Levels of Care for Perinatal Health

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Since its inception in the 1970s, the stratification of perinatal health care into complexity-based levels has resulted in improved outcomes. Recent trends toward de-regionalization based on financial incentives, however, threaten to undermine these gains and should be addressed.

The concept of regionalized health care delivery refers to an integrated, population-based approach that stratifies patient care according to complexity, thus creating "levels of care." As it applies to perinatal health care, the eighth and most recent edition of Guidelines for Perinatal Care describes a system that ensures access to care for all patients of a given population (usually based on geography), identifies risks early and directs patients to facilities best able to provide necessary care, provides linkage to appropriate levels of care, ensures adherence to standards of care, and promotes efficient use of resources [1].

Such a system improves patient outcomes through 2 primary mechanisms: 1) improved outcomes at high-volume, high-specialty centers and 2) improved coordination of care within a given geographic area. It reduces overall health care costs by reducing morbidity and also by avoiding unnecessary duplication of expensive services [2].

The application of regionalization for perinatal health and levels of care in North Carolina has evolved over the past 4 decades, and it continues to be affected by changes in obstetric and pediatric care, reimbursement for health care, and political/legislative realities.

History of Perinatal Care in the United States

Prior to the 20th century, childbirth was considered a natural, home-based event with most births attended by family members and/or midwives. In the 1900s, however, the availability of anesthesia and therefore the possibility of "pain-free childbirth" drove the shift to hospital delivery [3]. Over the first half of the century improvements were seen in pregnancy outcomes as the result of obstetrical and pediatric practices, but these practices were not uniform or widespread [4]. The recognition that "the fate of newborn infants depends largely upon the medical and nursing care they receive" inspired the first publication of standards and recommendations for hospital care of newborn infants, full term and premature, in 1943 [5].

Regionalization and Levels of Care

By the 1970s, the advantages of regionalization for perinatal health care services had become apparent [4]. Neonatal intensive care units (NICUs) were expensive and were only needed for a small subset of newborns. To have a NICU in every community would be economically unfeasible, and if patient numbers were small the providers could not maintain expertise in complex care. With the goal of developing a process to ensure that every mother-baby dyad would receive optimal, risk-appropriate care, the March of Dimes convened representatives from the American College of Obstetrics and Gynecology (ACOG) and the American Academy of Pediatrics (AAP). Their consensus statement, "Toward Improving the Outcome of Pregnancy" (TIOP), was published in 1976 [6]. This landmark document established levels of care as follows: Level 1 – uncomplicated, routine pregnancies and normal, full-term newborns; Level II – Level I care, plus selected high-risk conditions (eg, preeclampsia, preterm labor > 32 weeks, preterm infants > 2 kg, mild respiratory distress, hypoglycemia); and Level III – Levels I and II, plus care for all perinatal problems, management of transport service, education, outcomes, and follow-up.

Implicit in the designation of levels of care were the following:

1) Risk assessment will be provided in all pregnancies, with mothers noted to be at increased risk being referred from Level I to Level II or III units as indicated. For example, the goal was that no mother would deliver a preterm infant at a Level I facility. Likewise, a healthy-appearing term newborn who develops significant problems after birth should be transported safely to an appropriate Level II or III unit.
2) Up to 20% of suboptimal pregnancy outcomes occur in low-risk pregnancies, so providers at any level of care must have skills and resources to identify and manage unexpected problems, for example the resus-

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citation and stabilization of an unexpected preterm delivery.

3) Differences in *levels* of care do not represent differences in *quality* of care. Highly skilled, competent practitioners are essential at all 3 levels of care.

Guidelines for Perinatal Care was published in 1983 [4] to follow up on TIOP, detailing recommendations for providing both normal and high-risk care for expectant mothers and babies. The qualifications of physicians and nurses needed for Levels I, II, and III were delineated, and the necessary physical spaces, resources (equipment, supplies, medications), support services (anesthesia, surgical, laboratory, blood bank, and imaging), and specific policies and procedures needed for each level of care were listed.

Implementation in North Carolina – The Statewide Perinatal Advisory Council

In 1974 the North Carolina General Assembly established the Statewide Perinatal Advisory Council. This group was comprised of physicians, nurses, hospital administrators, and others representing each of the state's 6 health care regions. It was charged with improving the outcome of pregnancy in the state, which was among the worst in the country. A voluntary 3-level system of hospital care was developed, and by the early 1980s each of the 6 regions had at least one Level III center and 4 had dedicated neonatal transport teams. The Level III centers cooperated with each other in locating available beds for at-risk patients (via a call center at Wake Forest Baptist Health) and transporting sick infants from Level I and II hospitals to Level III centers. Each region had at least one outreach education coordinator who provided education for physicians and nurses at Level I hospitals and facilitated consultation and referral processes. Prenatal care was improved by a network of high-risk clinics.

Improvements in outcomes included a reduction in the proportion of infants weighing < 2,000 grams born outside a hospital with Level III neonatal services from 1974 through 1994 [7]. After 1974, birth of such infants in a hospital with Level III neonatal services was associated with lower neonatal mortality [7]. The statutory authority of the Statewide Perinatal Advisory Council, however, was repealed by the General Assembly in 1991.

Improvements in Perinatal Outcome and De-regionalization

Preterm birth rates in the United States increased from 10.6% to 12.0% from 1990 to 2010 due to various factors including advanced maternal age, multiple births, and complications associated with assisted reproductive technology [8, 9]. Mortality rates continued to decline during this period, however, due to advances in medical care such as the use of antenatal steroids, surfactant treatment, and Group B strep infection prophylaxis. Ironically these advances and the introduction of new neonatal therapies may have played a role in de-regionalization, as Level II providers began to expand their scope of care [10]. Small NICUs opened at community hospitals based on financial incentives and payer mix as opposed to population-based need. There are definitely advantages to keeping high-risk patients in their home communities, but such care may not result in equivalent, favorable outcomes. A study in California showed that de-regionalization resulted in 20% of deliveries of infants < 1,500 grams (very low birth weight, or VLBWs) occurring in lower-volume Level I and Level II hospitals, which was disturbing given their higher risks of infant mortality [11].

Expansion of NICU facilities and beds is regulated by certificate of need (CON) legislation in 30 states (including North Carolina). This process attempts to match the availability of care with the need for such care. A survey in 2008 showed states without CON programs have more NICUs and NICU beds, and large metropolitan areas in non-CON states had higher infant mortality [12]. Even with the CON program, North Carolina has seen a significant increase in the number of Level II and Level III units over the past 30 years.

AAP 2012 Revision and Level IV Care

In 2012 the AAP's Committee on Fetus and Newborn (COFN) reaffirmed the importance of regionalized perinatal care and added a Level IV designation. This additional level refers to those units that offer care for the most critical and complicated patients, including those needing complicated heart surgery and extra-corporeal membrane oxygenation, or ECMO (a temporary lung bypass technology usually used for a relatively short time). Such units should have virtually all pediatric medical and surgical subspecialists available 24/7. The lack of outcome-based supporting evidence was acknowledged, but the COFN concluded that concentrating the care of relatively unusual, highly complex patients would best allow those centers to develop and maintain expertise to achieve optimal outcomes [10].

Levels of Care for Mothers

The stratification of levels of care described in TIOP in 1976 has been effectively applied to neonatal care but not to maternal care until recently. In 2014, responding to increasing awareness of the relationship between obstetric complications and hospital patient volumes, the ACOG's Society for Maternal-Fetal Medicine described levels of maternal care similar to those used for NICUs and published them in the Guidelines for Perinatal Care [1]. Levels of neonatal and maternal care may not match within facilities, but attempts should be made to provide optimal care for both the mother and baby.

Current State in 2019 and Ongoing Challenges

Despite concerted efforts to achieve a comprehensive, integrated perinatal care delivery system, "this goal has not

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been attained in many areas of the country, where financial incentives promote competing systems and duplication of services," according to the AAP [1]. Maldistribution of resources undermines universal access to care, perhaps the most important aspect of the levels of care approach. Discrepancies in access to care are apparent in North Carolina, where wide variation is seen in pregnancy outcomes. Rural areas (mostly in the far eastern and western counties) may have infant mortality rates up to 3 times the state average [13]. Infant mortality is certainly impacted by other factors, but such extreme variation underscores the need to provide risk-appropriate care to all regardless of location.

Overall, the infant mortality rate for North Carolina has been essentially flat since reaching the all-time low of 7.0 deaths/1,000 live births in 2010. The most recent available statistics (2017) show infant mortality of 7.1 deaths/1,000, compared to the national rate of 5.8/1,000 [14].

The popular expression, "it's complicated," certainly applies to the improvement of pregnancy outcomes. It involves social, political, and economic factors in addition to excellent health care. Providers should continue to strive for a comprehensive, high-quality, universally accessible system, taking advantage of the available evidence and the expert advice of AAP and ACOG experts. NCMJ

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References

1. American Academy of Pediatrics, American College of Obstetrics and Gynecology. Guidelines for Perinatal Care. 8th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2017.

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2. Lorch SA, Myers S, Carr B. The regionalization of pediatric health care. Pediatrics. 2010;126(6):1182–1190.
3. Scott M. How did birth move from the home to the hospital, and back again? WHYY.org. https://whyy.org/segments/how-did-birth-move-from-the-home-to-the-hospital-and-back-again/. Published Dec 13, 2013. Accessed September 26, 2019.
4. American Academy of Pediatrics, American College of Obstetrics and Gynecology. Guidelines for Perinatal Care. Elk Grove Village, IL: American Academy of Pediatrics; 1983.
5. Dunham EC, Crane MM. Standards and Recommendations for Hospital Care of Newborn Infants, Full-term and Premature. Bureau Publication 392. Washington, DC: U.S. Dept of Labor, Children's Bureau; 1943.
6. March of Dimes, Committee on Perinatal Health. Toward Improving the Outcome of Pregnancy: Recommendations for the Regional Development of Maternal and Perinatal Health Services. White Plains, NY: March of Dimes National Foundation; 1976.
7. Bode MM, O'Shea TM, Metzguer KR, Stiles AD. Perinatal regionalization and neonatal mortality in North Carolina, 1968-1994. Am J Obstet Gynecol. 2001;184(6):1302–1307.
8. Martin JA, Hamilton BE, Ventura SJ, et al. Births: final data for 2009. Natl Vital Stat Rep. 2011;60(1):1-70.
9. Schieve LA, Ferre C, Peterson HB, Macaluso M, Reynolds MA, Wright VC. Perinatal outcome among singleton infants conceived through assisted reproductive technology in the United States. Obstet Gynecol. 2004;103(6):1144–1153.
10. AAP Committee on Fetus and Newborn. Levels of Neonatal Care. Pediatrics. 2012;130(3):587-597.
11. Chung JH, Phibbs CS, Boscardin WJ, Kominski GF, Ortega AN, Needleman J. The effect of neonatal intensive care level and hospital volume on mortality of very low birth weight infants. Med Care. 2010;48(7):635-644.
12. Lorch SA, Maheshwari P, Even-Shoshan O. The impact of certificate of need programs on neonatal intensive care units. J Perinatol. 2012;32(1):39-44.
13. North Carolina State Center for Health Statistics. 2017 North Carolina Vital Statistics, Volume 1. North Carolina Department of Health and Human Services website. https://schs.dph.ncdhhs.gov/data/vital/volume1/2017/. Accessed October 14, 2019.
14. Center for Disease Control and Prevention. Infant Mortality Rates by State. CDC website. https://www.cdc.gov/nchs/pressroom/sosmap/infant_mortality_rates/infant_mortality.htm. Accessed October 14, 2019.