Care:

- Urology should be consulted post-operatively.
- The bladder/kidney function needs to be closely monitored.
- Catheter can be removed once prone position is not required.
- CIC parameters are listed here.

Neural tube not repaired prenatally or wound appears dehiscd if repaired prenatally

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Imaging:
Imaging includes head ultrasounds, renal/bladder ultrasounds, and an MRI of the brain and spine.

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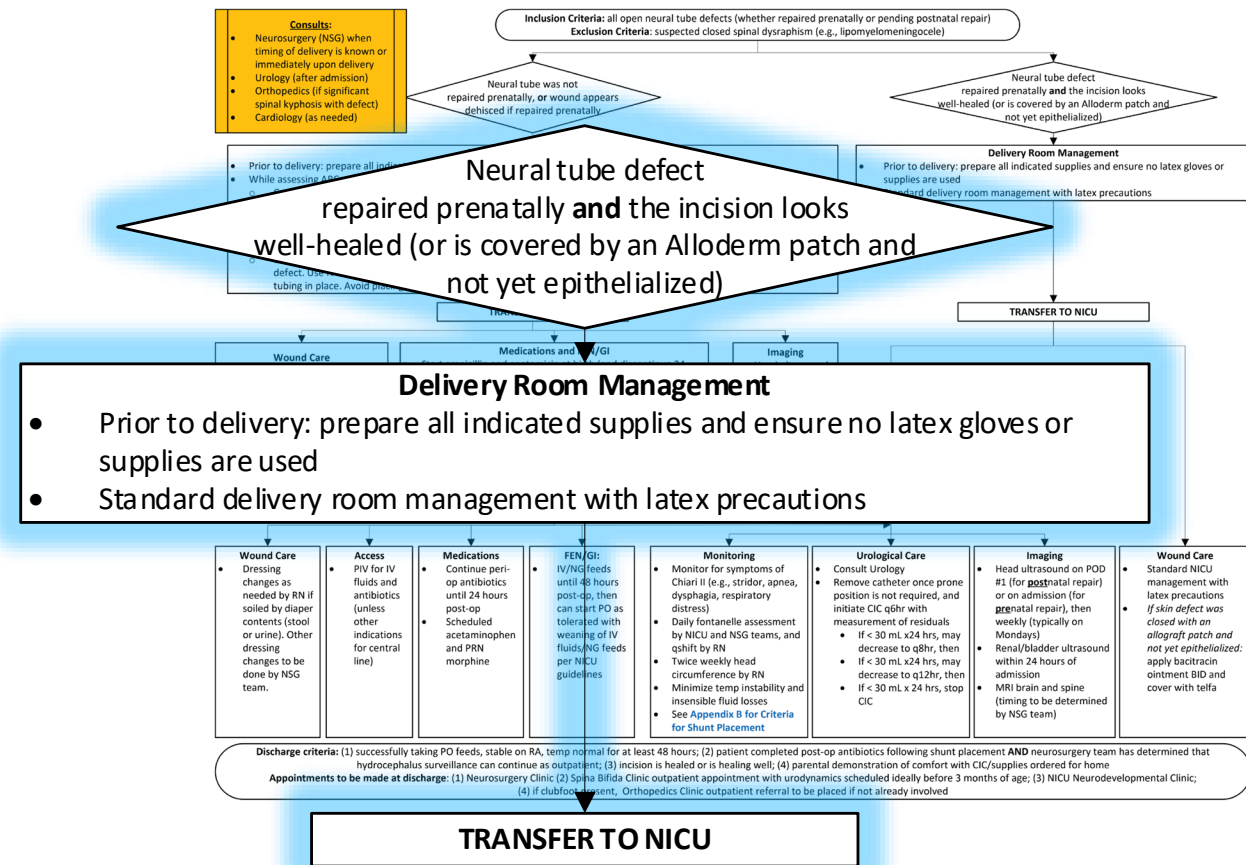
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Neural tube repaired prenatally and the incision looks well-healed (or covered by Alloderm patch and not yet epithelialized)

For defects repaired prenatally that are well healed (or covered by an Alloderm patch and not yet epithelialized), delivery room management is standard with latex precautions.

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Neural tube repaired prenatally and the incision looks well-healed (or covered by Alloderm patch and not yet epithelialized)

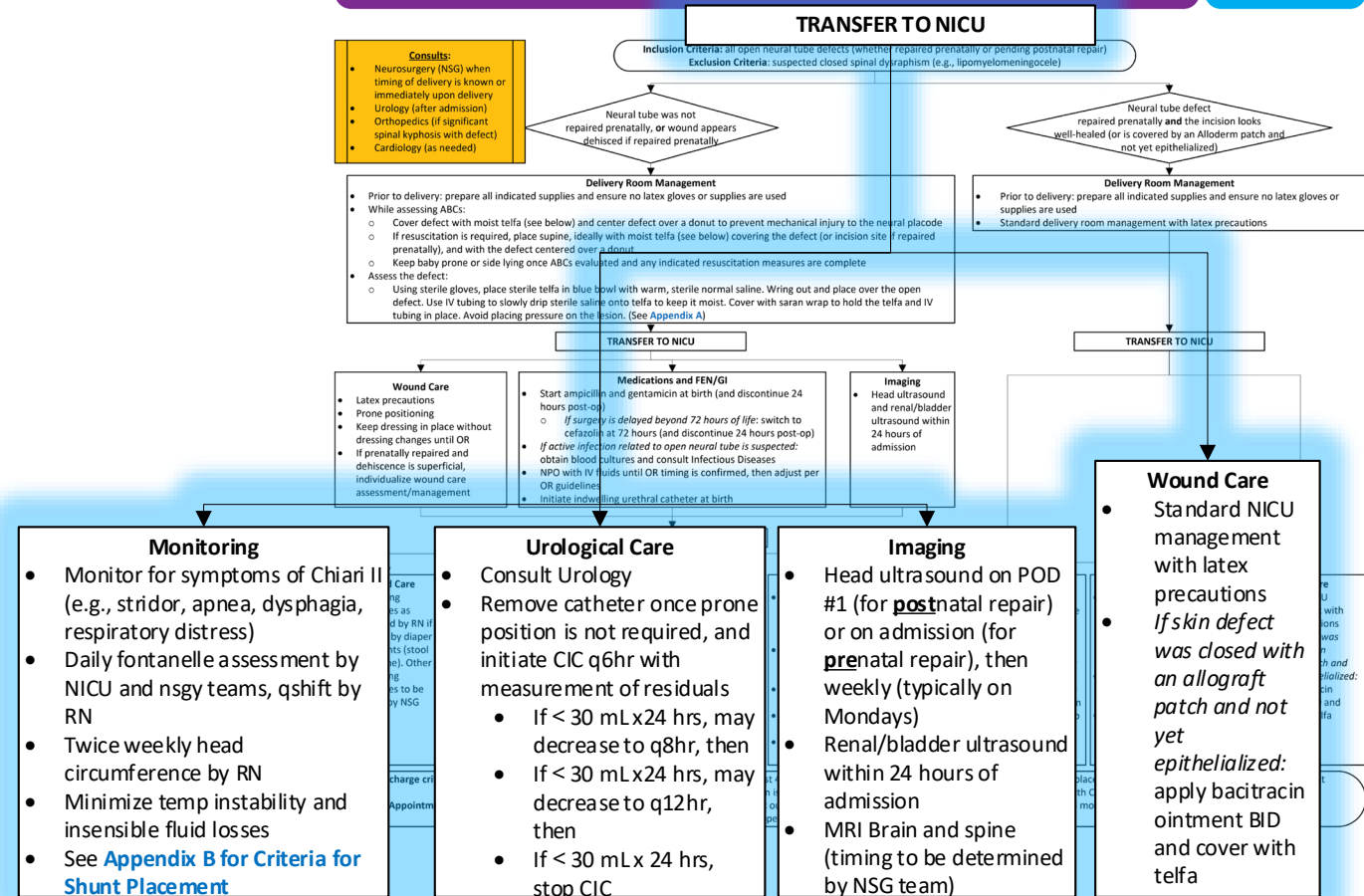
NICU management includes the same monitoring, urological care, and imaging as for patients who did not have prenatal repair.

However, wound care should be standard NICU management.

If there is an allograft patch, bacitracin should be applied and the wound covered with telfa.

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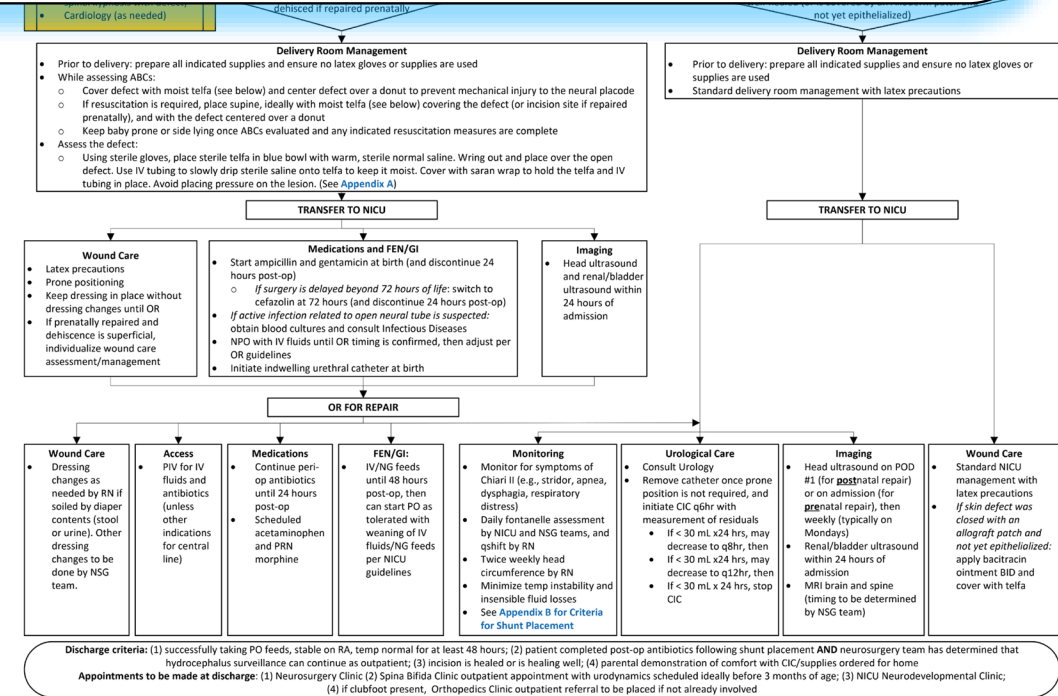
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Discharge criteria: (1) successfully taking PO feeds, stable on RA, temp normal for at least 48 hours; (2) patient completed post-op antibiotics following shunt placement **or** neurosurgery team has determined that hydrocephalus surveillance can continue as outpatient; (3) incision is healed or is healing well; (4) parental demonstration of comfort with CIC/supplies ordered for home

Appointments to be made at discharge: (1) Neurosurgery clinic (2) Spina Bifida Clinic outpatient appointment with UDS scheduled ideally before 3 months of age; (3) NICU Neurodevelopmental Clinical; (4) if clubfoot present, orthopedics outpatient referral to be placed if not already involved



Discharge criteria for all patients managed with this pathway are listed here.

It is very important to ensure that all follow up appointments are made at discharge.

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Review of Key Points

- Immediate wound management with sterile telfa that must be kept clean and moist until surgical repair of the defect
- Surgical repair typically occurs within 24-48 hours of delivery. The neonate should be stabilized from a respiratory and cardiovascular standpoint prior to surgery.
- Close monitoring of bladder/kidneys
- Post-repair, must undergo close monitoring for hydrocephalus

Quality Metrics



- # of patients entering pathway
- % using order set
- NICU length of stay
- % patients (not repaired prenatally) undergoing myelomeningocele repair within 48 hours of delivery
- % patients requiring VP shunt prior to discharge
- % patients with wound issues / wound infections
- % patients with ventriculitis and/or shunt infection
- % patients requiring intermittent catheterization upon discharge

Pathway Contacts



- David Hersh, MD; Neurosurgery
- Alaina Pyle, MD; NICU
- DonnaMaria Cortezzo, MD; NICU
- Anne Dudley, MD; Urology

References



1. Cohen AR, Robinson S. Early management of myelomeningocele. In: Pediatric neurosurgery, McLone DG (Ed), WB Saunders, Philadelphia 2001. p.241.
2. McLone DG. Care of the neonate with a myelomeningocele. Neurosurg Clin N Am 1998; 9:111.
3. Charney EB, Melchionni JB, Antonucci DL. Ventriculitis in newborns with myelomeningocele. Am J Dis Child 1991; 145:287.
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5. Joseph DB, Baum MA, Tanaka ST, et al. Urologic guidelines for the care and management of people with spina bifida. J Pediatr Rehabil Med 2020; 13(4):479-489.

Thank You!



About Connecticut Children's Pathways Program

Clinical pathways guide the management of patients to optimize consistent use of evidence-based practice. Clinical pathways have been shown to improve guideline adherence and quality outcomes, while decreasing length of stay and cost. Here at Connecticut Children's, our Clinical Pathways Program aims to deliver evidence-based, high value care to the greatest number of children in a diversity of patient settings.

These pathways serve as a guide for providers and do not replace clinical judgment.