Time Perception during Neonatal Resuscitation

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Objective To assess the accuracy of time perception during a simulated complex neonatal resuscitation.

Study design Participants in 5 neonatal resuscitation program courses were directly involved in a complex simulation scenario. They were asked to assume the role of team leader, assistant 1, or assistant 2. At the end of the scenario, each participant completed a questionnaire on perceived time intervals for key resuscitation interventions. During the scenario, actual times were documented by an external observer and video recorded for later review. In addition, participants were asked to evaluate their self-perceived level of stress and preparation.

Results Health care providers (68 physicians and 40 nurses) were involved in 36 scenarios. Perceived time intervals for the initiation of key resuscitation interventions were shorter than the actual time intervals, regardless of the participant's role in the scenario. Self-assessed levels of stress and preparation did not influence time perception.

Conclusions Health care providers underestimate the passage of time, irrespective of their role in a simulated complex neonatal resuscitation. Participant's self-assessed levels of stress and preparation were not related to the accuracy of their time perception. These findings highlight the importance of assigning a dedicated individual to document interventions and the passage of time during a neonatal resuscitation. *(J Pediatr 2016;177:103-7).*

During neonatal resuscitation, specific time intervals for each intervention are recommended in the neonatal resuscitation program (NRP) and European Resuscitation Council algorithms.[1,2] In addition, time intervals are used to guide the duration of resuscitative efforts and eligibility for therapies such as postresuscitation therapeutic hypothermia. However, the accuracy of time perception by health care providers during neonatal resuscitation is not known. Studies in cognitive psychology demonstrate that the accuracy of time perception varies depending on several factors such as the complexity of the event, emotional status, stress, personality, previous experience, and evaluation methods.[3-6]

Although accurate perception of time is important for responders to medical emergencies, previous studies have shown that clinicians experience time distortion. Emergency medical technicians in the field and responders to simulated in-hospital adult cardiac arrest events underestimate the passage of time in some situations and overestimate time in others.[7-10] As a result, the initiation of interventions and the accuracy of documentation reported by the health care providers at the end of an acute event could be affected. Neonatal resuscitation is unique because most often there is a well-defined start time and an electronic timer clearly visible; however, the time perceived by health care providers in a neonatal resuscitation setting is unknown.

The aim of the present study was to investigate the time perceived by the health care providers during a simulated complex neonatal resuscitation in relation to the participant's role.

Methods

This prospective observational study was conducted at 5 Italian hospitals. The study protocol was approved by the Ethics Committee of Azienda Ospedaliera, University of Padova, Padova, Italy.

Consent to record the scenario and to use the data was obtained by all participants. A 2-day NRP course was conducted in 5 Italian hospitals by a team of 6 instructors from February to November 2014. The course consisted of didactic sessions followed by hands-on skill stations and practice scenarios. Participants included physicians and nurses who were routinely involved in the care of newborns in the delivery room. At the end of the course, participants were involved in a high-fidelity simulation using a neonatal simulator (SimNewB, Laerdal, Stavanger, Norway). The scenario consisted of an asphyxiated term infant needing a complex resuscitation including positive pressure ventilation, endotracheal intubation (ETT), chest compressions, and emergency medications. Heart rate, respiratory rate, and breath sounds were controlled remotely and could be assessed by auscultation of the thorax, observation of chest movements, and

A1	Assistant 1
A2	Assistant 2
ETT	Endotracheal intubation
NRP	Neonatal resuscitation program

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palpation of the umbilical cord. The vital signs that are typically available in the delivery room (heart rate and hemoglobin oxygen saturation via pulse oximetry [SpO_2]) were displayed on the bedside monitor about 40 seconds after the positioning of the oximeter probe on the right hand of the manikin. The SpO_2 was not shown on the monitor when the heart rate was less than 60 beats per minute. The external observer provided verbal feedbacks during the scenario only if specifically required by the team and not provided by the manikin (ie, the presence of secretions). A bedside Apgar timer ringing at 1, 5, and 10 minutes was available for the team.

Participants were divided into groups of 3 and were asked to assume the roles of team leader responsible for coordinating the team and managing the airway, assistant 1 (A1) responsible for chest compressions, and assistant 2 (A2) responsible for umbilical catheter insertion and medication administration. All the other tasks, such as time recording during the scenario, were left to the decision of the team. During each simulation, an external observer documented the actual time of each intervention and the duration of the entire scenario for calculation of accurate time intervals. All scenarios were video-recorded, stored, and reviewed by the same observer to confirm the documented intervention times. We chose this approach to have a double evaluation of time intervals; however, video tape was used as the gold standard method of ascertaining timing.

At the end of the scenario, each participant completed a 13-item questionnaire. Participants were asked to estimate the time elapsed from birth to the following events: beginning positive pressure ventilation, ETT, beginning chest compressions, administration of the first dose of adrenaline, first spontaneous breath, and duration of the entire scenario. The questionnaire did not include the assignment of the Apgar score. Finally, each participant was asked to describe how stressful he/she found the scenario by using the following Likert scale: 0 = not stressful; 1 = mildly stressful; 2 = moderately stressful; and 3 = very stressful. A similar scale was used to measure each participant's assessment of their preparation for the resuscitation scenario: 0 = very well prepared; 1 = moderately well prepared; 2 = unprepared; and 3 = very unprepared. Participants were informed only at the end of the scenario that they were required to estimate the time (retrospective timing).

The primary outcome of the study was the difference between the actual time and perceived time according to the participant's role in the scenario (team leader, A1, A2). In addition, we assessed the relationships between self-perceived stress and preparation with time perception.

Statistical analysis was performed using R 2.12 software (R Foundation for Statistical Computing, Vienna, Austria).[11] Given the lack of information about the time perceived by health care providers during neonatal resuscitation, the sample size could not be estimated using mathematical methods. Therefore, all the participants in the NRP courses were included in the study sample. Time data were expressed as median and IQR and represented the difference (seconds) between perceived time and actual time measured by the observer. These time differences were compared using the Wilcoxon signed rank test. Self-perceived stress level and preparation were expressed as a median score (IQR) and were compared among the 3 roles using the Kruskal-Wallis test. The correlation between stress level and preparation was evaluated using the Spearman rank correlation coefficient.

Two multiple regression models were performed to identify the effects of role, stress level, and preparation on the perception of time from birth to the first spontaneous breath and the duration of the entire scenario. A P value of less than .05 was considered statistically significant.

Results

Health care providers (68 physicians and 40 nurses) attended the courses and were involved in a total of 36 complex scenarios. The role of team leader was most frequently assumed by physicians (97.2%), and the roles of A1 and A2 were distributed between physicians (A1: 55.6%; A2: 36.1%) and nurses (A1: 44.4%; A2: 63.9%) ($P < .001$).

Study participants perceived that the time interval between birth and the initiation of key resuscitation interventions was significantly shorter than the actual time interval (**Table**

Table. Difference between perceived time and actual time in relation to the participant's role (team leader, A1, A2) in the scenario

	Difference Team leader-EO	Difference A1-EO	Difference A2-EO	Actual time
Beginning PPV	–13 (–40 to 5)*	–6 (–44 to 5)	–25 (–43 to 0)*	57 (43-70)
Insertion of endotracheal tube	–81 (–226 to –9.5)†	–239 (–420 to –90)‡	–136 (–340 to –54)‡	246 (174-451)
Beginning chest compressions	–65 (–119 to –15)‡	–45 (–87 to 0)‡	–50 (–90 to 0)‡	128 (100-211)
Administration first dose of adrenaline	–93 (–160 to –30)‡	–109 (–215 to –55)‡	–96 (–199 to –41)‡	304 (243-395)
Duration of chest compressions	–25 (–86 to 70)	–15 (–76 to 48)	30 (–88 to 100)	148 (108-215)
First spontaneous breath	–60 (–135 to 0)‡	–60 (–170 to 0)‡	–60 (–300 to 0)‡	600 (360-600)
Duration of the entire scenario	–60 (–120 to –5)‡	–60 (–174 to –20)‡	–38 (–120 to 0)‡	600 (447-630)

EO, external observer; *PPV*, positive pressure ventilation.
Data (seconds) expressed as median (IQR).
*$P < .05$.
†$P < .01$.
‡$P < .001$.