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COMMENT

Focus is in the gaze of the beholder

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Health care innovations are becoming integral and indispensible in the management of newborns in the delivery room. Studies have highlighted the limitations and difficulties of clinical assessment of heart rate, color, and chest rise during neonatal resuscitation. Therefore, clinical providers increasingly rely on technology and information gained from medical devices to improve performance under high stress clinical situations. Over the past decade, pulse oximeters have proven to guide clinicians to better adjust and, thereby, optimize the required fraction of inspired oxygen to achieve the recommended target oxyhemoglobin saturations (SpO_2) during neonatal resuscitation.[1] Reliance on technology has been further advocated in the most recent 2015 International Liaison Committee on Resuscitation guidelines, which have suggested the use of three-lead electrocardiogram in the delivery room as the most reliable method to assess heart rate.[2]

The growing array of medical equipment in the delivery room to enhance monitoring during neonatal resuscitation is quickly gaining popularity. Near-infrared spectroscopy (NIRS) enables continuous, noninvasive monitoring of cerebral tissue oxygenation ($CrSO_2$) and may be used as an adjunct to SpO_2 to guide oxygen administration in newborns in the delivery room.[3] In addition, evidence has suggested that resuscitators are unable to accurately determine chest wall movement visually during ventilation of newborns in the delivery room[4] and assessment of adequate ventilation by means of respiratory function monitoring (RFM) has shown more effective mask ventilation and a decreased need for intubation.[5]

In the present issue of the journal, Wagner et al.[6] study the application of eye-tracking goggles to analyze participant's gaze behavior during a simulated neonatal resuscitation and provide important new insights on the use of this technology in the delivery room. The participants in the aforementioned study report that the goggles were not distracting and did not cause interference in their tasks; a sentiment that has been corroborated by participants wearing similar eye-tracking goggles in other neonatal simulation studies.[7,8] Participants in these studies also expressed that they would consider wearing these goggles during newborn resuscitation in real time. Of note, the Tobii-manufactured eye-tracking goggles (Tobii, Stockholm, Sweden) worn in these studies cannot be superimposed on eyeglasses. This deficiency needs to be addressed if this technology becomes more widely available, given the proportion of health care providers who wear eyeglasses.

Eye-tracking glasses have been designed to analyze gaze by determining measurements of fixation (time the eyes are in a certain position), dwell (amount of time spent looking at an area of interest), and saccade (quick movements of the eyes between fixations in which meaningful information is likely not acquired).[9] The aviation industry laid the groundwork on eye movement and gaze behavior research as early as the 1950s to study situational awareness and optimize pilot performance. The medical field followed suit and eye-tracking studies in medicine have contributed to more nuanced understandings of visual interpretation and diagnostic decision-making across several subspecialties, including neonatology.[7,8,10] Differences between experts and trainees with regard to time spent on areas of interest that need focus compared to distractions may provide objective data that may be used to give constructive feedback to trainees and improve education (Fig. 1).

To date, no clinical studies in neonatal resuscitation have evaluated the effectiveness of gaze analysis on health outcomes. Simulation scenarios provide the perfect environment to safely study and acquire data on gaze analysis in an attempt to also study the impact of this new information on cognitive load. Resuscitation of the critically ill newborn requires providers to make quick decisions by processing, analyzing, and understanding large amount of data streams under immense time pressure. Introducing new technology to an already highly complex task may hide important clinical information from humans, increase the overall complexity of the work, and increase cognitive demand, which risk a higher chance for human error.[11] Adequate training on new medical devices is, therefore, imperative to prevent degradation of skills and mitigate complexities in the work environment.

The extraordinary rate at which technological advancements develop and seemingly permeate the work environment is both inspiring and daunting. In the current era of medical modernization, specialized training may be required in the education of health care providers who will likely be exposed to an ever-growing armamentarium of medical equipment. New curricula that assess the cognitive load of large data streams on task performance may be necessary. Eye-tracking goggles and gaze analysis may prove to be a welcoming educational tool that could be used to help teach and familiarize trainees on new technology (e.g., RFM, NIRS) in simulation scenarios or animal experiments prior to implementation and use of the equipment in the clinical setting.

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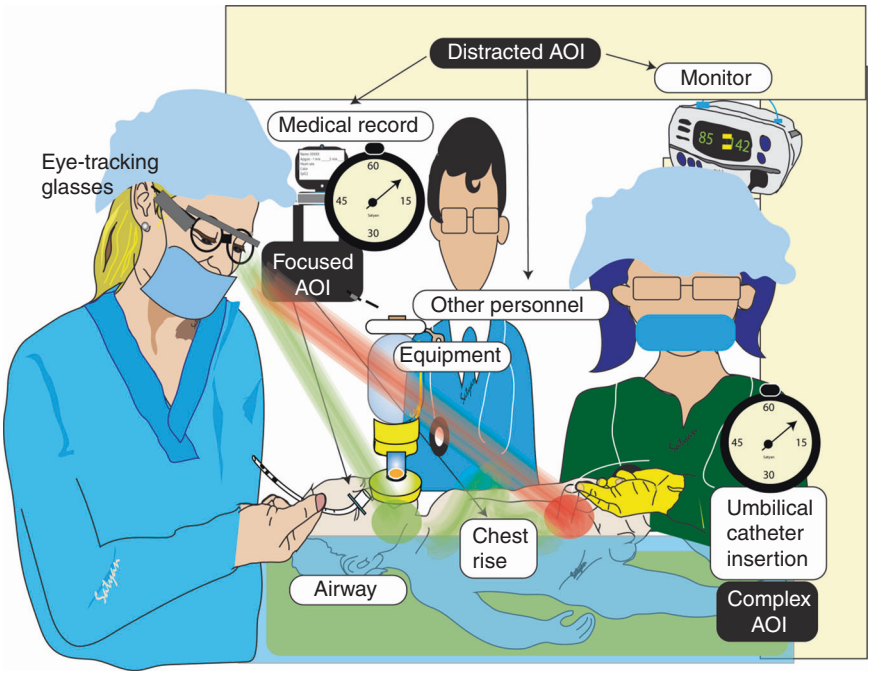

Fig. 1 Use of eye-tracking goggles to assess time spent on various areas of interest (AOI) during neonatal resuscitation. The stop-watch symbol indicates tasks that demanded the highest amount of time (airway management and umbilical line insertion). The fluorescent lines (green and red) indicate the heat map based on time spent focusing on each task. (Copyright Satyan Lakshminrusimha, MD).

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