

Extreme Prematurity: Diagnosis and Management

Background

Extreme prematurity is associated with increased morbidity and mortality. Factors that affect survival rates for extremely premature infants (gestational age below 26 weeks) include:

-Gestational age is the major factor in determining viability; however, there is a significant margin of error (e. g., few days to two weeks) in the estimation of gestational age using either prenatal or postnatal assessment tools.

-Other factors that affect survival rate include birth weight at a given gestational age, gender, plurality, and the use of antenatal corticosteroid therapy.

Significant morbidities of extremely premature survivors include severe intraventricular hemorrhage (ie, grade III and IV), periventricular leukomalacia, necrotizing enterocolitis, bronchopulmonary dysplasia, severe retinopathy of prematurity (ie, \geq Stage 3), late-onset infection, and neurodevelopmental impairment. Other than retinopathy of prematurity that requires surgical intervention, there is little overall variation in the morbidity rates based on gestational age among extremely premature survivors.

A web-based tool from the National Institute of Child Health and Human Development (NICHD) is available to estimate outcome based on gestational age, birth weight at a given gestational age, gender, plurality, and the use of antenatal corticosteroid therapy (http://www.nichd.nih.gov/about/org/der/branches/ppb/programs/epbo/Pages/epbo_case.aspx).

This tool provides a range of possible outcomes and should not be the sole basis for parental counseling and clinical decision making.

Ethical Principles

Autonomy: respecting an individual's right to make decisions that affect his or her life

Beneficence: acting so as to benefit others

Nonmaleficence: avoiding harm to others

Justice: treating people truthfully and fairly*

Parents fill this role for the fetus and need relevant, accurate, and honest information about the risks and benefits of each treatment options. Even after meeting with parents, uncertainty about fetal condition, actual gestational age, likelihood of survival, and the potential for severe disabilities may make it difficult for the parents to decide before the delivery what is in their baby's best interest. In rare cases, the health care team may conclude that a decision made by a parent is not reasonable and is not in the baby's best interest and further consultation is necessary.

Situations in which it may be ethical to not initiate resuscitation.

Resuscitation may not be indicated in cases with gestational age, birth weight and congenital anomalies are associated with almost certain death or unacceptably high morbidity is likely. This may also occur in specific cases to comply with parental request. (See NICHD Survival Calculator)

*While not in the primary screen, one may also want to consider the 'justice' of allocation of resources in cases of low likelihood of survival.

Examples of cases where non-initiation of resuscitation may be appropriate

- Confirmed EGA less than 22 weeks
- Anencephaly
- Confirmed lethal aneuploidy or malformation
- When available data support an unacceptably high likelihood of death or severe disability

Management:

A.) Delivery not imminent

1.) Consultation with an obstetrician and a pediatrician to include:
(See Tables 1-3)

Primary consideration should be what is best for the newborn considering*

- 1) The chance that the therapy will succeed
- 2) The risks of treatment and non-treatment
- 3) The degree that if successful the therapy will extend life
- 4) The pain and discomfort associated with the therapy
- 5) The anticipated quality of life for the newborn with and without treatment

*AMA Code of Medical Ethics

- 2.) Consider tocolysis, antenatal steroids, neuroprotection, cerclage, or expectant management
- 3.) Exceptions may be made at the discretion of the attending clinician if there is additional evidence that significantly worsens the prognosis (e. g., certain congenital anomalies or profound growth restriction).
- 4.) Offer hospice care if appropriate

B.) Factors necessitating delivery

A.) Signs of incomplete abortion, partial delivery, active labor, hemorrhage
-tissue presenting outside the cervix
-prolapsed cord, fetal parts
-labor
-marked hemorrhage

B.) Signs of chorioamnionitis

Maternal fever ≥ 38 degrees C (≥ 100.4 F)

Plus one of the following:

- Maternal leukocytosis (greater than 15,000 cells/mm³)
- Maternal tachycardia (greater than 100 beats/minute)
- Fetal tachycardia (greater than 160 beats/minute)
- Uterine tenderness
- Foul odor of the amniotic fluid

C.) Other conditions threatening the life of the mother, e. g., DIC, Amniotic Embolism, Severe Pre-eclampsia, HELLP, hemorrhage, etc....

- 1.) Consultation with an obstetrician, plus a pediatrician
- 2.) Obstetric management to include cervical ripening, augmentation of labor, and antibiotics as appropriate

See appropriate ANMC Clinical Guideline

Revised 12/25/16njm
Reviewed 12/1/14njm
Approved 9/17/14njm

References

AMA Code of Medical Ethics, (Accessed 12/25/16)

<http://www.ama-assn.org/ama/pub/physician-resources/medical-ethics/code-medical-ethics.page>

Code of Professional Ethics of the American College of Obstetricians and Gynecologists

<http://www.acog.org/~media/Departments/National%20Officer%20Nominations%20Process/ACOGcode.pdf?dmc=1&ts=20140905T143101694>

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Neonatal Resuscitation Program, American Academy of Pediatrics

<http://www2.aap.org/nrp/> (Accessed 12/25/16)

NICHD Survival and Neurodevelopmental Impairment Data Calculator

http://www.nichd.nih.gov/about/org/der/branches/ppb/programs/epbo/Pages/epbo_case.aspx (Accessed 12/25/16)

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Limit of viability, UpToDate

<http://www.uptodate.com/contents/limit-of-viability> (Accessed 12/25/16))

ELBW morbidity & mortality data

Table 1. Survival rates by gestational age for infants ≤25 weeks EGA

Population	Birth year(s)	22 weeks	23 weeks	24 weeks	25 weeks	Comments
UK and Republic of Ireland ¹	1995	2%/ 9% (n=138/ 22)	22%/ 20% (n=241/ 131)	26%/ 34% (n=382/ 298)	44%/ 52% (n=424/ 357)	All liveborn/ NICU admissions
NICHD Network centers ²	1995 & 1996	21% (n=56)	30% (n=216)	50% (n=301)	24% (n=379)	All liveborn infants; infants w/ congenital malformations excluded
Norway ³	1999 & 2000	5%/ 0% (n=38/ 0)	16%/ 39% (n=55/ 23)	44%/ 60% (n=80/ 58)	66%/ 80% (n=83/ 69)	All deliveries/ NICU admissions
NICHD Network centers ¹⁰	1998-2003	5%	26%	56%	75%	4,466 inborn infants at 19 centers; excludes infants w/ BW >1000 g or who did not require mechanical ventilation
Vermont-Oxford Network centers ⁹	2003-2005	5% (n=2,625)	29% (n=5,481)	56% (n=8,722)	73% (n=9,795)	All infants born at a member hospital or transferred to a member hospital at ≤ 28 days postnatal age

Table 2. Survival rates by birth weight for infants ≤1000g

Population origin	Birth Year(s)	<500g	500-750g	750-1000g	Comments		
UK and Republic of Ireland ¹	1995	6% (n=33)	32% (n=497)	56% (n=276)	NICU admissions		
NICHD Network centers ²	1995-1996	11%	52% (500-800g)	85%	All liveborn infants; infants w/ congenital malformations excluded		
Vermont - Oxford Network units ⁴	1994-1996	17% (n=497)	60% (n=5334)	90% (n=6336)	All liveborn; lethal anomalies excluded		
Norway ³	1999 & 2000	10% / 54% (n=71/ 13)	42% / 68% (n=216/ 92)	78% / 88% (n= 268/ 240)	All deliveries/ NICU admissions		
United States ⁵	2001	14% (n=6450)	52% (n=11,081)	85% (n=11,847)	All live births		
Vermont-Oxford Network centers ⁹	2003-2005	17% (n=4,662)	56% (n=22,649)	85% (n=27,052)	All infants born at a member hospital or transferred to a member hospital at ≤ 28 days postnatal age		
NICHD Network centers ² (100g increments)	1995-1996	501-600g 29% (n=317)	601-700g 64% (n=449)	701-800g 74% (n=439)	801-900g 86% (n=419)	901-1000g 90% (n=462)	All liveborn infants; infants w/ congenital malformations excluded

Table 3. Survival rates by gestational age, gender, and birthweight for infants ≤25 weeks EGA and ≤600 g¹⁰

Birthweight	22 weeks		23 weeks		24 weeks	
	Male	Female	Male	Female	Male	Female
401g-500g	3%	2%	8%	19%	26%	28%
501g-600g	6%	9%	21%	21%	35%	49%