ARTIFICIAL INTELLIGENCE-BASED MODELS FOR PROGNOSTICATION AND RISK STRATIFICATION IN AML: A SYSTEMATIC REVIEW OF POST-2020 STUDIES

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Introduction

- AML is clinically heterogeneous hematologic malignancy.
- While current prognostic systems like ELN classification provide guidance, their predictive power is limited.
- AI/ML models offer a potential for improved individual risk stratification by integrating complex, multi-dimensional data.

Objectives

To systematically review recent literature evaluating the performance and clinical relevance of AI-based models in predicting outcomes and risk stratification in AML patients.

Methods

- Systematic review conducted per PRISMA guidelines.
- Literature search of PubMed, ScienceDirect, and BMC databases (January 2020-May 2025) identified studies using AI/ML for AML prognosis or risk modeling.

Inclusion Criteria

- Studies (Jan 2020–May 2025) on **AI/ML models** for prognostic prediction or risk stratification in **AML**.
- Used **clinical, cytogenetic, genomic, or multi-omic data**.
- Reported performance metrics (**AUC, accuracy, C-index**) with **model validation**.
- Included newly diagnosed or relapsed/refractory AML patients.

A total of six studies included, covering ~7800 AML patients (newly diagnosed or relapsed/refractory). Populations varied from elderly, azacitidine-treated cohorts to younger patients undergoing intensive chemotherapy.

No direct patient interventions performed

Results

- **Neural network**

Predicted overall survival (OS) with **68.5% accuracy** for intensive chemotherapy and **62.1%** for azacitidine.

- **Nine supervised ML models :**

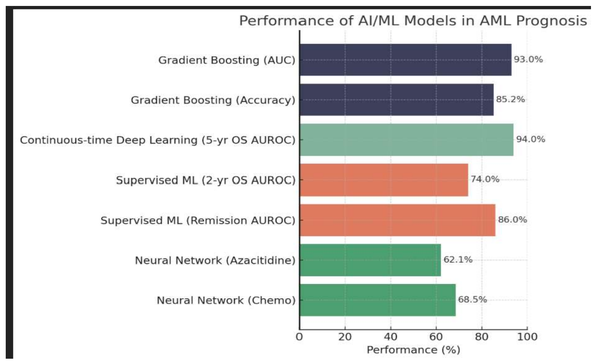
Predicted **complete remission** and **2-year OS**.
AUROC: 0.77–0.86 for complete remission,
0.63–0.74 for 2-year OS.

- **Continuous-time deep learning model:**

Predicted **5-year survival** with **AUROC of 0.94**.

- **Gradient boosting model (SEQENS):**

Achieved **85.17% accuracy** and **AUC of 0.930** using leukocyte count and serum LDH



Conclusion

AI-based prognostic models in AML demonstrate improved predictive accuracy and refined risk stratification over conventional systems. Despite promising results, large-scale prospective validation and integration into workflows are needed.

Discussion

Improved Prognostication: AI/ML models outperform conventional systems like ELN by integrating clinical, cytogenetic, and multi-omic data, offering more accurate survival and relapse predictions

Challenges Remain: Variability in datasets, modeling approaches, and lack of large-scale prospective validation limit immediate clinical adoption.

AI models can detect AML from blood smear images with astonishing diagnostic accuracy (up to ~100%), though these are not prognostic studies

References

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