ARTIFICIAL INTELLIGENCE IN EMERGENCY MEDICINE:

REDUCING DIAGNOSTIC DELAY AND IMPROVING CRITICAL CARE OUTCOMES- A SYSTEMATIC REVIEW

Innovations Transforming the 21st Century

FACULTY OF HEALTHCARE SCIENCE
EAST EUROPEAN UNIVERSITY

PRESENTED BY:
VISHAL SAWANT
MANDAR PENDSE
PRATIK PAYGUDE

WHY AI IN EMERGENCY MEDICINE NOW?

- Rising patient demand: Increasing ED visits and overcrowding
- Diagnostic delays: Time-critical conditions (sepsis, stroke) linked to higher morbidity/mortality
- Complex data overload: Labs, imaging, vitals, EHRs in real-time
- Cognitive support: AI offers pattern recognition, predictive modeling, and rapid risk stratification

STUDY DESIGN

- Systematic review of literature (2020–2025)
- Included primary validation studies and high-level syntheses (meta-analyses, umbrella reviews)

- Evaluated AI applications for:

- Diagnostic prediction
- Triage prioritization
- Outcome and workflow optimization
- Focused on emergency medicine and prehospital settings

METHODS + PRISMA

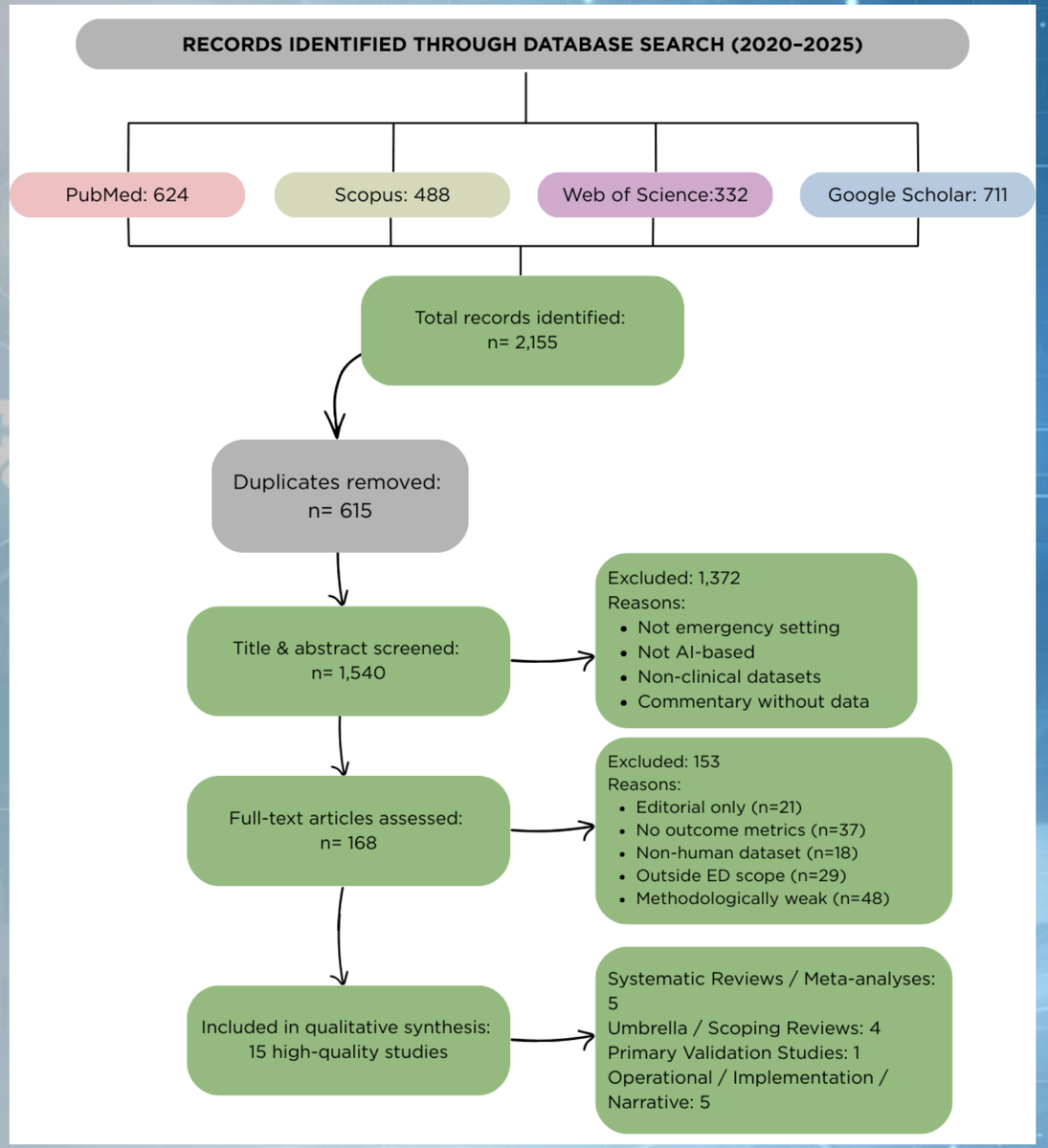
- Databases: PubMed, Scopus, Web of Science, Google Scholar
- Screening & reporting: PRISMA 2020 framework

Inclusion criteria:

1. Human clinical datasets
- AI-based diagnostic, triage, or outcome models
- Emergency medicine focus

1. Quality assessment tools:

- QUADAS-2 (diagnostic accuracy)
- PROBAST (prediction models)



CATEGORIES OF AI APPLICATION

- Diagnostic prediction: Sepsis, stroke, trauma
- ED disposition & revisit prediction
- AI-supported triage systems: Risk prioritization & misclassification reduction
- Operational workflow optimization: Wait times, resource allocation, decision support

DIAGNOSTIC PERFORMANCE

- High discrimination: AUROC 0.87–0.93 for early diagnosis & ED disposition
- Early risk stratification: Faster identification than conventional scores
- Data sources: EHRs, imaging, continuous vitals

TRIAGE & CLINICAL IMPACT

- Improved inter-rater consistency
- Reduced under-triage in high-acuity patients
- Dynamic AI models outperform static triage scales
- Some studies integrate NLP to extract structured triage data
- Majority retrospective, limited prospective trials

OPERATIONAL OUTCOMES

- ED revisit prediction: AUROC up to 0.90
- Wait time reduction: AI-assisted triage & decision support tools
- Improved resource allocation and workflow efficiency
- Real-world multicenter validation limited

ETHICAL, BIAS & GOVERNANCE CONCERNS

- Algorithmic bias: Risk if training datasets not representative
- Overfitting: Single-center or small sample studies
- Transparency & explainability: Explainable AI frameworks increase trust
- Data governance: Federated learning allows secure multicenter model training
- Regulatory oversight: Evolving, not standardized

STRENGTHS & LIMITATIONS OF CURRENT EVIDENCE

Strengths:

- High predictive discrimination
- Rapid technological development
- Multi-dataset validation in some studies

Limitations:

- Mostly retrospective studies
- Limited multicenter validation
- Sparse calibration reporting
- Few prospective trials or mortality outcome data

CONCLUSION

AI shows strong potential for diagnostic, triage, and operational improvements in EDs
Should be used as decision-support, not replacement for clinicians

Future directions:

- Multicenter prospective validation
- Structured clinical integration
- Cost-effectiveness and patient-centered outcome studies

REFERENCES

1.Kuo, K.-M., & Chang, C. S. (2025). A meta-analysis of the diagnostic test accuracy of artificial intelligence predicting emergency department dispositions. BMC Medical Informatics and Decision Making, 25, 187. https://doi.org/10.1186/s12911-025-03010-x

2.Almagharbeh, W. T., Alharrasi, M., Khan Rony, M. K., Kabir, S., Alrazeeni, D. M., & Akter, F. (2025). The applicability of artificial intelligence in managing emergency patients: An umbrella review. International Emergency Nursing, 83, 101710. https://doi.org/10.1016/j.ienj.2025.101710

3.Di Fazio, N., Zanza, C., Longhitano, Y., Voza, A., Balagna, R., Mosca, S., Balagna, P., Rossignoli, R., Cerenzia, S., Bertozzi, G., Maiese, A., Frati, P., & La Russa, R. (2026). Artificial intelligence for early diagnosis in emergency department. Journal of Anesthesia, Analgesia and Critical Care, 6, 7. https://doi.org/10.1186/s44158-025-00334-y

4.Kuo, K.-M., Wu, W.-S., & Chang, C. S. (2025). A meta-analysis of the diagnostic test accuracy of artificial intelligence for predicting emergency department revisits. Journal of Medical Systems, 49(1), 81. https://doi.org/10.1007/s10916-025-02210-2

5.Yang, J., Zhang, B., Jiang, X., Huang, J., Hong, Y., Ni, H., & Zhang, Z. (2024). Application of artificial intelligence to advance individualized diagnosis and treatment in emergency and critical care medicine. Diagnostics, 14(7), 687. https://doi.org/10.3390/diagnostics14070687

6.Abdalhalim, A. Z. A., Ahmed, S. N. N., Ezzelarab, A. M. D., Mustafa, M., Albasheer, M. G. A., Ahmed, R. E. A., & Elsayed, M. B. G. (2025). Clinical impact of artificial intelligence-based triage systems in emergency departments: A systematic review. Cureus, 17(6), e85667. https://doi.org/10.7759/cureus.85667

7.Tyler, S., Olis, M., Aust, N., Patel, L., Simon, L., Triantafyllidis, C., Patel, V., Lee, D. W., Ginsberg, B., Ahmad, H., & Jacobs, R. J. (2024). Use of artificial intelligence in triage in hospital emergency departments: A scoping review. Cureus, 16(5), e59906. https://doi.org/10.7759/cureus.59906

REFERENCES

8. Sun, L., Agarwal, A., Kornblith, A., Yu, B., & Xiong, C. (2024). ED-Copilot: Reduce emergency department wait time with language model diagnostic assistance. arXiv:2402.13448. https://doi.org/10.48550/arXiv.2402.13448

9.Dhillon, G. D., Zhang, Z., Grewal, H. G., & Kashyap, R. K. (2024). Editorial: Clinical application of artificial intelligence in emergency and critical care medicine, volume IV. Frontiers in Medicine, 10, 1346070. https://doi.org/10.3389/fmed.2023.1346070

10.Elfahim, O., Edjinedja, K. L., Cossus, J., Youssfi, M., Barakat, O., & Desmettre, T. (2025). A systematic literature review of artificial intelligence in prehospital emergency care. Big Data and Cognitive Computing, 9(9), 219. https://doi.org/10.3390/bdcc9090219

11.Almagharbeh, W. T., Alharrasi, M., Khan Rony, M. K., Kabir, S., Alrazeeni, D. M., & Akter, F. (2025). The applicability of artificial intelligence in managing emergency patients: An umbrella review. International Emergency Nursing, 83, 101710. https://doi.org/10.1016/j.ienj.2025.101710

12.Da'Costa, A., Teke, J., Origbo, J. E., Osonuga, A., Egbon, E., & Olawade, D. B. (2025). AI-driven triage in emergency departments: A review of benefits, challenges, and future directions. International Journal of Medical Informatics, 197, 105838. https://doi.org/10.1016/j.ijmedinf.2025.105838

13.Correia, G., Alves, V., & Novais, P. (2025). The impact of artificial intelligence on emergency medicine: A review of recent advances. arXiv:2503.14546. https://doi.org/10.48550/arXiv.2503.14546

14.Alomari, L. M., Alshammari, M. M., Arbaeen, A. O., Alshehri, R. A., & Almalki, H. S. (2025). Safety and accuracy of AI in triaging patients in the emergency department. International Journal of Emergency Medicine, 18, 243. https://doi.org/10.1186/s12245-025-01069-x

15.Kirubarajan, A., Taher, A., Khan, S., & Masood, S. (2020). Artificial intelligence in emergency medicine: A scoping review. Journal of the American College of Emergency Physicians Open, 1(6), 1691–1702. https://doi.org/10.1002/emp2.12277


THANK YOU!