

The Apgar Score (1953-1958) ^[1]

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In 1952 Virginia Apgar, a physician at the Sloane Women's Hospital in New York City, New York, created the Apgar score as a method of evaluating newborn infants' health to determine if they required medical intervention. The score included five separate categories, including heart rate, breathing rate, reaction to stimuli, muscle activity, and color. An infant received a score from zero to two in each category, and those scores added up to the infant's total score out of ten. An infant with a score of ten was healthy, and those with low scores required medical attention at birth. Apgar originally used the score to determine how infants responded to the pain-relieving drugs given to pregnant women during labor. The Apgar score also served to determine when the infant required medical assistance, especially oxygen resuscitation. As of 2017, nearly every hospital in the world uses an updated Apgar score to evaluate the health of newborn infants. The Apgar score has allowed for medical personnel to evaluate an infant directly after birth on an objective scale to determine whether that infant could benefit from possibly life-saving medical intervention.

Apgar first created the score in 1952 while working at the Sloane Women's Hospital, part of the Presbyterian Hospital in New York City, New York. According to her first report on the scoring system, Apgar wanted to use a simple, clear, objective evaluation method for newborn infants to better see the effects on infants of different kinds of pain-relieving drugs used on pregnant women during labor. Because the infant and the pregnant woman share a blood supply during birth, drugs given to the pregnant woman can also have effects on the infant. Apgar was particularly interested in those effects as she was the anesthesiologist responsible for administering pain-relieving drugs to pregnant women. She and her fellow physicians evaluated over 2,000 infants as a data set for their initial publication in 1953. In that publication, Apgar described the five categories and the two-point scoring system that comprises the Apgar score, along with the criteria used to award points.

The original Apgar score required a nurse or physician to evaluate a newborn infant sixty seconds after birth. Five separate categories made up the score. Those categories included heart rate, breathing rate, reaction to stimuli, muscle activity, and color. Depending on how the infant performed in each category, it received zero points, one point, or two points. A score of zero in a category meant that life signs were not present in the infant. A score of one meant that signs were weakly present. A score of two meant that signs were optimally present in the infant. An infant in perfect condition received a score of ten comprised of scores of two across all five categories. Under the Apgar score, infants scoring eight, nine, or ten were considered in excellent condition. Infants scoring five, six, or seven were considered in moderate condition. Infants scoring four or below were considered in poor condition and required medical intervention to survive. Medical intervention was usually oxygen resuscitation for infants not breathing well.

Each of the five categories in the Apgar score evaluated different measures of health. For the first category, heart rate, a nurse or physician measured the infant's pulse. Normal infant

heart rate is anything between seventy and 190 beats per minute. When an infant's heart rate is too low, their hearts are not pumping blood fast enough to adequately oxygenate their body. For the Apgar score, if there was no heartbeat, the infant received a score of zero. If the heart rate was less than one hundred beats per minute, the infant received a score of one. If the heart rate exceeded one hundred beats per minute, the infant received a score of two.

For the second category, breathing rate, a nurse or physician monitored the infant's breathing sixty seconds after birth. If the infant was not breathing, the infant received a score of zero. Those infants not breathing were resuscitated, or the practitioner administered oxygen directly to infants to help them breathe, usually via a mask placed over their faces. If the infant took slow or irregular breaths or had weak cries, the infant received a score of one. Those infants sometimes received oxygen resuscitation as well. If the infant cried loudly, the infant received a score of two and did not receive medical intervention.

For the third category, reaction to stimuli, a nurse or physician made the infant react to something, anything from a puff of air to the face to a gentle pinch. For Apgar's original purpose of testing how pain-relieving drugs affected newborn infants, reaction to stimuli served as a judge of infant activity. More activity meant that the infants were less affected by the drugs. For the Apgar score, if the infant did not react to stimuli, the infant received a score of zero. If the infant grimaced, the infant received a score of one. If the infant grimaced and coughed, sneezed, or cried loudly, the infant received a score of two.

For the fourth part of the Apgar score, muscle activity, a nurse or physician observed how the infant moved its arms and legs. Apgar's reason for a muscle activity score mirrored her reasoning for the reaction to stimuli score, to measure the impact of drugs administered during delivery. According to Apgar, infants less affected by maternal pain-relieving drugs had better muscle tone. If the infant's muscles were loose and floppy with no movement in the limbs, the infant received a score of zero. If the infant moved its limbs weakly, the infant received a score of one. If the infant actively flailed its arms and legs, the infant received a score of two. Moving their muscles on their own indicated that infants were neither suffering side-effects from pain-relieving drugs nor suffering from another condition.

For the fifth and final category, color, a nurse or physician evaluated the tint of the infant's skin. Skin color indicated how well oxygenated the infant was. Infants having trouble breathing were bluer than infants who were not. If the infant's entire body was pale blue, the infant received a score of zero. Those infants received medical attention in the form of oxygen resuscitation. If the infant's body was pink but its fingers and toes were blue, the infant received a score of one. Those infants often also received oxygen. If the infant's entire body was pink, the infant received a score of two. Apgar, in her original report on her score, noted that of all the signs she listed, color was the least informative. Some infants are born blue due to moments of oxygen deprivation during delivery. Many infants with poor scores in the color category scored excellently in other categories and were in excellent condition overall, as excellent heart and breathing rates quickly corrected poor color score.

After Apgar's original study, she and other researchers expanded the number of infants measured to test whether scoring infants at five minutes after birth as well as sixty seconds helped medical personnel better administer treatment. From 1953 to 1958, five years of testing the Apgar score went on in various clinics in the US with participation from other physicians and medical personnel. In all, over 15,000 infants were evaluated using the Apgar score, culminating in a second article that Apgar and other researchers from [Columbia University](#)

[2] in New York City, New York, published. The second report on the Apgar score included some of the critiques and changes made in response to those who had been using the test to evaluate the infants. First, the participants saw that infants whose scores fell below four were in poor health and needed medical assistance. Therefore, they used the score of four as the cut-off for providing oxygen to the infants, meaning any infant scoring four or below received additional oxygen.

Additionally, the researchers confirmed that nurses should score infants sixty seconds after the birth and again at five minutes after birth for all infants, especially to see if infants with low scores improved as a result of administered oxygen. They stated that scores that started low and stayed low for fifteen minutes after birth, even with medical attention, indicated that an infant's chances of surviving were not good. Monitoring the score of a low-scoring infant after birth helped medical personnel see if the infant's condition was improving as a result of their efforts. As of 2017, five minutes after birth is the second time a nurse or physician tests an infant for an Apgar score. For infants scoring below seven, medical personnel re-evaluate the infants every five minutes for twenty minutes after birth.

The second study also found that medical personnel quickly learned how to use the Apgar scoring system, which meant a wide variety of people could perform the evaluation. Whoever was in charge of the infant at sixty seconds assigned the score without interrupting any other procedure. People who could assign infants the Apgar score included obstetricians, pediatricians, medical students, nurses, or others present in the delivery room. Some medical clinics had different birthing procedures, which required some adjustments to the scoring method. In medical clinics where physicians did not clamp the umbilical cord as fast as others, the scores assigned for the response to stimuli category were not satisfactory, according to the researchers. Therefore, if the standard test of blowing air up an infant's nostrils was not effective, the researchers recommend that observers should slap the soles of the infant's feet instead. The researchers suggest that slapping feet was a simpler and more effective test for that category in general.

Finally, the second report on the Apgar score stated that not all of the five criteria were equally important. Of the five, heart rate and breathing rate were most important, followed by muscle activity and response to stimuli. Color, as Apgar noted in her original publication, proved least important and least informative about the infant's condition.

The over 15,000 infant birth study and the subsequent article that described the study spread the Apgar score to other hospitals and clinics while proving its effectiveness in predicting the condition of infants after birth. With the Apgar score, not only could medical personnel evaluate an infant's condition and predict whether it would survive the minutes after birth, but they could also intervene to save the infant's life, usually with oxygen resuscitation. In the 1950s, before and in the early days of the Apgar score, one in thirty infants died at birth. Many of those infants were born premature or with birth defects and so nurses and physicians set them aside as too sick to survive and did not give them medical attention to improve their condition. With the Apgar score, nurses and physicians could determine the infant's condition at sixty seconds and then provide treatment, be it oxygen or something else. At five minutes after birth, medical personnel evaluated the infant again, and most infants improved drastically by that point. In the early twenty-first century, because of the Apgar score and the advances in neonatal intensive care, only one in five hundred infants die at birth in the US.

As of 2017, nurses and physicians in hospitals around the world use the Apgar score to

evaluate newborn infants and determine whether they need to provide medical treatment. The 2015 Apgar score guidelines encourage medical intervention for any infant with a score lower than seven, as it indicates that the infant is not adjusting to conditions outside the pregnant woman's womb [3] very well. Most commonly, the medical intervention takes the form of providing additional oxygen, clearing out the infant's airways, or stimulating the heart so it beats properly. According to the National Library of Medicine, most low scores measured at sixty seconds are in the normal range by the time a second score is assigned at five minutes. The Apgar score does not, however, predict the long-term health of the infant. Researchers have done studies to link an infant's Apgar score to its long term health and development, and as of 2017 no study has shown that such a link exists.

Sources

1. Apgar, Virginia. "A Proposal for a New Method of Evaluation of the Newborn Infant." *Current Researches in Anesthesia and Analgesia* 32 (1953): 260-7. <https://profiles.nlm.nih.gov/ps/access/CPBBKG.pdf> [4] (Accessed February 9, 2017).
2. Apgar, Virginia, Duncan A. Holaday, L. Stanley James, Irvin M. Weisbrot, and Cornelia Berrien. "Evaluation of the Newborn Infant-Second Report." *Journal of the American Medical Association* 168 (1958): 1985-8.
3. Gawande, Atul. "The Score: How Childbirth Went Industrial." *The New Yorker*. 6 October 2006. <http://www.newyorker.com/magazine/2006/10/09/the-score> [5] (Accessed February 9, 2017).
4. Medline Plus. "APGAR." U.S. National Library of Medicine. <https://www.nlm.nih.gov/medlineplus/ency/article/003402.htm> [6] (Accessed September 6, 2015).
5. Medline Plus. "Pulse." U.S. National Library of Medicine. <https://www.nlm.nih.gov/medlineplus/ency/article/003399.htm> [7] (Accessed November 15, 2015).
6. Profiles in Science. "The Virginia Apgar Papers." National Library of Medicine. <http://profiles.nlm.nih.gov/ps/retrieve/Narrative/CP/p-nid/178> [8] (Accessed September 6, 2015).
7. Sandelowski, Margarete. *Pain, Pleasure, and American Childbirth: From the Twilight Sleep to the Read Method, 1914-1960*. Westport: Greenwood Press, 1984.
8. Watterberg, Kristi L., Susan Aucott, William E. Benitz, James J. Cummings, Eric C. Eichenwald, Jay Goldsmith, Brenda B. Poindexter, Karen Puopolo, Dan L. Stewart, and Kasper S. Wang. "The Apgar Score." *Pediatrics* 136 (2015): 819-22. <http://pediatrics.aappublications.org/content/136/4/819.full> [9] (Accessed May 3, 2016).

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Subject

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