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The Apgar Score

AMERICAN ACADEMY OF PEDIATRICS COMMITTEE ON FETUS AND NEWBORN,
AMERICAN COLLEGE OF OBSTETRICIANS AND GYNECOLOGISTS COMMITTEE ON OBSTETRIC PRACTICE

abstract

The Apgar score provides an accepted and convenient method for reporting the status of the newborn infant immediately after birth and the response to resuscitation if needed. The Apgar score alone cannot be considered as evidence of, or a consequence of, asphyxia; does not predict individual neonatal mortality or neurologic outcome; and should not be used for that purpose. An Apgar score assigned during resuscitation is not equivalent to a score assigned to a spontaneously breathing infant. The American Academy of Pediatrics and the American College of Obstetricians and Gynecologists encourage use of an expanded Apgar score reporting form that accounts for concurrent resuscitative interventions.

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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] Dr Apgar subsequently published a second report that included a larger number of patients.[2] This scoring system provided a standardized assessment for infants after delivery. The Apgar score comprises 5 components: (1) color; (2) heart rate; (3) reflexes; (4) muscle tone; and (5) respiration. Each of these components is given a score of 0, 1, or 2. Thus, the Apgar score quantitates clinical signs of neonatal depression, such as cyanosis or pallor, bradycardia, depressed reflex response to stimulation, hypotonia, and apnea or gasping respirations. The score is reported at 1 minute and 5 minutes after birth for all infants, and at 5-minute intervals thereafter until 20 minutes for infants with a score less than 7.[3] The Apgar score provides an accepted and convenient method for reporting the status of the newborn infant immediately after birth and the response to resuscitation if it is needed; however, it has been inappropriately used to predict individual adverse neurologic outcome.

The purpose of the present statement was to place the Apgar score in its proper perspective. This statement revises the 2006 College Committee Opinion/American Academy of Pediatrics policy statement to include updated guidance from the 2014 report *Neonatal Encephalopathy and Neurologic Outcome* (second edition)[4] published by the American College

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of Obstetricians and Gynecologists in collaboration with the American Academy of Pediatrics, along with new guidance on neonatal resuscitation. The guidelines of the Neonatal Resuscitation Program state that the Apgar score is useful for conveying information about the newborn infant's overall status and response to resuscitation. However, resuscitation must be initiated before the 1-minute score is assigned. Therefore, the Apgar score is not used to determine the need for initial resuscitation, what resuscitation steps are necessary, or when to use them.[3]

An Apgar score that remains 0 beyond 10 minutes of age may, however, be useful in determining whether continued resuscitative efforts are indicated because very few infants with an Apgar score of 0 at 10 minutes have been reported to survive with a normal neurologic outcome.[3,5,6] In line with this outcome, the 2011 Neonatal Resuscitation Program guidelines state that "if you can confirm that no heart rate has been detectable for at least 10 minutes, discontinuation of resuscitative efforts may be appropriate."[3]

The *Neonatal Encephalopathy and Neurologic Outcome* report defines a 5-minute Apgar score of 7 to 10 as reassuring, a score of 4 to 6 as moderately abnormal, and a score of 0 to 3 as low in the term infant and late-preterm infant.[4] In that report, an Apgar score of 0 to 3 at 5 minutes or more was considered a nonspecific sign of illness, which "may be one of the first indications of encephalopathy." However, a persistently low Apgar score alone is not a specific indicator for intrapartum compromise. Furthermore, although the score is widely used in outcome studies, its inappropriate use has led to an erroneous definition of asphyxia. Asphyxia is defined as the marked impairment of gas exchange, which, if prolonged, leads to progressive hypoxemia, hypercapnia, and significant metabolic acidosis. The term asphyxia, which describes a process of varying severity and duration rather than an end point, should not be applied to birth events unless specific evidence of markedly impaired intrapartum or immediate postnatal gas exchange can be documented on the basis of laboratory test results.

LIMITATIONS OF THE APGAR SCORE

It is important to recognize the limitations of the Apgar score. It is an expression of the infant's physiologic condition at 1 point in time, which includes subjective components. There are numerous factors that can influence the Apgar score, including maternal sedation or anesthesia, congenital malformations, gestational age, trauma, and interobserver variability.[4] In addition, the biochemical disturbance must be significant before the score is affected. Elements of the score, such as tone, color, and reflex irritability, can be subjective and partially depend on the physiologic maturity of the infant. The score may also be affected by variations in normal transition. For example, lower initial oxygen saturations in the first few minutes need not prompt immediate supplemental oxygen administration; the Neonatal Resuscitation Program targets for oxygen saturation are 60% to 65% at 1 minute and 80% to 85% at 5 minutes.[3] The healthy preterm infant with no evidence of asphyxia may receive a low score only because of immaturity.[7,8] The incidence of low Apgar scores is inversely related to birth weight, and a low score cannot predict morbidity or mortality for any individual infant.[8,9] As previously stated, it is also inappropriate to use an Apgar score alone to diagnose asphyxia.

APGAR SCORE AND RESUSCITATION

The 5-minute Apgar score, and particularly a change in the score between 1 minute and 5 minutes, is a useful index of the response to resuscitation. If the Apgar score is less than 7 at 5 minutes, the Neonatal Resuscitation Program guidelines state that the assessment should be repeated every 5 minutes for up to 20 minutes.[3] However, an Apgar score assigned during resuscitation is not equivalent to a score assigned to a spontaneously breathing infant.[10] 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 correctly describe such infants and provide accurate documentation and data collection, an expanded Apgar score reporting form is encouraged (Fig 1). This expanded Apgar score may also prove useful in the setting of delayed cord clamping, in which the time of birth (ie, complete delivery of the infant), the time of cord clamping, and the time of initiation of resuscitation can all be recorded in the comments box.

The Apgar score alone cannot be considered to be evidence of or a consequence of asphyxia. Many other factors, including nonreassuring fetal heart rate–monitoring patterns and abnormalities in umbilical arterial blood gas results, clinical cerebral function, neuroimaging studies, neonatal electroencephalography, placental pathology, hematologic studies, and multisystem organ dysfunction, need to be considered in diagnosing an intrapartum hypoxic–ischemic event.[6] When a category I (normal) or category II (indeterminate) fetal heart rate tracing is associated with Apgar scores of 7 or higher at 5 minutes, a normal umbilical cord arterial blood pH (±1 SD), or both, it is not

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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 reporting form. Scores should be recorded 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 by using a checkmark in the appropriate box. The comment box is used to list other factors, including maternal medications and/or the response to resuscitation between the recorded times of scoring. ETT, endotracheal tube; PPV/NCPAP, positive pressure ventilation/nasal continuous positive airway pressure.

consistent with an acute hypoxic–ischemic event.[4]

PREDICTION OF OUTCOME

A 1-minute Apgar score of 0 to 3 does not predict any individual infant's outcome. A 5-minute Apgar score of 0 to 3 correlates with neonatal mortality in large populations[11,12] but does not predict individual future neurologic dysfunction. Population studies have uniformly reassured us that most infants with low Apgar scores will not develop cerebral palsy. However, a low 5-minute Apgar score clearly confers an increased relative risk of cerebral palsy, reported to be as high as 20- to 100-fold over that of infants with a 5-minute Apgar score of 7 to 10.[9,13–15] Although individual risk varies, the population risk of poor neurologic outcomes also increases when the Apgar score is 3 or less at 10 minutes, 15 minutes, and 20 minutes.[16] When a newborn infant has an Apgar score of 5 or less at 5 minutes, umbilical arterial blood gas samples from a clamped section of the umbilical cord should be obtained, if possible.[17] Submitting the placenta for pathologic examination may be valuable.

OTHER APPLICATIONS

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

CONCLUSIONS

The Apgar score describes the condition of the newborn infant immediately after birth and, when properly applied, is a tool for standardized assessment.[18] It also provides a mechanism to record fetal-to-neonatal transition. Apgar scores do not predict individual mortality or adverse neurologic outcome. However, based on population studies, Apgar scores of less than 5 at 5 and 10 minutes clearly confer an increased relative risk of cerebral palsy, and the degree of abnormality correlates with the risk of cerebral palsy. Most infants with low Apgar scores, however, will not develop cerebral palsy. The Apgar score is affected by many factors, including gestational age, maternal medications, resuscitation, and cardiorespiratory and neurologic conditions. If the Apgar score at 5 minutes is 7 or greater, it is unlikely that peripartum hypoxia–ischemia caused neonatal encephalopathy.

RECOMMENDATIONS

1. The Apgar score does not predict individual neonatal mortality or neurologic outcome and should not be used for that purpose.
2. It is inappropriate to use the Apgar score alone to establish the diagnosis of asphyxia. The term asphyxia, which describes a process of varying severity and duration rather than an end point, should not be applied to birth events unless specific evidence of markedly impaired intrapartum or immediate postnatal gas exchange can be documented.
3. When a newborn infant has an Apgar score of 5 or less at 5 minutes, umbilical arterial blood gas samples from a clamped section of the umbilical cord should be obtained. Submitting the placenta for pathologic examination may be valuable.
4. Perinatal health care professionals should be consistent in assigning an Apgar score during resuscitation; therefore, the American Academy of Pediatrics and the American College of Obstetricians and Gynecologists encourage use of an expanded Apgar score reporting form that accounts for concurrent resuscitative interventions.

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