

THE APGAR SCORE

AMERICAN ACADEMY OF PEDIATRICS
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ABSTRACT

The Apgar score provides a convenient shorthand for reporting the status of the newborn infant and the response to resuscitation. The Apgar score has been used inappropriately to predict specific neurologic outcome in the term infant. There are no consistent data on the significance of the Apgar score in preterm infants. The Apgar score has limitations, and it is inappropriate to use it alone to establish the diagnosis of asphyxia. An Apgar score assigned during resuscitation is not equivalent to a score assigned to a spontaneously breathing infant. An expanded Apgar score reporting form will account for concurrent resuscitative interventions and provide information to improve systems of perinatal and neonatal care.

KEY WORDS: Apgar score, asphyxia, neurologic outcome, resuscitation, cerebral palsy

INTRODUCTION

In 1952, Dr. Virginia Apgar devised a scoring system that was a rapid method of assessing the clinical status of the newborn infant at 1 minute of age and the need for prompt intervention to establish breathing.¹ A second report evaluating a larger number of patients was published in 1958.² This scoring system provided a standardized assessment for infants after delivery. The Apgar score comprises 5 components: heart rate, respiratory effort, muscle tone, reflex irritability, and color, each of which is given a score of 0, 1, or 2. The score is now reported at 1 and 5 minutes after birth. The Apgar score continues to provide a convenient shorthand for reporting the status of the newborn infant and the response to resuscitation. The Apgar score has been used inappropriately in term infants to predict specific neurologic outcome. Because there are no consistent data on the significance of the Apgar score in preterm infants, in this population the score should not be used for any purpose other than ongoing assessment

in the delivery room. The purpose of this statement is to place the Apgar score in its proper perspective.

The neonatal resuscitation program (NRP) guidelines³ state that “Apgar scores should not be used to dictate appropriate resuscitative actions, nor should interventions for depressed infants be delayed until the 1-minute assessment.” However, an Apgar score that remains 0 beyond 10 minutes of age may be useful in determining whether additional resuscitative efforts are indicated.⁴ The current NRP guidelines³ state that “if there is no heart rate after 10 minutes of complete and adequate resuscitation efforts, and there is no evidence of other causes of newborn compromise, discontinuation of resuscitation efforts may be appropriate. Current data indicate that, after 10 minutes of asystole, newborns are very unlikely to survive, or the rare survivor is likely to survive with severe disability.”

Previously, an Apgar score of 3 or less at 5 minutes was considered an essential requirement for the diagnosis of perinatal asphyxia. *Neonatal Encephalopathy and Cerebral Palsy: Defining the Pathogenesis and Pathophysiology*,⁵ produced in 2003 by the American College of Obstetricians and Gynecologists in collaboration with the American Academy of Pediatrics, lists an Apgar score of 0 to 3 beyond 5 minutes as one suggestive criterion for an intrapartum asphyxial insult. However, a persistently low Apgar score alone is not a specific indicator for intrapartum compromise. Further, although the score is used widely in outcome studies, its inappropriate use has led to an erroneous definition of asphyxia. Intrapartum asphyxia implies fetal hypercarbia and hypoxemia, which, if prolonged, will result in metabolic acidemia. Because the intrapartum disrup-

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APGAR SCORE

Gestational Age _____ weeks

SIGN	0	1	2	1 minute	5 minute	10 minute	15 minute	20 minute	
				COLOR	Blue or Pale	Acrocyanotic	Completely Pink		
HEART RATE	Absent	<100 minute	>100 minute						
REFLEX IRRITABILITY	No Response	Grimace	Cry or Active Withdrawal						
MUSCLE TONE	Limp	Some Flexion	Active Motion						
RESPIRATION	Absent	Weak Cry; Hypoventilation	Good, crying						
TOTAL									
Comments:				Resuscitation					
				Minutes	1	5	10	15	20
				Oxygen					
				PPV/NCPAP					
				ETT					
				Chest Compressions					
				Epinephrine					

Figure 1. Expanded Apgar score form. Record the score in the appropriate place at specific time intervals. The additional resuscitative measures (if appropriate) are recorded at the same time that the score is reported using a check mark in the appropriate box. Use the comment box to list other factors including maternal medications and/or the response to resuscitation between the recorded times of scoring. PPV/NCPAP indicates positive-pressure ventilation/nasal continuous positive airway pressure; ETT, endotracheal tube.

tion of uterine or fetal blood flow is rarely, if ever, absolute, asphyxia is an imprecise, general term. Descriptions such as hypercarbia, hypoxia, and metabolic, respiratory, or lactic acidemia are more precise for immediate assessment of the newborn infant and retrospective assessment of intrapartum management.

LIMITATIONS OF THE APGAR SCORE

It is important to recognize the limitations of the Apgar score. The Apgar score is an expression of the infant’s physiologic condition, has a limited time frame, and includes subjective components. In addition, the biochemical disturbance must be significant before the score is affected. Elements of the score such as tone, color, and reflex irritability partially depend on the physiologic maturity of the infant. The healthy preterm infant with no evidence of asphyxia may receive a low score only because of immaturity.⁶ A number of factors may influence an Apgar score, including but not limited to drugs, trauma, congenital anomalies, infections, hypoxia, hypovolemia, and preterm birth.⁷ The incidence of low Apgar scores is inversely related to birth weight, and a low score is limited in predicting morbidity or mortality.⁸ Accordingly, it is inappropriate to use an Apgar score alone to establish the diagnosis of asphyxia.

APGAR SCORE AND RESUSCITATION

The 5-minute Apgar score, and particularly a change in the score between 1 and 5 minutes, is a useful index of the response to resuscitation. If the Apgar score is less than 7 at 5 minutes, the NRP guidelines state that the assessment should be repeated every 5 minutes up to 20 minutes.³ However, an Apgar score assigned during a resuscitation is not equivalent to a score assigned to a spontaneously breathing infant.⁹ There is no accepted standard for reporting an Apgar score in infants undergoing resuscitation after birth, because many of the elements contributing to the score are altered by resuscitation. The concept of an “assisted” score that accounts for resuscitative interventions has been suggested, but the predictive reliability has not been studied. To describe such infants correctly and provide accurate documentation and data collection, an expanded Apgar score report form is proposed (Fig 1).

PREDICTION OF OUTCOME

A low 1-minute Apgar score alone does not correlate with the infant’s future outcome. A retrospective analysis concluded that the 5-minute Apgar score remained a valid predictor of neonatal mortality, but using it to predict long-term outcome was inappropriate.¹⁰ On the other hand, another study¹¹ stated

that low Apgar scores at 5 minutes are associated with death or cerebral palsy, and this association increased if both 1- and 5-minute scores were low.

An Apgar score at 5 minutes in term infants correlates poorly with future neurologic outcomes. For example, a score of 0 to 3 at 5 minutes was associated with a slightly increased risk of cerebral palsy compared with higher scores.¹² Conversely, 75% of children with cerebral palsy had normal scores at 5 minutes.¹² In addition, a low 5-minute score in combination with other markers of asphyxia may identify infants at risk of developing seizures (odds ratio: 39; 95% confidence interval: 3.9–392.5).¹³ The risk of poor neurologic outcomes increases when the Apgar score is 3 or less at 10, 15, and 20 minutes.⁷

A 5-minute Apgar score of 7 to 10 is considered normal. Scores of 4, 5, and 6 are intermediate and are not markers of increased risk of neurologic dysfunction. Such scores may be the result of physiologic immaturity, maternal medications, the presence of congenital malformations, and other factors. Because of these other conditions, the Apgar score alone cannot be considered evidence or a consequence of asphyxia. Other factors including nonreassuring fetal heart rate monitoring patterns and abnormalities in umbilical arterial blood gases, clinical cerebral function, neuroimaging studies, neonatal electroencephalography, placental pathology, hematologic studies, and multisystem organ dysfunction need to be considered when defining an intrapartum hypoxic-ischemic event as a cause of cerebral palsy.⁵

OTHER APPLICATIONS

Monitoring of low Apgar scores from a delivery service can be useful. Individual case reviews can identify needs for focused educational programs and improvement in systems of perinatal care. Analyzing trends allows assessment of the impact of quality improvement interventions.

CONCLUSION

The Apgar score describes the condition of the newborn infant immediately after birth¹⁴ and, when properly applied, is a tool for standardized assessment. It also provides a mechanism to record fetal-to-neonatal transition. An Apgar score of 0 to 3 at 5 minutes may correlate with neonatal mortality but alone does not predict later neurologic dysfunction. The Apgar score is affected by gestational age, maternal medications, resuscitation, and cardiorespiratory and neurologic conditions. Low 1- and 5-minute Apgar scores alone are not conclusive markers of an acute intrapartum hypoxic event. Resuscitative interventions modify the components of the Apgar score. There is a need for perinatal health care professionals to be consistent in assigning an Apgar score during a resus-

citation. The American Academy of Pediatrics and the American College of Obstetricians and Gynecologists propose use of an expanded Apgar score reporting form that accounts for concurrent resuscitative interventions.

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