Augmented Reality in Emergency Medicine: A Scoping Review

Abstract (600 words):

Background

Augmented reality is increasingly being investigated for its applications to medical specialties as well as in medical training. Currently, there is little information about its applicability to training and care delivery in the context of emergency medicine. **Objective**: The objective of this article is to review current literature related to augmented reality applicable to emergency medicine and its training. **Methods:** Through a scoping review utilizing Scopus, MEDLINE, and Embase databases for article searches, we identified articles involving augmented reality that directly involved emergency medicine or was in an area of education or clinical care that could be potentially applied to emergency medicine. **Results**: A total of 24 articles were reviewed in detail and were categorized into three groups: user-environment interface, telemedicine and prehospital care, and education and training. Conclusions :Through analysis of the current literature across fields, we were able to demonstrate that augmented reality has utility and feasibility in clinical care delivery in patient care settings, in operating rooms and inpatient settings, and in education and training of emergency care providers. Additionally, we found that the use of augmented reality for care delivery over distances is feasible, suggesting a role in telehealth. Our results from the review of the literature in emergency medicine and other specialties reveal that further research into the uses of augmented reality will have a substantial role in changing how emergency medicine as a specialty will deliver care and provide education and training.

Importance of Research(200 words):

Since its inception as a specialty, emergency medicine has continually adapted and evolved in the way patient care is delivered as well as in training emergency medicine providers. From the adaptation and utilization of point-of-care ultrasound for procedures and clinical decision making to the methods in which critical care is delivered to patients—both in the prehospital setting and within the emergency department—emergency medical care has leveraged technological advances to improve outcomes for patients . Similarly, emergency medicine has been an early adopter for a variety of technology-based education tools, such as simulation and free open-access medical education .Augmented reality and virtual reality are two exciting, closely related, but fundamentally different emerging technologies. The central difference between the two technologies is that virtual reality is completely immersive: the headsets must, by necessity, block out the external world. However, augmented reality, by design, maintains the user's connections with the real world. Augmented reality synthesizes the virtual and real; like virtual reality, an augmented reality experience typically involves a headset through which you can view a physical reality that has been augmented or supplemented by computer-generated sensory input such as sound, video, graphics, or GPS data . Both augmented reality and virtual reality are expected to generate US $90 billion in revenue by 2022 . Augmented reality in particular has substantial potential to provide powerful, contextual, and situated learning experiences as well as construct new understanding based upon the user's interactions with

virtual objects, which bring underlying data to life. With various augmented reality technologies, one has the ability to perform a wide variety of tasks, including displaying and manipulating information within one's field of view, mapping virtual images to real objects, and video-conferencing

Biography (200 words)

Ehsan Khan has completed his phd in Physiology from King's College London and has been a Registered Nurse. He is currently working as Lecturer in King's College London. He is Academic Lead for development and utilization of online learning in the faculty and is involved in research and teaching of biosciences in nursing. He has published more than 30 papers and a number of book chapters primarily related to physiology and pharmacology in nursing. He is a founder visionary of an unconventional 24/7 urgent care concept for India with currently six successfully functional centres, a model which provides exclusive urgent care services to students, residents and corporates. He is currently the Medical Director at HUMA Hospital established in 1987 and also Heads the HUMA Urgent Care Centre, Humanitarian Outreach Initiative (India) and Therapeia holistic health care.

Info of Institute & Lab (200 words)

King's College London (informally King's or KCL) is a public research university located in London, United Kingdom, and a founding college and member institution of the federal University of London. King's was established in 1829 by King George IV and Arthur Wellesley, 1st Duke of Wellington, when it received its first royal charter (as a university college - though the roots of King's medical school, St. Thomas, date back to the 16th century with recorded first teaching in King's is one of the oldest universities in England. In 1836, King's became one of the two founding colleges of the University of London. In the late 20th century, King's grew through a series of mergers, including with Queen Elizabeth College and Chelsea College of Science and Technology (in 1985), the Institute of Psychiatry (in 1997), the United Medical and Dental Schools of Guy's and St Thomas' Hospitals and the Florence Nightingale School of Nursing and Midwifery (in 1998).

References:

1. Moore CL, Copel JA. Point-of-care ultrasonography. *N Engl J Med.* 2011 Feb 24;364(8):749–757.
Doi: 10.1056/nejmra0909487. [pubmed] [crossref] [Google Scholar]

2. Rivers EP, Nguyen HB, Huang DT, Donnino MW. Critical care and emergency medicine. *Curr Opin Crit Care.* 2002 Dec;8(6):600–606. [pubmed] [Google Scholar]

3. Seymour CW, Rea TD, Kahn JM, Walkey AJ, Yealy DM, Angus DC. Severe sepsis in pre-hospital emergency care: Analysis of incidence, care, and outcome. *Am J Respir*

Crit Care Med. 2012 Dec 15;186(12):1264–1271. Doi: 10.1164/rccm.201204-0713OC. Http://europepmc.org/abstract/MED/23087028. [PMC free article] [pubmed] [crossref] [Google Scholar]

4. Jones F, Passos-Neto CE, Melro Braghiroli OF. Simulation in medical education: Brief history and methodology. *Princ Pract Clin Res.* 2015;1(2):56–63. ISSN: 2378-1890. [Google Scholar]

5. Nickson CP, Cadogan MD. Free Open Access Medical education (FOAM) for the emergency physician. *Emerg Med Australas.* 2014 Feb;26(1):76–83. Doi: 10.1111/1742-6723.12191. [pubmed] [crossref] [Google Scholar]

6. Thomas C. *Download3K.com.* 2015. Jan 02, [2019-03-12]. The difference between augmented reality and virtual reality https://www.download3k.com/articles/The-Difference-Between-Augmented-Reality-and-Virtual-Reality-00992 *webcite*.

7. *Digi-Capital.* 2018. Jan 26, [2019-03-12]. Ubiquitous $90 billion AR to dominate focused $15 billion VR by 2022 https://www.digi-capital.com/news/2018/01/ubiquitous-90-billion-ar-to-dominate-focused-15-billion-vr-by-2022/ *webcite*.

8. Berryman DR. Augmented reality: A review. *Med Ref Serv Q.* 2012;31(2):212–218.

Doi: 10.1080/02763869.2012.670604. [pubmed] [crossref] [Google Scholar]

9. Brigham TJ. Reality check: Basics of augmented, virtual, and mixed reality. *Med Ref Serv Q.* 2017;36(2):171–178. Doi: 10.1080/02763869.2017.1293987. [pubmed] [crossref] [Google Scholar]

10. Zhu E, Hadadgar A, Masiello I, Zary N. Augmented reality in healthcare education: An integrative review. *Peerj.* 2014;2:e469. Doi: 10.7717/peerj.469. Doi: 10.7717/peerj.469. [PMC free article] [pubmed] [crossref] [crossref] [Google Scholar]

11. Kim Y, Kim H, Kim YO. Virtual reality and augmented reality in plastic surgery: A review. *Arch Plast Surg.* 2017 May;44(3):179–187. Doi: 10.5999/aps.2017.44.3.179. Http://e-aps.org/journal/view.php?Doi=10.5999/aps.2017.44.3.179. [PMC free article] [pubmed] [crossref] [Google Scholar]

12. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Plos Med.* 2009 Jul 21;6(7):e1000097. Doi: 10.1371/journal.pmed.1000097. Http://dx.plos.org/10.1371/journal.pmed.1000097. [PMC free article] [pubmed] [crossref] [Google Scholar]