Safe transport of the newborn

Suzanne Toce, M.D.
Gundersen Lutheran Medical Center, La Crosse
sstoce@gundluth.org

Janet Simdon, R.N.C.
Fort HealthCare, Fort Atkinson
Janet.simdon@forthc.com

Paul Neary, M.D
University of Wisconsin School of Medicine and Public Health
Meriter Hospital, Madison
pjneary@pediatrics.wisc.edu

Objectives

The participant will be able to:
• Describe the components and benefits of specialized transport of newborns
• Identify newborns who would benefit from transportation to a higher level of care
• Collaborate with the receiving provider to stabilize & prepare the baby and family for the transport and determine best mode of transport
• Have appropriate expectations of the transport team and the receiving NICU

Transport timeline

Team arrives at referring hospital
Team leaves referring hospital
Stabilization time
Mobilization time
Response time
Acceptance time

Why specialized neonatal transport?

• Development of a neonatal transport system
  – Up to 60% higher mortality of outborn newborns not transported by specialty teams
  – Fewer adverse events during transport
• In general, stabilization of the newborn prior to transport improves outcomes
• Shortened interfacility transport time leads to improved outcomes for sickest neonates
• Currently there are superspecialized transport teams that can provide ECMO, iNO, high frequency ventilation, and/or cooling

Remember

The womb is the best transport incubator.

Timing is important

• Don’t wait too long so that a very sick, unstable baby is transported
• Don’t send too soon so that a baby who is improving no longer needs NICU services
• Remember, treatments like therapeutic hypothermia for neonatal encephalopathy need to be started by 6 hrs. of life
**Case**

Referring level I hospital

- Mom comes to L and D with twins at 24 weeks
- She is contracting regularly and is 6 cm dilated. The A twin is breech.
- You are pretty short staffed
- Luckily everyone is up to date with NRP

Tertiary NICU

- The perinatologist declines the transport because mom is too far dilated to safely transport
- The neonatology medical control takes the call. Does he/she:
  - Tell the referring provider to call when the babies are born?
  - Arrange to send the team(s) to be there for the delivery?

**Consider consultation or referral**

- The acuity of the baby does not match the available resources
- The baby has multiple anomalies or needs multiple subspecialty consultations
- The differential diagnosis includes congenital heart disease, PPHN, or a surgically correctable lesion
- The illness is severe and/or may worsen
  - PPHN
  - Severe MAS
  - Infection with multiorgan dysfunction
- Additional personnel or equipment would be beneficial
- If you have questions, call for consultation/transfer

**For example: Respiratory distress**

- Evaluation
  - Careful history and physical exam
  - Vital signs, monitoring, oximetry
  - Bedside glucose screen
  - As indicated
    - CXR
    - Blood gas
    - CBC
    - Evaluation for infection

**Management**

- Well appearing baby with single symptom, no other risk factors, and normal O2 saturation: Monitor HR, RR, saturation and observe
- For other babies:
  - Ensure adequate oxygenation, ventilation, circulation
  - Normalize glucose, fluid, electrolyte, and nutritional status (don’t nipple feed unless safe)
  - Treat with antibiotics if indicated
  - Provide ongoing assessment, including laboratory and radiographic studies as indicated
  - Transfer/obtain consultation if worsening or needed resources are not available

**Preparation**

- Arrange for the transport
- Prepare the baby
- Prepare the information/communication
- Prepare the family
- Prepare the transport team
Case (continued)
Plan for potential delivery

- Where will the babies be stabilized?
- How will they be heated?
- What staff can you assemble to help care for mom and babies?
- What resources do you have for ventilation and intubation?
- What is the best mode of transport?
- All of the above can be discussed with med control after team is dispatched

There are multiple modes of safe neonatal transport

Ground/ambulance

- Lowest transport costs and slowest travel
- Relative immunity to weather
- May be specialty vehicle exclusively for pediatric and/or neonatal patients
- May be equipped to simultaneously transport 2 patients
- Comparatively roomy: improved patient access
- Preferred for short distance transport, frequently used < 25 miles

Helicopter

- Fast and versatile
- Rapid departure and arrival of the team
- Decreased out-of-hospital time
- Need for a landing zone near hospital
- Likelihood of grounding if bad weather
- High cost
- Limited patient assessment and access
- Typically used up to 150 miles

Yes, it is cozy in the helicopter
Fixed-wing aircraft

- For long-distance transportation >150 miles
- Efficient fuel costs over long distances
- Reasonable access to patient during flight
- Requires an airport for landing and takeoff operations then ambulance to the hospital
- Increased time with subsequent team ground transfer
- High cost

What is the best mode?

- In general, the decision is made based upon (in descending priority):
  - Weather, availability of transport modalities
  - Acuity of the baby
  - Need for fastest time to NICU
  - Distance to NICU
  - Cost

Comparison of different modes of transport

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<tr>
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<th>Ground Ambulance</th>
<th>Rotor-wing Aircraft</th>
<th>Fixed-wing Aircraft</th>
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<tbody>
<tr>
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<td>Excellent</td>
<td>Poor to fair</td>
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<tr>
<td>Arrival times</td>
<td>Fair to poor</td>
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<td>Out-of-hospital time</td>
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<td>Weather issues</td>
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<td>Cost</td>
<td>Low</td>
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http://emedicine.medscape.com/article/97806#overview#aw2aab6b6

Never sacrifice safety

“A medical helicopter dropped off a patient (in La Crosse) and then crashed shortly after it took off on its return flight to Madison, killing the surgeon, nurse and pilot on board…” May 2008

Stabilization prior to transport

Collaborate with NICU medical control re pretransport stabilization

- Airway
  - Is the airway patent?
  - Is the airway in the correct location and secure?

- Breathing
  - Is the infant making sufficient spontaneous respiratory effort?
  - If not, is artificial ventilation adequate?

- Circulation
  - Are the baby’s essential organs perfusing adequately?

- Metabolic
  - Is the baby’s blood glucose adequate?
  - Is the baby’s acid-base balance acceptable?

- Temperature control
  - Is the baby’s temperature normal?
  - Is the baby in a thermoneutral environment?
  - Is passive cooling indicated?

- Comfort
  - Is the baby being exposed to any noxious stimuli?
  - Does the baby need pharmacologic analgesia or sedation?
  - Based on Fowlie BJM 2004

Case (continued)

- Team 1 (NNP/RT) flew by helicopter ASAP
- Team 2 (PA/RT) left by ambulance as soon as they came in from home
- Team 1 returned by helicopter with the sicker twin and team 2 returned by ambulance with the more stable twin
- What if the helicopter was grounded for weather?
- Be flexible and responsive to the needs of the baby while maintaining safety for patient and staff
**Transport Team Stabilization**

- **Method 1**
  - Swoop & scoop; grab and go
  - May be beneficial if rapidly deteriorating
- **Method 2**
  - Maximally stabilize
  - Longer time away from NICU
  - Frequent when longer fixed wing or ground transport

**Characteristics of a stable baby**

- Pink – sats > 95-97% term and 91-94% premie
- Well perfused – cap refill ≤ 3 seconds
- Normal HR and RR
- Warm (temperature 36.5 -37.3°C) and dry
  - Note that passive cooling may be recommended in babies with encephalopathy
- Generally NPO with vascular access
- If airway, ET tube correctly placed
  - 7-8-9 (cm) tip to lip for 1-2-3 (kg)
  - Confirmed by x ray (tip below clavicles to 1cm above carina)

**Case (continued)**

- Team 1 arrived as twin A delivered. They resuscitated, intubated, gave surfactant, and ventilated twin A
- The community hospital staff helped as asked and kept the family informed
- While the community providers maintained twin A, team 1 cared for twin B until arrival of team 2

**Transport model**

The Retrieval Team ACCEPT model as defined in the Paediatric & Neonatal Safe Transfer and Retrieval Course (PANSTAR). The model divides the transfer process into three stages and summarizes the considerations for safe transfer of the patient. Advanced Life Support Group, United Kingdom.

**Transport initiation**

**On team arrival**

Consider P T on outbound leg 
On arrival consider:

- A: What has been done? What needs to be done?
- B: Team leader to delegate tasks
- C: Professionals
- D: Is transfer still appropriate?

Preparation, Packaging & Pre-departure checks

Transportation
Collaboration between the referring providers & staff and the transport team is invaluable.

Yes, everyone needs to wear a seatbelt

On arrival at NICU

Communication/documentation
- Communication between referring provider and medical control
  - Pertinent history, physical, copies of labs reports and x rays
  - Course up to current time
  - Treatments
  - Pertinent information about family
- Handoffs increase potential for adverse events
  - ¼ of adverse events relate to communication

“The interface between transfer team and referring unit is not always a smooth one, and an appreciation of each others’ responsibilities is essential.”

Fenton 2004
**Case (continued)**

- Verbal and written communications in this case were concise and complete
- What if the referring provider neglected to inform the team of maternal chorioamnionitis, Rh incompatibility, presence of murmur, or possible seizure activity etc.?
- What if the med control failed to specify ET tube depth, med doses, IV rate?
- What if no maternal prenatal labs were sent?

Good decisions and treatments are based on good data!

**What to send with baby**

- Mother and baby records
  - Include mother’s prenatal records especially labs
  - Include facesheet/demographic information
- Tube of mother’s blood and cord blood
- Metabolic screening card if available
- Placenta as indicated
- Transfer consent

**Family centered care**

- Contact with baby
  - Can mom be transferred as well?
  - Can a parent ride along on transport?
- Breast feeding support
- Information about baby
- Information about NICU
  - Info about unit and role of parents
  - Participation in care
  - Infection control
  - Visitors
- Information about parking, lodging ...
- Call back on arrival

**Expectations of the neonatal transport service**

- Access 24/7/365
- Available modes of transport appropriate to the babies acuity (weather permitting)
- Collaboration re pretransport stabilization
- Functions of the team
  - Introductions
  - Medical neonatal care and family communication
  - On-site teaching
  - Public relations including follow up post transport call
  - Regular audit of transports and QI

**Interfacility transport algorithm**

Provide immediate medical and nursing care to stabilization of patient

[Diagram of the interfacility transport algorithm]

**Figure 1. Interfacility transport algorithm**
What do the referring providers value most

• Ease of initiation of transport
• Fastest arrival time
• Inclusion of a physician
• Team providing the best follow up
• Time spent at the referring facility

Air Medical Journal 27:1

Medicolegal issues

• “The transferring physician is also responsible for determining the method of transport (i.e. ground or air), the necessary and most appropriate personnel to accompany the patient, the necessary and appropriate life support equipment to accompany the patient, and the medical treatment and medication orders for the duration of the transfer to cover any reasonably foreseeable complications during transfer.”
• “…once the EMS or specialty transport team assumes care of the patient, the medical director of the transport service or his/her surrogate has final authority for the care of the patient and protection of the transport team.”

– WI Interfacility Transport Guidelines 2006
• When the team is on the ground, responsibility is generally shared between the referring provider and medical control/transport team

Ethical issues on transport

• Involve the medical control in any differences of opinion or difficult decisions including decisions about withdrawal of support
• Role of the transport team if support is withdrawn
  − Consultation
  − Confirmation
  − Compassion
  − Communication
  − Conflict??? NEVER

Summary

• Transport utilizing specialized teams leads to optimal neonatal outcomes
• Each hospital should develop guidelines for identifying newborns in need of transfer based on internal resources
• Preparation of the baby and family will smooth the transition
• Collaboration between the referring providers, transport team, and medical control will optimize outcome

Resources

• Fowlie PW, Booth P, Skeoch CH. Moving the preterm infant. BMJ 2004; 329: 904

Resources

• Perinatal Regionalization Versus Hospital Competition: The Hartford Example. Richardson D et al. Pediatrics 1995; 96;417
Resources

- Use of Nasal Continuous Positive Airway Pressure During Retrieval of Neonates With Acute Respiratory Distress. Murray P, Stewart M. *Pediatrics* 2008;121;e754
- To Intubate or Not to Intubate? Transporting Infants on Prostaglandin E₁. Meckler G, Lowe C. *Pediatrics* 2009;123;e25