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# **ART OF MEDICINE**



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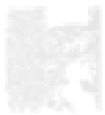
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ELSEVIER



SSRN

Universal  
Impact Factor



**NEONATAL RESUSCITATION IN 22-WEEK PREGNANCIES**

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A 20-year-old woman pregnant with her second child presents to the emergency department with premature contractions at 22 weeks' gestation. Her first child had been born by spontaneous vaginal delivery at 34 weeks' gestation and is currently a healthy 2-year-old. The woman has no chronic medical conditions and takes a prenatal vitamin daily. She has had routine prenatal care, and prenatal ultrasonography has shown no fetal or placental anomalies.

Her vital signs are within normal limits. Physical examination is notable only for a gravid abdomen. Cervical examination shows dilation to 3 cm, 40% effacement, and a fetal station of -2. She is admitted to the obstetrics ward for further management of her pregnancy.

You are an administrator in the hospital. The physicians caring for this patient contact you for guidance, since you have been charged with deciding whether resuscitation should be routinely performed for all neonates born at 22 weeks' gestation or whether selective resuscitation should be offered.

Which one of the following approaches would you take? Base your choice on the literature, your own experience, published guidelines, and other information sources.

Recommend resuscitation for all neonates born at 22 weeks' gestation.

Recommend selective resuscitation for neonates born at 22 weeks' gestation.

To aid in your decision making, we asked two experts in the field to summarize the evidence in favor of approaches assigned by the editors. Given your knowledge of the issue and the points made by the experts, which approach would you choose?

Option 1: Recommend Resuscitation for All Neonates Born at 22 Weeks' Gestation

Option 2: Recommend Selective Resuscitation for Neonates Born at 22 Weeks' Gestation

The issue of the initial management and resuscitation of infants born at 22 completed weeks of gestation has led to substantial debate among neonatology and maternal–fetal medicine specialists. Both the exact definition of and the approach to the limit of viability are major sources of anxiety for families and health care providers. That limit has changed drastically in the past 30 years, from 27 to 28 weeks of completed gestation to the current 22 to 23 weeks.

It is important to note that delaying delivery as long as it is safe for the mother and the fetus is the preferred approach. Now let us consider the question of resuscitation in all infants. After all, wouldn't it be easier to take a case-by-case approach? The answer is an emphatic "no." First, a standard approach to neonatal resuscitation and early post-resuscitative care, within the so-called golden hour, is well accepted to improve outcomes.<sup>1</sup> Second, these decisions are often made quickly, as in this vignette. Having a truly informed discussion is difficult given the stressors involved and the need to focus

on the mother's medical care as well. Third, prenatal gestational age assessments are suboptimal, which makes it difficult to be certain of a fetus's exact gestational age.<sup>2</sup> Fourth, a case-by-case approach allows for implicit biases to potentially influence decisions and contribute to the well-documented disparities in infant mortality in the United States.

Data have been published that support the use of a standard approach to resuscitating the neonates in all deliveries at 22 weeks' gestation. For example, in a study by Backes et al., the mortality rate at a hospital that used selective resuscitation was worse than the rate at a hospital in which active care was provided to all infants (survival, 19% vs. 53%,  $P < 0.05$ ).<sup>3</sup> A report from a hospital in Iowa in which active resuscitation was offered for all infants born at 22 to 23 weeks' gestation showed that 70% of the infants born at 22 weeks survived and 55% of these patients had no or only mild neurodevelopmental impairment at follow-up.<sup>4</sup> A cohort study of Swedish infants born at 22 to 24 weeks' gestation showed that 52% of the infants born at 22 weeks' gestation survived, with 50% of the survivors having no neurodevelopmental impairment at 2.5 years of age, outcomes that mirrored those in infants born at 23 to 24 weeks.<sup>5</sup> In pediatric cardiology practices, the survival rate of 30 to 70% among patients who require extracorporeal life support is considered reasonable for initiating that form of invasive therapy, so it certainly appears from the available data that birth at 22 weeks' gestation with resuscitation for all neonates also meets this mark.<sup>6</sup>

The earliest gestational age at birth after which survival is possible has decreased incrementally over time. Such improved survival has occurred as vanguard centers challenged conventional limits and demonstrated survival of infants born at gestational ages previously considered nonsurvivable. In this case vignette, an expectant mother presents with threatened preterm delivery at 22 weeks' gestation, the current "limit of viability." During antenatal counseling, parents should be offered selective resuscitation for their child.

What is selective resuscitation? Almost all extremely preterm infants require resuscitative interventions after birth to survive. Antenatal counseling for parents facing extremely preterm delivery of their baby is recommended and is typically possible, despite known challenges.<sup>7</sup> "Do not resuscitate" orders are accepted and encouraged in other medical settings when the possibility of survival is low and the burden of treatment is high. Selective resuscitation represents shared decision making to ensure that plans to initiate intensive care immediately after birth respect parental autonomy and wishes. As proxy decision makers, parents may select resuscitation as the first step of providing intensive care for their extremely premature infant or they may reasonably prioritize comfort care over invasive and potentially futile interventions.

Predicting outcomes with certainty after extremely preterm birth is difficult, owing to imprecise statistical models and the influence of factors beyond gestational age.<sup>8</sup> Morbidity and mortality are very high among infants born at 22 weeks' gestation, and nuanced features that influence outcomes should be acknowledged. In a 2021 meta-analysis of 2226 infants born at 22 weeks' gestation who received active treatment, the pooled prevalence of survival was 29%, and survival without major in-hospital complications was 11%.<sup>9</sup> Furthermore, the burden of treatment is high. Extremely preterm newborns who survive spend months in the neonatal intensive care unit, undergo hundreds of painful procedures, and are at high risk for subsequent neurodevelopmental impairment.<sup>10,11</sup>

Isolated centers have reported survival rates higher than 50% for infants born at 23 weeks or less of gestation. It is tempting to speculate that similar outcomes would be uniform after universal resuscitation, but that conclusion would be premature. First,

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such accounts represent the limited experience of specific and highly resourced hospitals, a factor that reduces generalizability. Survival estimates after active treatment are lower when pooled from more inclusive settings.<sup>9</sup> Second, many reports combine outcomes among infants born at 22 weeks' gestation with those among infants born at 23 and 24 weeks' gestation, making it difficult to ascertain the experience for infants at 22 weeks. Finally, infants born at the limits of viability are poorly represented in clinical trials and receive largely experimental care extrapolated from the care given to more mature patients. Ongoing scientific collaborations focused on this population may produce an evidence base for future widespread implementation, but this is not yet the current state of the field.

As perinatal medicine continues to advance, there always will be a gestational age threshold at which survival is possible but unlikely. Resuscitation should be offered but not universally mandated for these infants. The current limit of viability is 22 weeks' gestation. Prospective parents such as the mother in the vignette should be counseled regarding the range of possible outcomes and provided the opportunity to inform the goals of their child's medical care.

These studies call into question the notion that gestational age is itself a signal for determining the need for neonatal resuscitation. As is true for ill neonates of any gestational age who require intensive care, a universal approach to resuscitation improves overall outcomes; if severe life-limiting complications develop, a palliative approach can be offered when more prognostic information is available.

The use of a standard approach for infants born at 22 weeks' gestation results in outcomes that are as good as those among infants born at 23 to 24 weeks' gestation; thus, at this time there seems to be no persuasive argument against offering resuscitation to all neonates born at 22 weeks.

This section asks about your financial relationships with entities in the bio-medical arena that could be perceived to influence, or that give the appearance of potentially influencing, what you wrote in the submitted work. You should disclose interactions with ANY entity that could be considered broadly relevant to the work. For example, if your article is about testing an epidermal growth factor receptor (EGFR) antagonist in lung cancer, you should report all associations with entities pursuing diagnostic or therapeutic strategies in cancer in general, not just in the area of EGFR or lung cancer.

Report all sources of revenue paid (or promised to be paid) directly to you or your institution on your behalf over the 36 months prior to submission of the work. This should include all monies from sources with relevance to the submitted work, not just monies from the entity that sponsored the research. Please note that your interactions with the work's sponsor that are outside the submitted work should also be listed here. If there is any question, it is usually better to disclose a relationship than not to do so.

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receiving any financial support from any third party -- that is, the work was supported by funds from the same institution that pays your salary and that institution did not receive third-party funds with which to pay you. If you or your institution received funds from a third party to support the work, such as a government granting agency, charitable foundation or commercial sponsor, check "Yes".

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