

"A Proposal for a New Method of Evaluation of the Newborn Infant" (1953), by Virginia Apgar"

In 1953, Virginia Apgar published the article "A Proposal for a New Method for Evaluation of the Newborn Infant" about her method for scoring newborn infants directly after birth to assess their health and whether medical intervention was necessary. Apgar worked at the Presbyterian Hospital in New York City, New York, as an obstetrical anesthesiologist, a physician who administers pain medication during childbirth. In that capacity, she sought to reestablish clear scoring guidelines for newborn infants so that she could compare which obstetric practices, pain relief methods, and resuscitation methods worked the best during and after childbirth. She published her article in *Current Researches in Anesthesia and Analgesia* in 1953, and the Apgar scoring system is still used in hospitals around the world as of 2016. In the article, Apgar establishes a scoring system for newborn infants that allows for quick assessment of their health directly after birth and therefore swift intervention by medical personnel to promote healthy development.

While researching the article, Apgar worked as a professor in the department of anesthesiology at Columbia University College of Physicians and Surgeons in New York City, New York, and as an obstetrical anesthesiologist at the Presbyterian Hospital. During the 1950s, obstetricians administered heavy medication to women giving birth, including pain-relieving drugs and drugs that prevented them from remembering the delivery process. Those drugs put the women into a state of semi-consciousness so that they remained sleepy and drowsy during childbirth, called twilight sleep. The goal was to prevent women from remembering the extreme pain of childbirth. However, drugs given during childbirth often resulted in negative effects on the infant, including poor breathing after birth. As an anesthesiologist, Apgar was interested in determining the effects those drugs had on infants during and after the birthing process, as well as how best to give oxygen resuscitation to infants with breathing troubles. For "Proposal for a New Method," she applied her scoring system to over 1,000 infants born at the Sloane Hospital for Women in New York City, New York, which was part of the Presbyterian Hospital.

In "Proposal for a New Method," Apgar begins with an introduction of why she created an infant scoring system, how she went about creating it, and which five categories she chose to use in the scoring system. After the introductory section, Apgar explains her materials, including how many infants participated in the research, how the women gave birth, and what anesthesia or other drugs those women received during childbirth. Apgar then moves into her results, explaining how well different infants scored after birth, with a special focus on prematurity, resuscitation, and deaths. She concludes the article with a summary of what she accomplished with the article, namely a scoring system for measuring the health of newborn infants.

Apgar begins "Proposal for a New Method" with the acknowledgement that many physicians and researchers have written articles on the resuscitation of infants at birth. She notes that many of those articles contain unscientific observations, poor quality data, or no data at all. Apgar presents "Proposal for a New Method" as an article that establishes a clear scoring system for newborn infants to compare the effects of both different pain relieving drugs used on pregnant women giving birth, as well as the effects of resuscitation on the infant. Previous scoring systems, Apgar notes, used breathing time and crying time as their criteria. Breathing time meant how long it took for an infant to take a breath after the delivery of its head, while crying time similarly meant the time it took for an infant to cry. Apgar objects to those criteria because of the effects that drugs given to pregnant women during childbirth could have on the outcomes. Excessive drug amounts caused infants to breathe once and then stop. Apgar also states that prior scoring systems used terms

such as mild, moderate, or severe depression of the infants as criteria, which Apgar identifies as too subjective.

Instead, Apgar suggests using five objective signs that nurses or physicians could easily and quickly determine. She recommends recording the infant's score sixty seconds after birth. Her scoring system has five categories, including heart rate, breathing rate, response to stimuli, muscle activity, and color. In each category, the infant could score a 0, 1, or 2. A score of 0 meant the sign was not present. For example, if the infant did not have a heartbeat, the infant received a 0 in that category. A score of 1 meant the sign was weakly present or not in good condition. A score of 2 meant the sign was present and in perfect condition, such as a heart rate in the normal range. After the nurse or physician gave the infant a score in each category, they added the scores together to form the infant's total score, from 0 to 10.

Apgar then goes on to detail the criteria for receiving a perfect score in each of the five categories. For heart rate, an infant received a 2 if it had a rate of 100 to 140 beats per minute, a 1 if less than 100 beats per minute, and a 0 if the scorer could find no heartbeat. Apgar recommends feeling the umbilical cord two inches from where it attaches to the infant for measuring the pulse. For breathing rate, infants who were breathing and crying by sixty seconds received a 2, infants who were breathing shallowly or irregularly received a 1, and infants not breathing at sixty seconds received a 0. Sometimes, Apgar says, infants heavily affected by pain relieving drugs gasped once before sixty seconds and then stopped breathing. If those infants were not breathing at sixty seconds, they still received a 0, even though they were breathing before. Apgar's third category is the infant's response to some sort of stimulation. Often, nurses or physicians cleared out the infant's nose with a suction tube. If the infant grimaced, sneezed, or coughed, it received a 2. Apgar does not mention in her paper what response earns a 1 or a 0. Her fourth category, muscle activity, or muscle tone, refers to whether the infant moved its arms and legs or let them hang. Hanging limbs received a 0, while infants who flexed their arms and legs on their own and resisted someone else extending them received a 2. In the paper, Apgar does not describe a score of 1.

Apgar's final scoring category is the color of the infant. She prefaces the section by admitting the sign is the least informative and caused the most disagreement among individuals evaluating the infants. All infants are born blue due to their lack of oxygen, owing to the transition from receiving oxygenated blood from their mothers to breathing on their own. Therefore, Apgar claims, the time it takes for the infants turn the desired color of pink depends on how well their heart beats and how well they breathe. Apgar notes that both of those are already included in the score as heart rate and respiratory effort. Apgar mentions that at sixty seconds after birth, not many infants received a 2 in this category, even if they had excellent scores for the other categories. Reasons for that include leftover material from birth covering their skin, the naturally darker skin of some infants, and some unexplained cases of lingering blue coloring in hands and feet. Most infants, when reexamined for color five minutes after birth, were entirely pink and healthy-looking. Apgar concludes her discussion of the scoring criteria with a note about how the childbirth staff at the hospitals using her scoring method became quite competitive with one another about who delivered the best-scoring infants.

Next, Apgar moves into the material section of "Proposal for a New Method," in which she describes the births of the infants who served as test subjects. For the article, Apgar and others rated 1,021 infants born alive at the Sloane Hospital for Women, part of the Presbyterian Hospital. Those infants were born in five different types of delivery. The first category Apgar lists is deliveries in which the pregnant woman gave birth with little to no medical assistance from the physician, meaning she did not require the physician to use curved clasps called forceps to assist in delivering the infant. The second category is Cesarean section births, in which the physician cuts open the pregnant woman's abdomen and lifts the infant out. The third category is births in which the physician used forceps to assist the woman in pushing the infant out of the birth canal. The fourth category is breech deliveries, in which the infant comes down the birth canal foot- or buttocks-first. Finally, the fifth category is when the infant is positioned within the womb of the pregnant woman foot- or buttocks-first and the physician manipulates the infant so that it is in a more favorable position prior to delivery. Apgar reports that the best scores came from infants born in the first category, without much interference from the physician and vaginally with the back of the head coming out first. The

average score for that method was 8.4. The other methods scored, respectively: 6.8, 6.9, 6.7, and 6.3. Apgar concludes that vaginal birth produced the best scores and no significant difference in scores came from the four other delivery methods.

Apgar then discusses what kind of anesthesia or other drugs the women received during childbirth and the effects those had on the infants' scores. For Cesarean sections, women received either anesthesia injected into the center of the spine, general anesthesia to render them unconscious, or anesthesia injected in the area just outside the spine, referred to as an epidural. Spinal anesthesia and epidural anesthesia numbed the women from the waist down. The best infant scores came from women who received spinal anesthesia prior to birth. The average score was 8.0. Women who received epidurals had infants with an average score of 6.3, while the infants of women who received general anesthesia fared the worst with an average score of 5.0. Apgar uses those scores to conclude that spinal anesthesia not only produced infants with better scores, but the women who received it gave birth faster than those given general anesthesia.

Apgar then discusses her opinion on Cesarean section births versus vaginal births. She states that if physicians select the right kind of anesthetics for Cesarean sections and administer those drugs correctly, infants born will survive just as well as those born via uncomplicated vaginal deliveries. However, she points out that the data she collected shows that vaginally birthed infants scored much higher than other methods of birth. She mentions that a woman's labor may promote better respiration and circulation in the newborn infant.

Apgar's next results come from a small study she conducted on the effects of specific drugs on pregnant women. Those drugs were relaxants, given to pregnant women to keep them from moving during labor, and another kind of anesthesia called cyclopropane used to render the woman unconscious. The women who had a relaxant and cyclopropane gave birth to infants scoring on average a 5.0, while women given only cyclopropane also gave birth to infants scoring on average a 5.0. Additionally, Apgar notes that both sets of infants needed oxygen after birth seventy percent of the time. Thus, she concludes that administering a relaxant or cyclopropane to pregnant women during childbirth did not improve the infants' condition.

Apgar then discusses another small study about twin births. Apgar again notes that using regional anesthesia, such as spinal anesthesia or epidurals, on pregnant women produced better scoring infants than using general anesthesia. The average scores were 9.8 and 8.2, respectively. Also, she noticed that the first twin born scored slightly better than the second twin in many cases. The average scores there were 8.9 for the first twin and 8.2 for the second.

The final small study Apgar focuses on is the scores of infants treated with oxygen resuscitation after birth. Medical personnel provided oxygen resuscitation, or extra oxygen, to the infant when the infant's condition was poor. The medical personnel could use three different kinds of resuscitation. The first was face oxygen, in which unpressurized oxygen was given to the infant to breathe in. The second method was positive pressure mask, in which a mask was pressed to the infant's face to deliver pressurized oxygen. The third method was endotracheal oxygen, in which the infant's larynx, or voice box, was punctured to allow for airflow. Around nineteen percent of the live infants needed oxygen, and most of them received face oxygen or positive pressure mask of oxygen. Also, most of the infants needing oxygen came from Cesarean section or breech deliveries. As such, those infants who received face oxygen had an average score of 6.7, those with positive pressure mask 3.9, and those with endotracheal oxygen 2.1.

Apgar then switches to a discussion of infants who died during or after childbirth. Beyond the 1,021 infants scored, 2,096 infants were born at Sloane Hospital for Women during the study. Of those 2,096, twenty-five died, making the death rate 1.2 percent. If thirty-eight stillborn infants under viable weight are included, the death rate rose to 3.0 percent. Most of the infants died during breech deliveries, where the infant's feet or backside comes out first. Apgar points out that complications from anesthesia did not contribute to any infant deaths in the study.

Apgar concludes "Proposal for a New Method" by stating that infants scoring 8, 9, or 10 have an excellent likelihood of surviving the minutes after birth, while infants scoring 0, 1, or 2 have a poor prognosis. She does not say how well infants in between those scores are likely to fare. She also notes that color of an infant is a relatively unimportant sign of health at sixty seconds after birth.

Finally, Apgar states that "Proposal for a New Method" provides a practical method for evaluating the health of an infant.

Prior to the Apgar score, few guidelines existed for determining whether infants would benefit from medical attention or if they were too sick to survive. If infants were born small, malformed, or blue, medical personnel would often set them aside as too sick to survive. "Proposal for a New Method" provided guidelines for when medical personnel could apply life-saving medical attention for newborn infants. The article has been cited thousands of times and established an infant scoring system still used in hospitals worldwide as of 2016. Researchers have attempted to study how an infant's Apgar score correlates with later life health, intelligence, and even delinquency. However, the Apgar score does not predict anything about an individual's later life. The score is meant to assess an infant's condition directly after birth and continues to be used in that way.

Sources

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