Essay

Weaponizing EHRs to Close that Diagnosis Gap - Coupling Agentic AI with EHRs for Earlier, More Equitable Diagnosis with Minority Estrogenopathies

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Weaponizing EHRs to Close that Diagnosis Gap - Coupling Agentic AI with EHRs for Earlier, More Equitable Diagnosis with Minority Estrogenopathies

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Highlight

Delayed diagnosis in minority estrogenopathies is not an intractable problem; rather, it is a solvable systems failure. By marrying agentic AI with rich, longitudinal EHR data, healthcare organizations can identify risk earlier, reduce diagnostic bias, and initiate treatment when it is most effective.
EHRs are no longer just records of what has happened. With agentic AI, they become instruments of foresight and actionable, driving more timely, equitable, and human-centered care. The opportunity is clear, and the time to act is now. Weaponization of agentic AI for diagnostic equity should be mandated.

Abstract

Electronic Health Records (EHRs) are no longer passive repositories built for regulatory compliance. They are evolving into dynamic engines that can actively improve care quality, equity, and outcomes. When coupled with agentic AI, EHRs have the potential to address one of healthcare's most persistent failures: delayed and inequitable diagnosis among minority women with estrogenopathies. Endometriosis, estrogen receptor-positive breast cancer, ovarian and cervical cancers, and osteoporosis, disproportionately affect women and are strongly influenced by estrogen dysregulation. While biology plays a role in estrogen-related diseases, delayed diagnosis is not a biological issue. Across healthcare systems, women experience longer diagnostic timelines than men, and these delays are amplified among racial and ethnic minority women. The consequences are profound - later-stage disease at presentation, delayed treatment initiation, higher morbidity, and poorer long-term outcomes. We promulgate leveraging of agentic AI in EHRs to transition healthcare from reactive documentation to proactive, equitable diagnosis, particularly for minority estrogenopathies.

Keywords: minority; estrogenopathy; diagnosis; delay; EHR; agentic AI; equitable

Introduction

Estrogenopathies comprise a diverse group of diseases driven by dysregulation of estrogen estrogen levels/signaling. Elevated estrogen levels have been implicated in flares among women with systemic lupus erythematosus (SLE) [1], in endometriosis [2] and in the pathogenesis of estrogen receptor positive breast cancer [3], while estrogen deficiency, particularly the abrupt decline in estrogen levels accompanying menopause, is associated with osteoporosis [4]. Aside from their susceptibility to estrogen-mediated disease, women face a systemic disadvantage in healthcare

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delivery - delayed diagnosis vs. men across a broad spectrum of conditions, independent of disease etiology [5–7]. These delays are further exacerbated among women from racial and ethnic minorities[8,9]. Delayed diagnosis inevitably translates into delays with treatment initiation, increased disease burden, and poorer prognoses.

Herein we promulgate pairing of agentic AI with EHRs to identify, monitor, and reduce diagnostic delays in minority estrogenopathies. Coupling rich, longitudinal patient data with autonomous clinical reasoning and action has the potential to flag disease in a more timely and equitable manner for historically underserved populations.

Methods

This study does not include interaction with or intervention in human subjects; nor did it obtain any identifiable private information. Door-to-diagnosis time and/or time-to-intervention were computed for several diseases based on the available literature.

Diagnostic Delays with Minority Estrogenopathies

In endometrial, breast, ovarian, and cervical cancers, and with osteoporosis, minorities experience longer delays prior to diagnosis and are more likely to be diagnosed at a later disease stage. Compared with White women, Black women and Hispanic women are less likely to be diagnosed (Black, odds ratio (OR) 0.49, 95% confidence interval (CI) 0.29–0.83; Hispanic, OR 0.46, 95% CI 0.14–1.50) with endometrial disease [10]. One study [11] reported that compared with their White counterparts, Black women were diagnosed 2.6 years later, and Hispanic women 3.8 years later with this disease. Equally disconcerting, despite similar prevalence of endometrial disease in adolescent Whites and Blacks, the latter cohort was less likely to receive diagnostic laparoscopy (OR 0.20, 95% CI 0.03–0.69) or non-emergent surgery (OR 0.01, 95% CI 0.00-0.20) [12]. In so far as breast cancer is concerned, amongst symptomatic women, median time to diagnosis ranged was 36 days for Whites and 53.6 days for Blacks [13]. Among women with abnormal mammograms, median time to diagnosis was 21 days in Whites and 29 days in Blacks [14] who also had the highest proportion of Stage III or IV tumors. For patients with epithelial ovarian cancer, Blacks were more likely (OR 1.20, 95% CI 1.07–1.35) to be diagnosed with stage III and IV disease compared with Whites [15]. Compared with White women, Black (OR 1.29, 95% CI 1.11–1.46) and Hispanic (OR 1.14, 95% CI 1.11–1.46) women had greater odds of late-stage cervical cancer at diagnosis [16]. With osteoporosis, Hispanic women have lower rates (25.4%) of receiving a bone density scan followed by Black women (37.1%), compared to 47.7% for White women [17]. Even after a fracture, Black and Hispanic women are less likely to receive proper testing (relative risk 0.66 and 0.58, respectively) vs. White women [18].

Factors Associated with Delays in Diagnosis

A multitude of factors is typically associated with delays in diagnosis. Ethnicity and race play a role with clinicians, especially male clinicians, paying reduced attention to health issues relating to minority women, being dismissive of their symptoms, and/or attributing them to imagination or psychosomatic causes [19]. Socioeconomic factors include use of savings for non-health related expenses including food and rent; sub-par insurance policies translate to increased co-pays or fewer providers each of which can act as a barrier to visiting a clinician. Neighborhood effects include residence in remote or rural areas which can translate to poor quality providers and a geographic barrier for the patient to seek care until the issue becomes serious. Finally, in many cultures women are still expected to serve as the homemaker and ignore or suppress symptoms and sacrifice their health for the smooth running of the household.

EHRs and Machine Learning (ML)

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EHRs are a living breathing narrative of a patient's health history. They are being increasingly used for storing, retrieving, and managing patient health records, and are being leveraged for data-driven initiatives, such as clinical research, quality improvement, predictive analytics and decision support [20]. Indeed, EHRs are evolving into comprehensive dashboards comprising patient health data accumulated by patient encounters including patient demographics, health history, past and present health problems, immunizations and treatments, and laboratory, radiology, pathology and even genomic reports. Today, with data digitization, and especially with use of tokenization, patient-specific data can be collated from different ecosystems, be they provider sites, or payor/reimbursement sites without sacrificing privacy. Databases such as AllofUs (https://allofus.nih.gov) and the UK Biobank (www.ukbiobank.ac.uk) are increasingly housing data beyond that which are routinely gathered during patient contact. Wearable data such as steps taken daily, heart rate and sleep patterns, patient residence zip codes, dietary habits including consumption of red meat, and performance metrics on providers visited are becoming integrated into a single data set. It is increasingly recognized that outcomes are influenced by these external factors in addition to factors intrinsic to patients.

Of late, data from EHRs are being leveraged to quantify disease risk, stage disease, predict times-to-event, generate synthetic control arms for clinical trials [21], and identify fast-progressor that may benefit clinical trial timelines. The Kidney Failure Risk Equation (The Kidney Failure Risk Equation) can stage chronic kidney disease and quantify risk for end-stage renal disease. The MDCalc platform (MDCalc - Medical calculators, equations, scores, and guidelines) is a widely used, free digital medical reference that provides evidence-based clinical decision-support tools, including medical calculators, risk scores, formulas, and algorithms. Created by physicians, it helps healthcare professionals quickly assess patient risks and make informed decisions at the point of care. The recently deployed DXGPT (https://dxgpt.app/) is an advanced AI-assisted medical diagnosis platform that utilizes advanced language models to provide rapid differential analysis from symptom descriptions and clinical histories.

Databases including AllofUs and the UK Biobank can currently be mined using ICD-10 and/or SNOMED codes to identify patients diagnosed by injury or disease. In many cases the primary event leads to secondary diseases. Examples include congestive heart failure in individuals that experienced a myocardial infarction or lupus nephritis in patients with systemic lupus nephritis. Both EHR-based and external variables alluded to above can be submitted to ML algorithms to conduct a multivariate-based calculation of time-to-event for the secondary disease. For example, in patients with SLE, being black, consumption of red meat and residence in the SLE belt is each a factor associated with increased risk for nephritis [22,23]. Patients with SLE carrying each of these risk factors may experience a reduced time to kidney involvement. In patients with metabolic dysfunction-associated liver disease (MASLD), diabetes, obesity, older age, male gender or being of certain ethnicities have been identified as burdening features during diagnosis of MASLD-related HCC, specifically MASLD-related HCC without cirrhosis [24–29]. Mining of these databases for ML-powered predictive analytics is being used to enroll fast progressors for clinical trials, to serve as digital placebo controls for trials with invasive interventions, and to estimate both revenue and reimbursement costs by providers and payors, respectively.

Agentic AI

It is here that agentic AI can further weaponize EHRs and level the playing field. Representing the next evolution in clinical intelligence, agentic AI systems can autonomously plan, reason, and execute multi-step actions toward specified goals with minimal human supervision. These systems integrate ML, large language models, and reinforcement learning to perceive complex clinical signals, adapt over time, and orchestrate workflows across tools and data sources. By continuously learning from longitudinal data, agentic AI can move beyond risk prediction to proactive clinical engagement. Coupling agentic AI to these databases can be used to alert both the patient and the provider of risk for disease and inform diagnosis. In the context of minority estrogenopathies agentic AI can: -

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Continuously monitor symptom trajectories, laboratory trends, and care utilization patterns. - Incorporate external risk modifiers such as race, geography, diet, and access to care. - Estimate individualized time-to-diagnosis or time-to-complication risk. – Most important, proactively alert clinicians and patients when diagnostic thresholds are likely being crossed. Rather than waiting for disease to declare itself overtly, AAI enables earlier, anticipatory engagement. Agentic AI can facilitate earlier initiation of therapy with potentially improve outcomes.

Conclusion

Agentic AI can be designed to counteract, rather than reinforce, existing biases. By grounding alerts in objective longitudinal data and transparent risk logic, these systems can prompt evaluation even when symptoms are subtle or historically discounted. For patients with minority estrogenopaties, whose concerns are more likely to be minimized and even dismissed, this represents a powerful mechanism for bias mitigation.

Alerts can be structured to recommend diagnostic escalation, guideline-based testing, or specialist referral, while simultaneously engaging patients through portals or digital outreach. In doing so, agentic AI can shift the burden of advocacy away from patients and embeds equity directly into clinical workflows. The convergence of EHRs and agentic AI mirrors a broader shift in healthcare, from documentation to decision-making, from volume to value, and from reactive care to prevention. Earlier diagnosis of minority estrogenopathies not only improves individual outcomes but also reduces downstream costs associated with advanced disease, hospitalizations, and complications. The data infrastructure already exists. The analytical tools are maturing rapidly. What remains is intentional deployment, governance, and cultural adoption. The opportunity is clear, and the time to act is now.

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