Advancing *Algorithmovigilance* for AI-Driven Healthcare Equity and Effectiveness

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Algorithm-driven Healthcare

- Growth in Algorithm-driven healthcare decision support
- Ongoing development and application of such tools
- **Increasing evidence of unintended negative impacts**

- Looking to the future, need for a “learning system” to:
  - Monitor algorithm-driven healthcare for effects
  - Mechanisms respond/adjust to unintended effects, drift

Need to monitor healthcare Algorithms

Biases in Data:
Known and Unknown

Caution about generalizability

Unexpected results can be expected

Must monitor to promote trust

Need new systems and approaches

Essential for safe, efficient, effective and equitable care

Pharmacovigilance

Processes for discovering adverse effects

Systematic surveillance approaches growing

Increasingly leveraging EHRs and related data for monitoring of safety and effectiveness

Pharmacovigilance:

- Science relating to the *collection, detection, assessment, monitoring, and prevention* of adverse effects with pharmaceutical products.

Adverse Effect Reporting

- Individual Case Safety Reports (standards)
- Coding of adverse events
- Seriousness determination
- Expedited reporting
- Spontaneous reporting
- Aggregate reporting

”Algorithmovigilance”

“The scientific methods and activities relating to the evaluation, monitoring, understanding, and prevention of adverse effects of algorithms in health care.”

Akin to pharmacovigilance for monitoring drug effects

Increasingly important as AI/ML-derived algorithms are used

JAMA Network Open

Invited Commentary | Health Informatics

Algorithmovigilance—Advancing Methods to Analyze and Monitor Artificial Intelligence–Driven Health Care for Effectiveness and Equity

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In recent years, there has been rapid growth and expansion in the use of machine learning and other artificial intelligence approaches applied to increasingly rich and accessible health data sets to develop algorithms that guide and support health care.[1] As they make their way into practice, such algorithms have the potential to fundamentally transform how health care decisions are made and, therefore, how patients are diagnosed and treated.[2] While such approaches hold great promise for enabling more precise, accurate, timely, and even fair decision-making when properly developed and applied, there is also growing evidence that systematic biases can lead to unintended and even severe consequences.[3,4] Mirroring disparities and inequities inherent in our society and health system,[5] such biases can be inherent in not only the underlying data used to develop algorithms but also how algorithmic interventions are deployed.

Elsewhere in *JAMA Network Open*, Park and colleagues[6] present findings from a study evaluating different approaches to the debiasing of health care algorithms developed to predict postpartum depression (PPD) among a cohort of pregnant women with Medicaid coverage. The researchers, from IBM Research, leveraged the IBM MarketScan Medicaid Database, a deidentified, individual-level claim records data set with approximately 7 million Medicaid enrollees across multiple states, to derive their algorithms. They started by developing 2 sets of machine learning models trained to predict 2 outcomes: (1) diagnosis or treatment for PPD and (2) postpartum mental health service utilization. Their initial, risk-adjusted generalized linear models for each outcome demonstrated a notable difference in the cohort with binarized race, with White patients having twice the predicted likelihood of being diagnosed with PPD compared with Black patients and a significantly higher likelihood of utilizing mental health services. However, as the authors point out,

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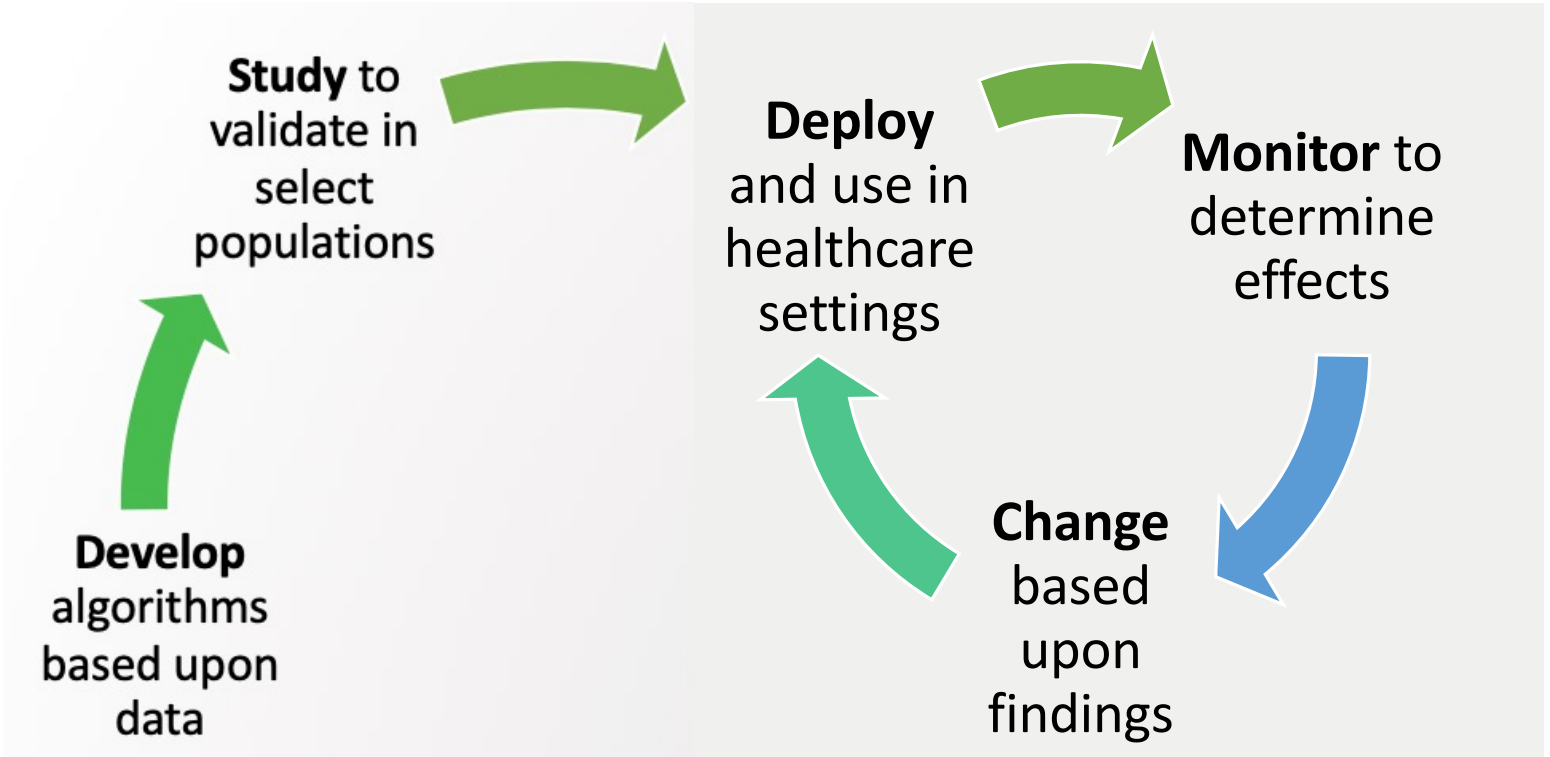
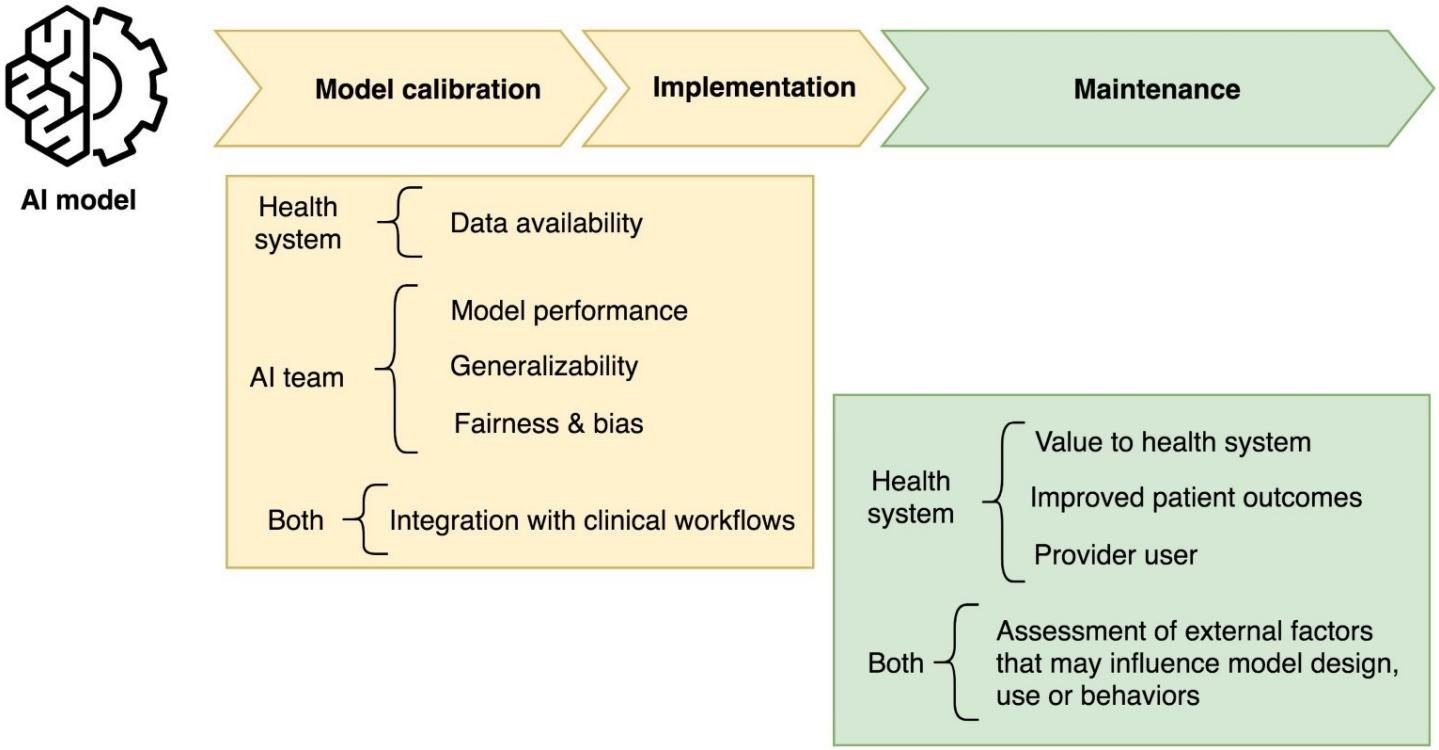
Embi PJ. JAMA Network Open. 2021;4(4):e214622.

Algorithmovigilance via learning health system

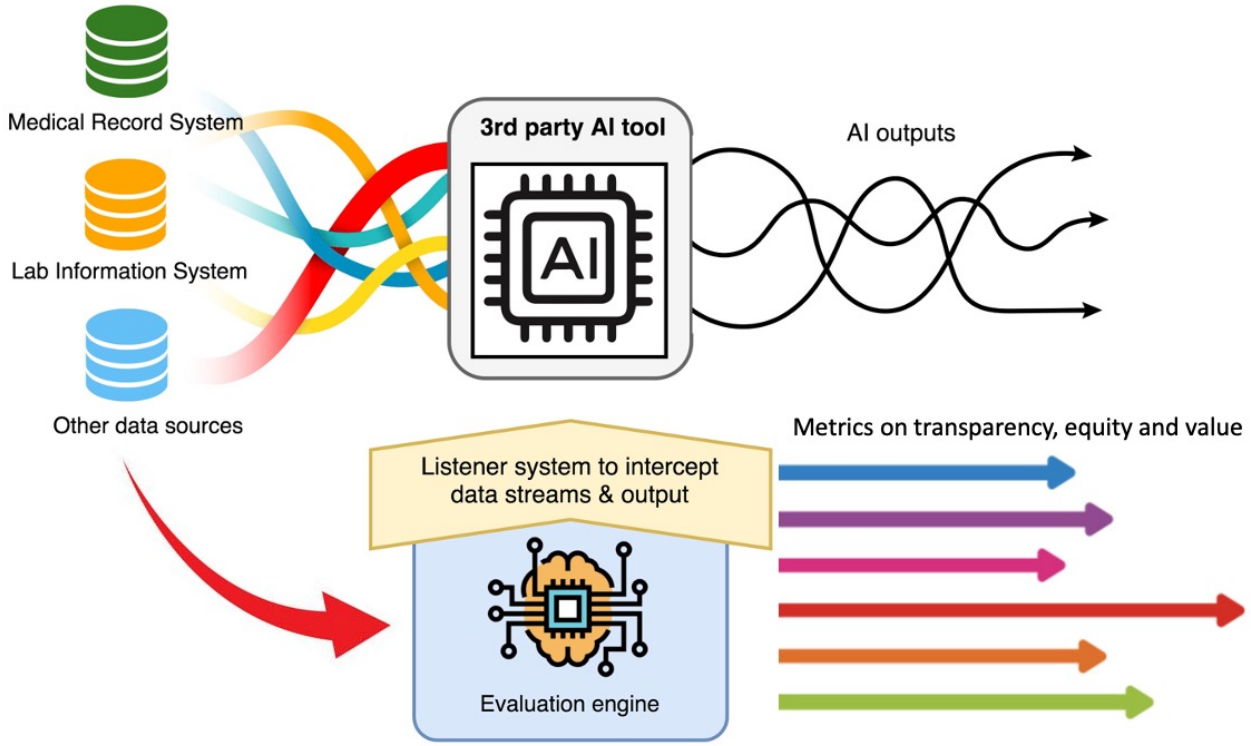


Emerging model for operationalizing algorithmovigilance



- Goals: systematic monitoring of computable algorithms and AI-driven systems to evaluate and respond to expected or unexpected health effects and inequities for individual patients and populations

Developing new technologies to enable algorithmovigilance




Thanks!