Exploring the Use of Visual Learning Tools in Neonatal Resuscitation Education: A Scoping Review

Madison Pelton[1], Susan Niermeyer[2], Kori Baker[3], Kayla Sompel[3]

1 - University of Colorado School of Medicine, MS4
2 - Center for Global Health, University of Colorado School of Public Health
3 - University of Colorado School of Medicine, MS2

University of Colorado Anschutz Medical Campus

Background

- In 2021, there were an estimated 2.3 million neonatal deaths, accounting for 47% of deaths in children under the age of 5 years.[1]
- The Neonatal Resuscitation Program (NRP) and Essential Newborn Care (ENC) are widely accepted neonatal resuscitation programs for healthcare workers (HCWs) that teach knowledge and skills to end preventable newborn deaths.[2,3]
- New visual learning tools have been designed for these programs, but literature lacks summative evidence on the outcome of these visual tools or best practices for implementation and reporting.
- **Visual learning tools (VLTs)** are defined in this report as any illustration, photograph, video, or digital platform with visual imagery that has been incorporated into neonatal resuscitation knowledge acquisition, skills training, and clinical performance.

Aims

- Summarize the use of VLTs as learning adjuncts in NR education and the impact of VLTs on acquisition and retention of NR knowledge and skills.
- Identify how VLTs have been used to examine NR clinical environments and clinical practices to improve overall patient outcomes and clinical performance.

Methods

- JBI scoping review methodology[4], OSF scoping review protocol template[5], and PRISMA Extension for Scoping Reviews Checklist[6] were utilized.
- PubMed, Cochrane Library, and Web of Science searched using key terms. Full-text articles available in English between 2004-2023 considered for review.
- Two researchers reviewed each title/abstract for inclusion/exclusion criteria and reached consensus for further review.

Results

- 40 articles and 9 gray literature sources met inclusion criteria for the final manuscript
- VLTs have been incorporated into neonatal resuscitation pre-service education, continuing education, and quality improvement efforts across the globe
- The use of video recordings for quality improvement was one of the most common and well-established VLTs
- A trend toward creating digital platforms that incorporate virtual reality and interactive serious game design was noted
- Majority of published studies report HCW attitudes toward using VLTs and measure the impact of VLTs on pre-service education outcomes such as neonatal resuscitation knowledge and skills retention
- Few studies have measured outcomes of VLTs on changes to clinical performance, changes to the clinical environment, or changes to neonatal morbidity and mortality

PRISMA flow diagram: Identification of studies via databases and registers

Identification
- Records identified from: 286
  - Databases (n = 3)
  - PubMed = 119
  - Web of Science = 108
  - Cochrane Library = 59
- Records removed *before screening*:
  - Duplicate records removed (n = 91)

Screening
- Records screened (n = 195) → Records excluded (n = 60)
- Reports and grey literature sought for retrieval (n = 14) → Reports not retrieved (n = 0)
- Reports assessed for eligibility (n = 149) → Reports excluded:
  - No visual learning tool investigated (n = 67)
  - Neonatal resuscitation not assessed (n = 9)
  - Not enough information on visual tools used (n = 4)
  - Visual tool not used for HCW education (n=10)
  - Insufficient details regarding design, implementation, or outcomes of VLT (n= 10)

Included
- Studies included in review (n = 40)
- Reports included (n = 9)

Conclusions

- HCWs across global contexts report positive attitudes toward novel VLTs in neonatal resuscitation education
- The most widely adopted VLTs appear to be videos, mobile health apps, and audiovisual feedback tools for simulation practice
- Evidence varies widely regarding the sustained outcome of VLTs on HCW knowledge and skill acquisition.
- There are very few studies that report changes in clinical performance or neonatal morbidity and mortality
- Few studies include pertinent sustainability considerations such as cost of design, rollout, and upkeep.

Future Directions

- Researchers creating novel VLTs for neonatal resuscitation education should clearly highlight which adult educational practices are informing their design process
- As novel VLTs are introduced to larger cohorts of HCWs, more systematic and holistic data should be collected to determine the true benefit of these tools
- As VLTs continue to be used across more diverse contexts, data regarding the sustainability of these tools and their adaptation to different groups of HCWs is essential

Conflict of Interest / Disclosures

- The authors have no disclosures or conflicts of interest to report.

Acknowledgements

- Dr. Susan Niermeyer for her role as an advisor, mentor, and field expert in neonatal resuscitation education.
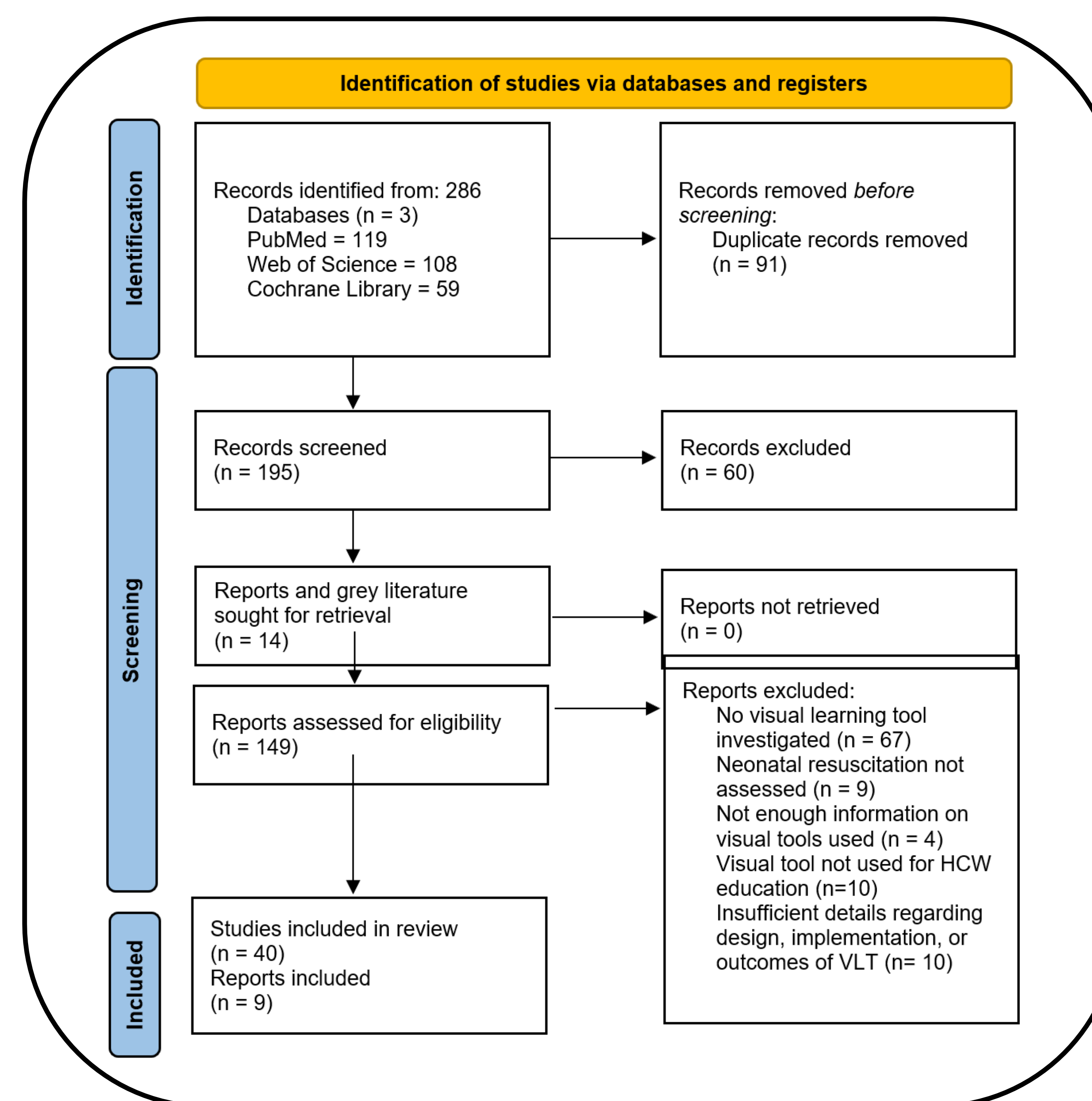
References

1. Neonatal Mortality. UNICEF. Updated January 2023. Accessed July, 2023. https://data.unicef.org/topic/child-survival/neonatal-mortality/
2. Weiner GM, Zaichkin J. Updates for the Neonatal Resuscitation Program and Resuscitation Guidelines. Neoreviews. Apr 1 2022;23(4):e238-e249. doi:10.1542/neo.23-4-e238
3. Niermeyer S. From the Neonatal Resuscitation Program to Helping Babies Breathe: Global impact of educational programs in neonatal resuscitation. Semin Fetal Neonatal Med. Oct 2015;20(5):300-8. doi:10.1016/j.siny.2015.06.005
4. Peters M D J GC, McInerney P, Munn Z, Tricco AC, Khalil H. Chapter 11: Scoping Reviews. In: Aromataris E MZ, ed. JBI Manual for Evidence Synthesis. JBI; 2020:chap 11.
5. Lely J, Morris, HC., Sasson, N., Camarillo, N.D., Livinski, A.A., Butera, G., Wickstrom, J. Scoping Review Protocol Template. 2023. doi:https://doi.org/10.17605/OSF.IO/YM65X https://osf.io/cuxm8
6. Tricco AC, Lillie E, Zarin W, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. Oct 2 2018;169(7):467-473. doi:10.7326/m18-0850