


**Fairview**

**Neonatal Resuscitation & the Implementation of a Tele-NICU Program in a Multi-Hospital Organization**



Emily Bourgeois, MSN, RNC-NIC, NPD-BC  
System NICU Professional Development Specialist

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**I have no conflict of interest to disclose regarding the content shared within this presentation.**



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**Learning Outcomes**

At the conclusion of this presentation, learners will be able to:

- Verbalize basic strategies for neonatal resuscitation, including partnership with a Tele-NICU program as a member of the multidisciplinary team
- Verbalize difference in neonatal resuscitation strategies in metro vs. rural hospitals
- Describe process for Tele-NICU roll out across multiple hospitals within our organization, including both rural and metro locations
- Verbalize understanding of data to support ongoing use of Tele-NICU programs to reach resuscitation teams, both with and without on-site NICU support
- Describe success of Tele-NICU program in providing resuscitative care & early transport activation to neonates who need transfer to a higher level of care



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### Neonatal Resuscitation

- Transition from extrauterine life dependent on many physiologic changes
- Preparedness is most important step in effective neonatal resuscitation
  - Education: NRP, AHA, PALS, The STABLE Program, etc.
- Effective & timely resuscitation at birth improves neonatal outcomes
- 10% of newborns need help to begin breathing (AHA, 2020, Donahue et al., 2019)
  - 1% - extensive resuscitative measures
  - 2% - intubation
- Neonatal mortality rate (US & Canada) (AHA, 2020)
  - 1960s: 20/1000
  - 2020: 4/1000

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### Neonatal Resuscitation

- When need for resuscitation is not anticipated or planned – delays in care, potential increase in risk for death
- Assessment of risk during pregnancy and labor should indicate need for additional support at delivery
- “Every birth should be attended by at least 1 person whose primary responsibility is the newborn & who is trained to begin PPV without delay” (AAP, 2021)

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The NRP 9th Edition Algorithm flowchart details the following steps:

1. Initial Assessment: Check for term, gestational age, and appearance.
2. Airway: Establish airway, suction if needed, and provide positive pressure ventilation (PPV).
3. Breathing: Assess for chest rise and adequate ventilation.
4. Circulation: Assess heart rate (HR) and provide chest compressions if HR is <math>60</math> or lower.
5. Advanced Life Support: Includes vascular access, medication administration, and volume expansion.
6. Resuscitation Outcomes: Includes delayed cord clamping and skin-to-skin contact.
7. Teamwork & Communication: Emphasized throughout the process.
8. Discharge/Transfer: Final steps for the newborn.

- AHA/AAP – NRP algorithm
- Primary roles: assess HR, administer PPV, provide O2 therapy if needed, & administer chest compressions
- Vascular access, med administration & volume expansion
- Delayed cord clamping & skin to skin
- Teamwork & Communication
- May be the only regular resuscitation training & experience received with renewal every 2 years

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### Access to Care: Impact of Delivery Hospital

- Variations in infant mortality persist in the United States based on:
  - Race
  - Ethnicity
  - Insurance
  - Co-morbidities
  - Geographic location
- Potential driver – variations in access to risk-appropriate delivery care
- Capabilities and care provided by a hospital influence overall outcomes
  - Improved outcomes supported for infants delivered in hospitals with resources to manage them during initial resuscitation




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### Access to Care: Impact of Delivery Hospital Matters

- First studied in 1970s (Lorch et al., 2021)
- Data compared regions with funding specific to perinatal care (including NICU units) vs. no funding
- In 8 regions: 60% infants weighing <1500g were born at a "high-level" center compared to 47% in comparison regions
  - Improvement in neonatal survival when VLBW infants delivered at hospital with "high-level" unit
  - For 12,771 infants weighing <2250g born in NYC between 1976-1978 – delivery at rural hospital was associated with 24% increase in mortality
- Similar infants born at highest level care, similar improvements with survival observed in US, Canada, Australia, and the Netherlands




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### Access to Care: Impact of Delivery Hospital Matters

- In general, 30-75% increase in mortality when infants with BW < 1500g were delivered in lower level or lower delivery volume hospitals
  - Meta-analysis of evidence published through 2010 summarized: .....  
 • Odds of death for VLBW infants born outside of hospitals with a level 3 or 4 NICU: 1.62  
 • Infants with BW <1000g, odds of death ratio: 1.80
- Neonatal transfer after delivery (compared to maternal transfer prior to delivery) associated with increased mortality and morbidity of newborn
- Obstacle in optimizing neonatal care for high-risk newborns: access to high-level, high-volume hospitals




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### Access to Care: Impact of Delivery Hospital Matters

- Effectiveness of resuscitation and stabilization may influence health outcomes, especially for at-risk neonates
- Outborn, preterm VLBW Infants (Fang, 2021; Donohue et al., 2019)
  - 1.5-3 times odds of dying compared to inborn neonates
  - Increased risk for IVH, BPD, & NEC
- Neonatal death rates – higher in hospitals with low number of annual births
- High acuity, low frequency skills used in neonatal resuscitation
- Rapid decline in knowledge/skills within months of not using NRP after training, less practice due to less frequency of need
- Historical support from neonatology: telephone support, limitations



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### Telemedicine to Aid in Neonatal Resuscitation

- NICUs and Neonatologists are traditionally regionalized, leaving large, rural, areas without immediate access to resources
- Urban areas contain 99% of NICUs in the United States
  - Results in regional variation in availability
- In 2019, study reported that (Bramley et al., 2017)
  - 93% of women of reproductive age in the US live within 50 miles of a NICU
  - 21% of states had <80% living within 50 miles of both an OB & NICU Unit
  - 3 states had <20% living within 50 miles of both OB & NICU unit
- Tele-NICU use decreases the number of transports needed to tertiary care centers, keeping mother-baby dyad together when possible (Donohue et al., 2019; Fang, 2018)



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### Telemedicine to Aid in Neonatal Resuscitation

- Offers ability to immediately bring more experienced team member(s) to aid or even lead a resuscitation
- Study of 26 rural hospitals demonstrated that neonatal resuscitation skills had not been performed in the last year by many providers with a direct correlation between frequency of skill performance and comfort level (Fang et al., 2018)
- Can be used to train and assist in emergent procedures (e.g., intubation, umbilical line placement, chest tube placement, etc.)
- Can provide opportunities to increase quality of neonatal resuscitation and stabilization in hospitals without NICUs on site (Donohue et al., 2019)
- Shown to improve provider perception of teamwork as well as patient safety & quality of care (Fang et al., 2018)
- Improves time to ventilation, including improved use of MRSOPA corrective steps, decreased intubation & increased adherence to NRP in simulations (Fang et al., 2018)



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**Limitations to Telemedicine**

- Technology requires initial capital & personnel investment
  - Video conferencing systems
  - Cameras/webcams
  - Microphones
  - Electronic stethoscopes
  - Staff buy-in on both sides, must view as beneficial
- Requires technology to be:
  - Present at both communicating sites
  - Readily available to remote specialist
  - Available to patients in multiple departments: OB, emergency department, etc.
  - Feasible with existing infrastructures (e.g., internet, networks, etc.)

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“Telemedicine is a relatively low-resource model of care that can be used to improve neonatal resuscitation and stabilization of newborns, particularly at rural and underserved labor and delivery units and has the potential to reduce morbidity and mortality in this group of patients.”

Lee T. Donohue et al., 2019

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**Implementation of Tele-NICU Program**

M Health Fairview  
Minneapolis, MN

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### Tele-NICU at M Health Fairview

- Vision: Bring University of Minnesota Masonic Children's Hospital Neonatology team to every nursery in the system and beyond
- "To combine our scientific and clinical strengths to deliver the best in innovative, accountable, compassionate care to our patients and impact the field of medicine for all. Advance evidence-based practice, create partnerships and make available to all in our state" – University of Minnesota Medical School Dean Tolar
- Tele-NICU in infancy within the M Health Fairview Organization, appearing first with tele-resuscitation
  - Have started to use for consulting services in Level II & III NICUs
  - Would like to expand eventually to follow up clinics, outpatient use, etc.



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### M Health Fairview (MHF) Organization:

- 9 hospitals total, all with labor and delivery units
  - Both rural and metro locations across state of Minnesota
  - 2 sites ~200 miles from Minneapolis
  - 2 sites ~60 miles from Minneapolis
- 5 sites with NICUs, all Minneapolis metro locations
- Total number of deliveries in 2024: **12,733**
  - Metro deliveries: 11,350 (89%)
    - NICU Team available in person
  - Rural deliveries: 1,383 (11%)
    - Tele-NICU Team available remotely



Members of the Masonic Children's Hospital Transport Team with Life Link Air Transport



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	Grand Itasca	Lakes	Masonic Children's Hospital	Northland	Range	Ridges	Southdale	St. John's	Woodwinds
Metro vs. Rural	Rural	Rural	Metro	Rural	Rural	Metro	Metro	Metro	Metro
Deliveries per Year (2024)	312	517	2186	368	186	1797	3042	2432	1893
NICU Present?	No	No	Yes	No	No	Yes	Yes	Yes	Yes
If Present - Level			Level IV			Level III	Level III	Level III	Level II SCN
NICU Discharges (2024)	n/a	n/a	600	n/a	n/a	210	265	263	136
Tele-NICU Available	yes	yes	No - answering facility	yes	yes	yes	yes	yes	yes



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### Tele-NICU Roll Out

- Initial capital for new telemedicine equipment (Ammwell C500 Carts) was funded by 3M Fund for Pediatrics Foundation
- M Health Fairview paid for personnel time, tech support, nursing education, etc.
- Joint venture with Department of Pediatrics at University of Minnesota
- Roving roll out, one site at a time, over period of ~1.5 years for 8 sites
  - First site: June 2021
  - Last (8<sup>th</sup> Site): November 2022
- Started with metro hospital with a Level III NICU and 24/7 Neonatal APP coverage
- Ended with 2 sites ~200 miles from Masonic NICU Hub
- Multidisciplinary team of employees all participated in simulations – ER physicians, family medicine physicians, pediatricians, pharmacists, advanced practice practitioners (APPs), labor and delivery nurses, NICU nurses, newborn nursery nurses, and respiratory therapists



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### Initial Tele-NICU Nursing Education



- Partnership between System NICU & Perinatal Professional Development Specialist Teams
- Dual didactic and simulation-based education
  - Short e-learning, required completion prior to in-person simulation
    - Required for all L&D & NICU RNs (where applicable)
    - Reviewed Tele-NICU guideline for care, inclusion criteria, & technology nuances
- Simulation with use of technology
  - Optional, highly encouraged
  - Offered hands on experience with Tele-NICU technology with answering Tele-NICU Provider
    - Required use of basic NRP clinical skills (e.g., ventilation)
- Ongoing education – included in new hire RN competencies, optional simulations offered yearly at all locations interested



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### Ongoing Tele-NICU Nursing Education



- Enduring simulations, continued meetings with site leaders to understand gaps and barriers
- Offer at least one simulation yearly at each site with Tele-NICU
- Focus on sites both **with** and **without** Neonatal APPs present
- Heavy emphasis on Debrief following simulations
- Monthly meetings evaluation needs, ongoing



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### Tele-NICU Provider Education

- Accredited Council for Graduate Medical Education (ACGME) implemented recommendations for trainees to be trained in tele-medicine, based on scope of practice
- Neonatology – primarily inpatient, far behind adult medicine specialties (e.g., stroke, hospitalist, etc.) to implement telemedicine
- Participated in simulation-based learning opportunities with Labor & Delivery RNs at all 8 sites using tele-NICU
- Through roll-outs, pilot provider curriculum was developed by NICU fellow & continues to be provided to all on ongoing basis to all neonatal-perinatal medicine fellows (Brown et al., n.d.)



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### Scope for Activation

- Activate NICU Telemedicine for all of the following:
  - All scenarios where Infant Code Blue is activated in NICU or Birthplace Unit(s)
  - All STAT Cesarean Births
  - All infants that require a transfer to a higher level of care NICU based on gestational age, diagnosis, congenital anomaly, possible need for advanced resuscitation, etc.
  - Any other situation based on clinical discretion of the OB team
- Supported in published, organization-wide guideline outlining resuscitation teams required at births



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### Nursing Workflow

- Enter Order for patients who qualify for Tele-NICU
  - L&D RN places "Verbal Order with Readback"
  - Placed on maternal chart, available immediately after birth
  - Stays active x2 hours after placement, can be re-ordered if expires
- Page Tele-NICU Attending
- Deliver Tele-NICU Cart to L&D Room
  - Stored **on L&D** at all sites currently
- Brief NICU Delivery Team &/or Tele-NICU Provider when arrive



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### Nursing Role: 3 "Ps" of Tele-NICU

#### Place Order

- Place order in delivering patient's chart
- Order name: Tele-NICU Video Connection
- Sign "Verbal with Readback" and utilize Neonatal APP as the Provider

#### Position Tele-NICU Cart

- 2-3 feet from corner of warmer
- Tele-NICU cart platform should be equal with radiant warmer mattress
- Do not touch the camera
- The cart will "answer" by itself

#### Page Provider

- Enter page: "SITE Tele-NICU Delivery, Delivering patient's last name, room number"
- Press "send"
- If no response in 5 minutes, repeat using the Telemedicine Second Call Neo Staff provider



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### Placement of Tele-NICU Cart



#### Ideal:

- Approximately 2-3 feet from edge of warmer
- At 90° angle of infant's head
- Directly across from CR monitor (if available)
- Tele-Neos have capability to adjust camera angle & zoom
- Image is mirrored –use terms such as "infant's left side", etc.



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### Nursing Support Tools

- Tele-NICU SBAR
- Remote neonatologists to receive an SBAR when joining resuscitation
- Provided script for nurses
- **Points to consider including:**
  - Your name & role
  - Name of the local team leader
  - Site you are calling from
  - SBAR about patient
  - Resuscitation equipment set up/preparation (if able prior to delivery)
- Laminated resources attached to all Amwell Carts on metal ring



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### Telemedicine Process

- All metro sites with NICU have at least 1 Neonatal APP present 24/7 in addition to attending Neonatologist (present during day for rounds & on as-needed basis, off-site on-call 24/7)
- Rural sites without NICUs have varying pediatric coverage 24/7, no neonatology coverage as baseline
- Tele-NICU Neonatologists: all based out of University of Minnesota Masonic Children's Hospital (UMMCH), Level IV NICU
- Remote neonatologist is "virtually present" via video-conferencing system to provide direct assistance
  - Additional set of eyes, practices questioning attitude
  - Team Leader
  - Connect with families
  - Arrange transport team
  - Place patient care orders
  - Assist with procedures



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### Case Example #1



- 23-week imminent delivery due to abruption at one of our community NICU sites
  - Call 6 minutes before birth
  - Present for set up
  - Activated transport team
  - Assist with resuscitation
  - Family communication
  - SBAR to incoming neonatologist
  - Arrival of transport team
  - Admit to Level 4 NICU



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### Case Example #2



- Delivery in a MN blizzard!
- Planned c-section at another site, unable to make it there due to conditions
- Preterm Labor
- 3-hour assistance via telemedicine for a family medicine provider until ground transport team could arrive.
- Assisted with resuscitation, ongoing respiratory needs, IV access, thermoregulation.
- Intubated after arrival of transport team

Source: Grand Rapids Herald Review



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### Interface with Transport



- Internal NICU Transport Team
- Members (all at UMMCH NICU):
  - NICU RN
  - NICU RT
  - NICU APP
- Notify EMS partners that NICU Transport is needed – EMS arrives at UMMCH to pick up NICU transport team & equipment, then travel together to location needed
- Tele-NICU MD is great bridge to NICU Transport Team

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### Tele-NICU Call Volumes - 2024

- Focus on Rural, Non-NICU Sites only:

Hospital	2024 Tele-NICU Call Volume	2024 # deliveries/year	2024 % deliveries with Tele-NICU activation
Grand Itasca	57	312	18%
Lakes	39	517	8%
Northland	70	368	19%
Range	18	186	10%

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### NICU Transport Volumes - 2024

- Focus on Rural, Non-NICU Sites only:

Hospital	2021 Transport Numbers (pre-Tele-NICU)	2021 Transport Dispatch Time (average) (pre-Tele-NICU)	2024 Transport Numbers (post Tele-NICU)	2024 Transport Dispatch Time (average) (post Tele-NICU)
Grand Itasca	1*	35 minutes	4* (↑)	43 minutes (↑)
Lakes	26	24.3 minutes	39 (↑)	54 minutes (↑)
Northland	10	51.5 minutes	14 (↑)	35 minutes (↓)
Range	0*	N/A	1* (↑)	57 minutes



\* - the two sites indicated are ~200 miles from the Minneapolis metro area and most often consult closer, Level IV NICU in Duluth, MN, for their transports

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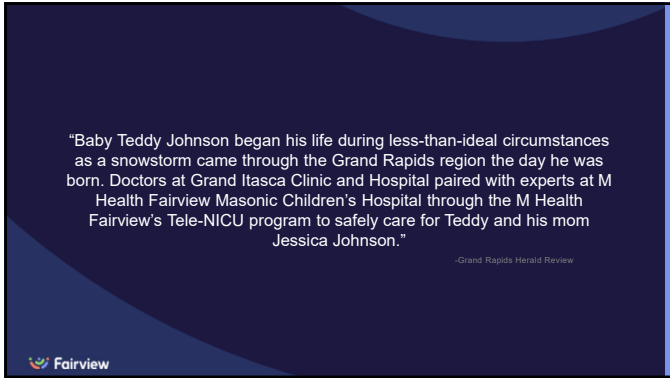
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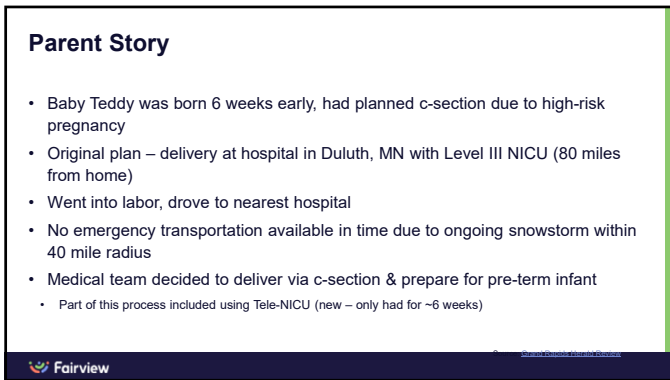
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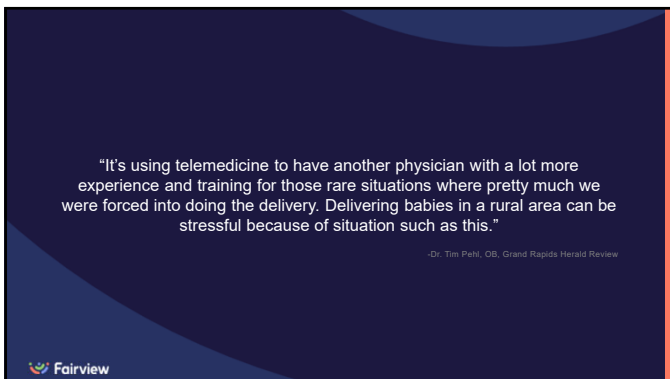
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### Parent Story

- In this particular situation, this hospital delivers on average ~1 baby/day
- While the majority do not need ICU, "this new program helps ease some concerns should the situation arise."
- "It's a way to delivery extremely critical care in an area, in a way, that we normally wouldn't be able to do that."
- "What we've learned with telehealth with resource-limited settings is babies who are born extremely premature like Teddy actually have a higher risk of death and higher risk of severe morbidity if they are not at a care center which is equipped to care for these patients" – Dr. Ellen Diego, attending Tele-Neonatologist

Source: [Grand Rapids Herald Review](#)



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"The biggest thing I can say is expressing my gratitude for the Grand Rapids team and everything they did. They were all great – down to the nurses & everything."

-Jessica Johnson, Teddy's Mom, Grand Rapids Herald Review



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### Tele-NICU Current Status - Maintenance

- Seeing continued use at all rural sites within our organization, seem increase with infants staying within the M Health Fairview System post Tele-NICU roll out
- Re-structuring tele-NICU answering provider role
  - Shared responsibility
  - Answering provider will now be one covering a Level III NICU vs. Level IV as previous
- Would like to eventually expand to outpatient, NICU follow up clinics, etc.
- Ongoing evaluation of transport numbers in correlation with tele-NICU calls – ongoing, data manually entered at this time by transport team members & not always informed about tele-NICU calls unless still in progress upon arrival
  - Would benefit from automated process to capture data more efficiently
  - Ideal to develop process to capture neonatal outcomes when Tele-NICU involved in resuscitation



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**Thank You!**

Happy to connect if you have questions –  
please don't hesitate to reach out!

Emily Bourgeois, MSN, RNC-NIC, NPD-BC  
Emily.Gilsrud@fairview.org



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