



Evolving Role of Artificial Intelligence and Radiomics in Population Precision Medicine for Breast Cancer: A Literature Review

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INTRODUCTION

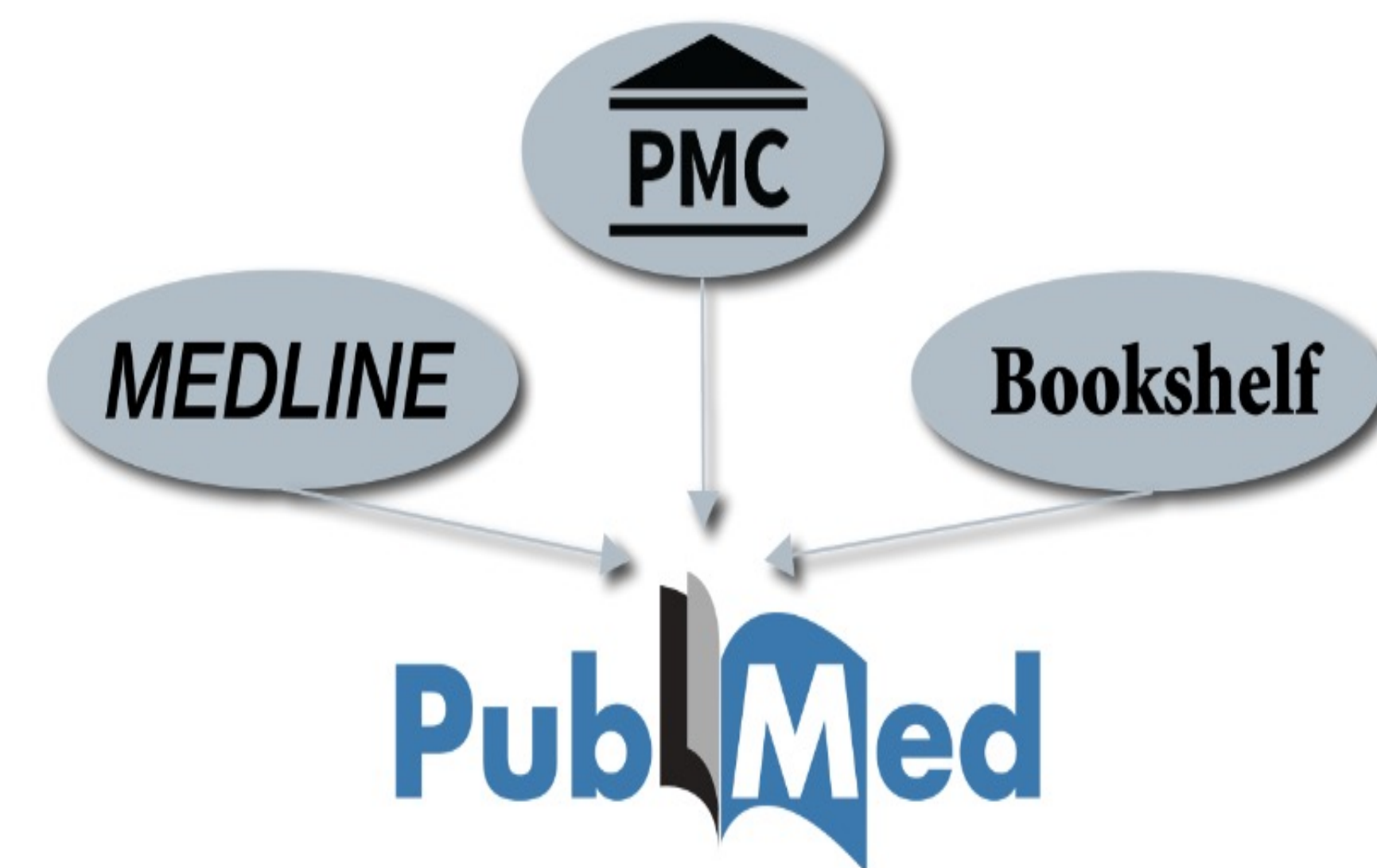
With 25% of all cancer cases in women being breast cancer, optimizing BC care through Precision Population Medicine (PPM) is crucial. PPM, with its focus on tailored care and genomic insights, promises significant advancements in individualized patient treatment.

Radiomics and Artificial Intelligence (AI) are at the forefront of this innovation, particularly in early diagnosis and customizing treatment regimens. The integration of AI in the radiomics workflow enables detailed analysis of BC data, providing personalized diagnostic solutions.

This study aims to explore how AI and radiomics, by considering disparities in disease characteristics across different populations, can improve outcomes for breast cancer patients through personalized care in PPM

METHODS

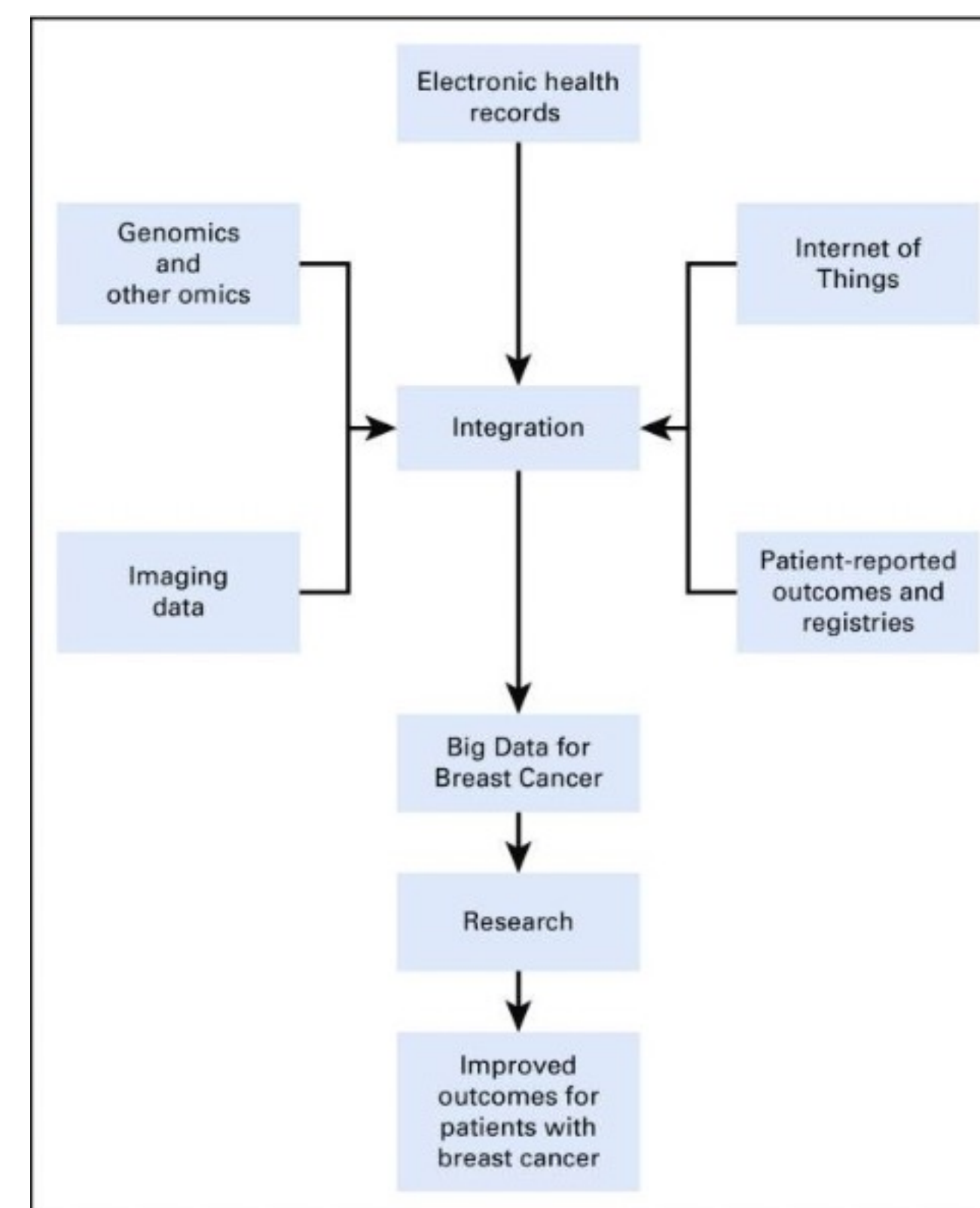
- A comprehensive literature review was conducted spanning from 2013 to 2023. This search utilized databases such as PubMed, MEDLINE, and Google Scholar.
- The search criteria include a combination of the following terms “genomic,” “epigenetic,” and “socioeconomic studies”.



Multi-database Literature Review

RESULTS

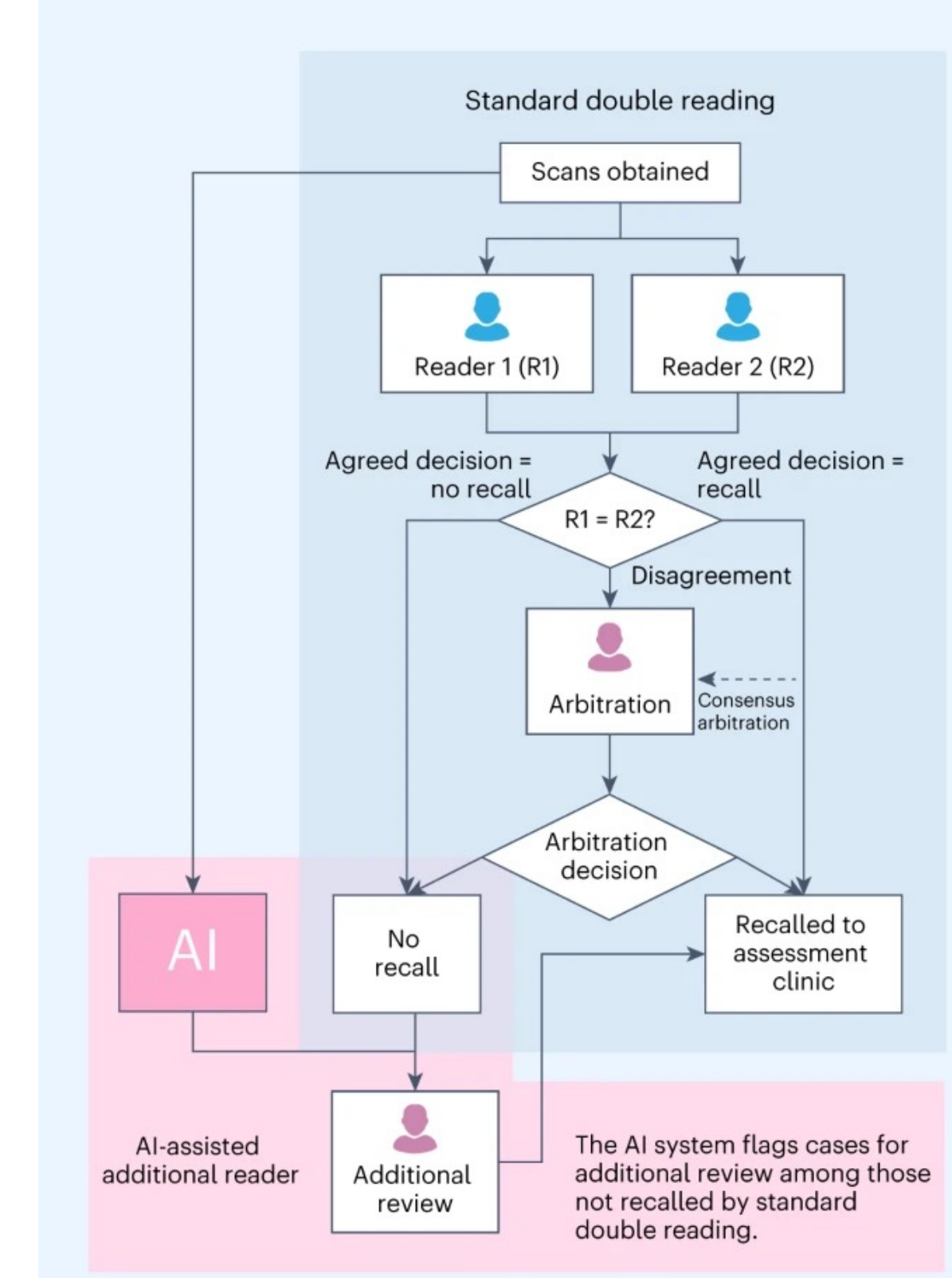
Integrative Data-Driven Approach to Enhancing Breast Cancer Outcomes



Jourquin J et al. Komen Big Data for Breast Cancer Initiative: How Patient Advocacy Organizations Can Facilitate Using Big Data to Improve Patient Outcomes. JCO Precis Oncol. 2019 Sep 12;3:PO.19.00184.

- Combining different forms of data—such as outcomes reported by patients, imaging data, data from electronic health records, genomics, and other omics-related data, among others—can propel scientific breakthroughs and enhance patient outcomes for those suffering from breast cancer.

AI-Enhanced Screening Workflow for Improved Diagnostic Accuracy

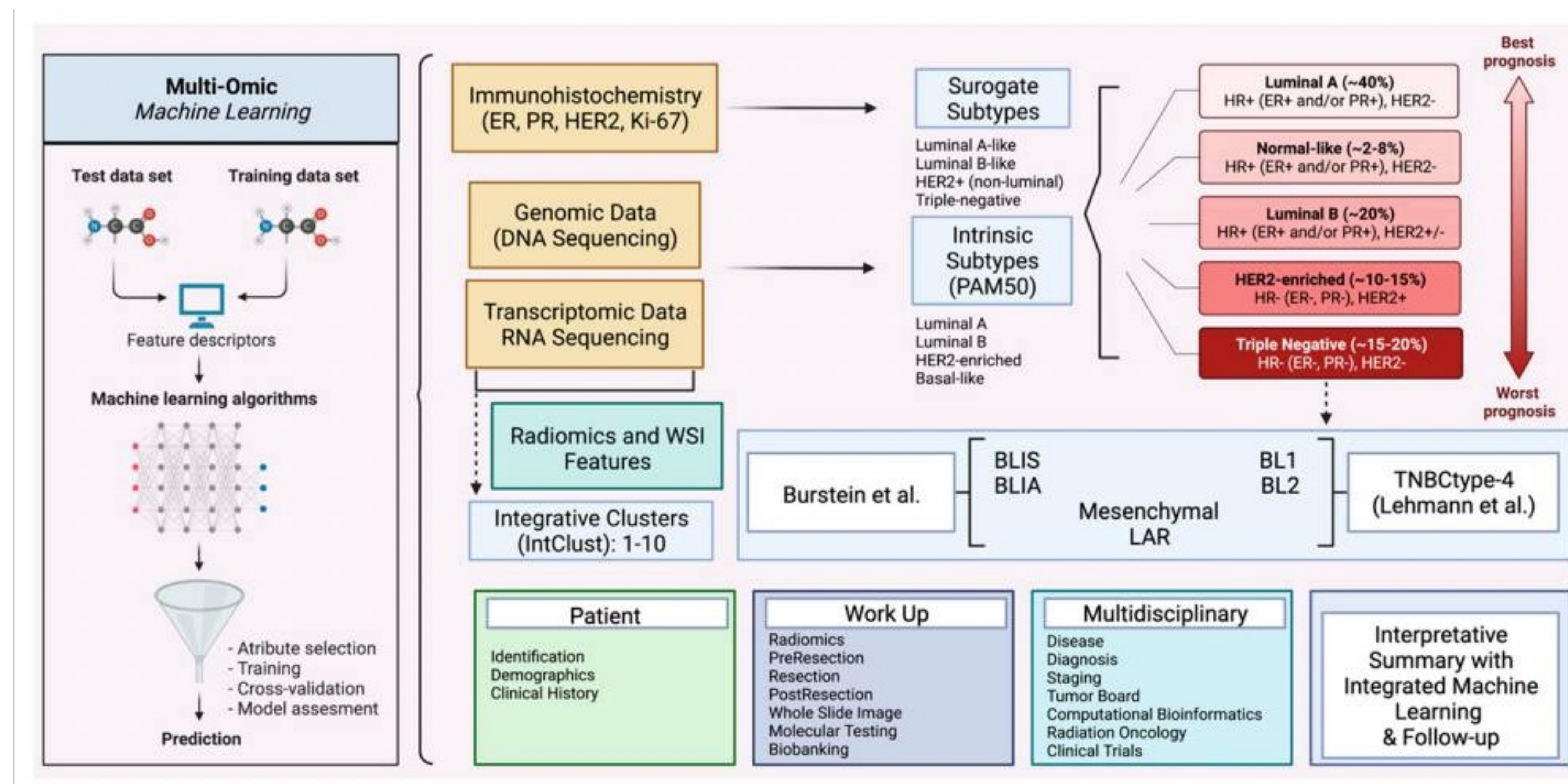


Ng AY et al. Prospective implementation of AI-assisted screen reading to improve early detection of breast cancer. Nat Med. 2023 Dec;29(12):3044-3049.

- The workflow, enhanced with AI for supplementary reading, adopts a traditional two-reader method, enriched by the integration of AI for image analysis.
- In instances where the initial two-reader evaluation results in a 'no recall' verdict but the AI system identifies a potential issue, the process incorporates an additional step where a designated human arbitrator conducts a thorough review.

RESULTS

Personalized Breast Cancer Care through Multi-Omic Machine Learning Integration



Hacking SM et al. From Immunohistochemistry to New Digital Ecosystems: A State-of-the-Art Biomarker Review for Precision Breast Cancer Medicine. Cancers (Basel). 2022 Jul 17;14(14):3469.

DISCUSSION

- PPM tailors breast cancer treatment plans to individual genetic and environmental profiles, enhancing patient care by incorporating lifestyle, age, race, and specific genetic markers.
- AI and Radiomics Integration into PPM significantly boosts the accuracy of breast cancer diagnostics and treatment decisions through advanced data analysis and image assessment.
- Personalized Treatment Options are developed by combining AI-driven radiomic data with genomic information, leading to more accurate prognoses and improved patient outcomes.
- Future directions involve overcoming existing barriers, validating AI tools in clinical settings, and further integrating multi-omic data to revolutionize breast cancer management.

CONCLUSION

By utilizing Radiomics and AI, this review showcases pivotal advancements in PPM, tailoring breast cancer care to meet diverse patient profiles. It illuminates groundbreaking approaches that address disparities, ushering in a new era of personalized treatment and diagnosis.

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