Survival of Infants Born at Periviable Gestational Ages

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KEYWORDS

• Mortality • Perinatal epidemiology • Preterm infant • Resuscitation • Stillbirth

KEY POINTS

- Estimates of gestational age–specific survival vary significantly across hospitals, regions, and countries and are influenced by a number of factors that can make unbiased comparisons challenging.
- Survival among live periviable births at 22 to 25 weeks of gestation has incrementally improved since the 1950s, with continued gains over the past decade.
- Provision of active treatment, particularly at 22 and 23 weeks of gestation, varies widely among centers and countries, and this variation has a substantial impact on reported survival rates.
- Improved reporting of survival rates for periviable births may yield a better understanding of birth outcomes for periviable births occurring at 20 to 25 weeks of gestation.

INTRODUCTION

Periviable births comprise a particularly high-risk group of patients cared for by obstetricians, neonatologists, and other caregivers. Periviable birth is currently defined as delivery occurring from 20 0/7 through 25 6/7 weeks of gestation.[1,2] This review provides a historical perspective into survival of periviable births, summarizes recent and new data on gestational age–specific survival rates, and reviews factors that can have a significant impact on survival. As this review is focused on survival, we do not

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discuss additional outcomes among surviving periviable infants, such as disability, but acknowledge the importance of considering such outcomes alongside estimates of mortality to inform understanding about prognosis.

HISTORICAL PERSPECTIVES

The survival of extremely low birth weight (ELBW; birth weight ≤1000 g) infants, including periviable infants, has improved consistently over the past 7 decades. In the 1940s, death was the expected outcome for all ELBW infants born in developed nations around the world.[3] Beginning in the 1950s and 1960s, the probability of survival for ELBW infants among several centers in the United States and the United Kingdom increased to 10% to 30% as understanding of neonatal physiology improved and the provision of neonatal intensive care became more common and more advanced.[3,4] In the 1970s, multiple reports from the United States and international centers demonstrated improved survival rates for ELBW and extremely preterm infants.[3] A single-center study from Illinois of 100 ELBW infants born between 1974 and 1976 and admitted to the neonatal intensive care unit (NICU) reported survival rates of 10% for infants weighing 501 to 750 g and 48% for infants weighing 751 to 1000 g.[5] A multicenter study of live births from 1976 to 1978 in New York City reported a survival rate of approximately 50% for singleton live births weighing 501 to 1250 g born at level-3 centers.[6] In a population-based study from England and Wales, survival of liveborn infants weighing less than 1000 g increased from 16% in 1964 to 23% in 1975.[7]

In the late 1980s and mid-1990s, prospective cohort studies from the National Institute of Child Health and Human Development (NICHD) Neonatal Research Network (NRN)[8] and EPICure[9] were among the first to systematically evaluate periviable birth outcomes on a relatively large scale in the surfactant era of neonatology. The NICHD NRN reported outcomes of 1804 very low birth weight (VLBW; birth weight 501–1500 g) live births at 8 academic centers in the United States from 1989 to 1990.[8] The estimated survival for liveborn infants in this cohort was 18% at less than 23 weeks of gestation, 15% at 23 weeks, 54% at 24 weeks, and 59% at 25 weeks. The EPICure study collected outcomes for periviable live births across all maternity units in the United Kingdom and Ireland in 1995 (n = 4004) and reported survival rates of 40% for births between 20 and 25 weeks of gestation.[9] Similar to the NICHD NRN study, the EPICure study reported survival approaching 20% for infants born before 24 weeks of gestation and survival greater than 60% for infants at 25 weeks of gestation.

In the early part of the twenty-first century, data from the NICHD NRN for periviable live-births from 2003 to 2007 suggested that improvements in survival had plateaued, with no increases in survival rates over the period.[10] However, more recent reports from the NICHD NRN (**Fig. 1**) and other centers in the United States,[11–13] as well as from several other developed nations around the world,[14–19] demonstrate incremental improvements in survival following periviable birth, continuing trends established more than half a century ago. These studies are discussed in detail in this article.

ESTIMATES OF GESTATIONAL AGE–SPECIFIC SURVIVAL

During the past 5 years, large cohort studies from developed nations in North America,[11–13,20,21] South America,[22] Europe,[14,15,23–25] Asia,[18,19,26] and Australia[27] have reported estimates of gestational age–specific survival following periviable birth. Direct comparisons of estimated survival rates among these studies are limited, however, by potential biases introduced from differences in the data sources, ascertainment of death, selection of denominators, and definitions of live birth.[28] Recommendations