Saving Lives and Saving Money: Artificial Intelligence for Improvement in AKI Quality of Care and Cost Effectiveness

Tuesday, June 7, 2022

Organized by the ASN AKINow Artificial Intelligence Workgroup
Welcome and Introductions

Jorge Cerdá, MD, FACP, FASN
ASN’s AKINow Steering Committee Chair
Albany Medical College
To promote excellence in the prevention and treatment of Acute Kidney Injury (AKI) by building a foundational program that transforms the delivery of AKI care, reduces morbidity and mortality and improves long-term outcomes.

https://www.asn-online.org/aki!now/
Artificial Intelligence (AI) Effort for Quality Improvement in Acute Kidney Injury

**Gaps**
- Many desired tools do not exist.
- AI tools may not be broadly validated.
- Current efforts are uncoordinated.
- AI tools can carry implicit bias if not carefully designed and evaluated.
- AI tools may not consistently provide evidence on improvements in care or cost savings.

**Patients**
- Design fair and equitable AI models
- Identify scenarios based on personal and caregiver experience that could be improved with AI
- Improve patient centered outcomes in AKI survivors

**Clinicians**
- Design fair and equitable AI models
- Identify areas of clinical uncertainty that may benefit from new AI tools
- Guide appropriate follow-up for AKI survivors

**Researchers**
- Evaluate current AI tools, with a focus on removing implicit bias
- Develop new AI tools to address gaps identified by patients and clinicians
- Develop AI methods to advance the science of AKI

Improve the quality, accessibility, affordability, and equity of care.

Visit [https://wwwASN-online.org/aki!Now/ai](https://wwwasn-online.org/aki!Now/ai) to learn more.
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Today’s Moderator

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This webinar, Saving Lives and Saving Money: Artificial Intelligence for Improvement in AKI Quality of Care and Cost Effectiveness? is provided as information and education and should not be construed as medical advice or recommendations for patient care.

The information expressed is that of the speaker(s) and contributor(s) only. Clinicians are to use their own training, clinical observations, and judgment to make all diagnostic and treatment decisions. The ASN Alliance (including ASN) does not offer medical advice.
This webinar is being recorded.

Following today’s webinar, the recording, slides, and speaker bio handout will be posted on the ASN AKI website at:

https://www.asn-online.org/aki!now/
Keynote Presentation

Ryan McDevitt, PhD
Duke Fuqua School of Business
Saving Lives & Saving Money:
AI for Improvement in AKI Quality of Care and Cost Effectiveness

Ryan C. McDevitt
June 7, 2022

Disclosure: Advisory Board of Renalogic
How Artificial Intelligence Is Changing Health Care Delivery

AI offers compelling opportunities to improve efficiency, reduce errors, and incorporate increased evidence-based decision support. However, challenges abound in areas such as data security, patient privacy, legal liability, and the challenges of applying AI tools in new contexts.”
Google AI Beats Doctors at Breast Cancer Detection—Sometimes

Company has developed similar AI systems for lung cancer, eye disease and kidney injury

The AI system was then tested on different mammograms of more than 25,000 women in the U.K. and 3,000 women in the U.S. from those datasets. The AI system reduced missed cases by 9.4% in the U.S. and 2.7% in the U.K. compared with the original radiologist diagnoses. It also reduced incorrect positive readings by 5.7% and 1.2%, respectively.

In the U.K., where two radiologists typically read a mammogram, the study found that the model didn’t perform worse than the second reader and could potentially reduce their workload by 88%.

https://www.wsj.com/articles/google-ai-beats-doctors-at-breast-cancer-detectionsometimes-11577901600
A.I. Comes to the Operating Room

Brain surgeons are bringing artificial intelligence and new imaging techniques into the operating room, to diagnose tumors as accurately as pathologists, and much faster, according to a report in the journal Nature Medicine.

The new approach streamlines the standard practice of analyzing tissue samples while the patient is still on the operating table, to help guide brain surgery and later treatment.

The traditional method, which requires sending the tissue to a lab, freezing and staining it, then peering at it through a microscope, takes 20 to 30 minutes or longer. The new technique takes two and a half minutes. Like the old method, it requires that tissue be removed from the brain, but uses lasers to create images and a computer to read them in the operating room.
Cigna Corp. plans to expand a system that uses artificial intelligence to identify gaps in treatment of chronic diseases, such as patients skipping their medications, and deliver personalized recommendations for specific patients.

The product, called Health Connect 360, integrates data from a combination of sources and analytical tools, some developed at Cigna and others brought in as part of its $54 billion acquisition of pharmacy-benefit manager Express Scripts Holding Co., completed late last year. Express Scripts, which began developing the service two years ago, rolled out portions of it to some customers this year.

More health-care organizations are looking to artificial intelligence to spot diseases, prioritize cases and improve patient outcomes—results that also have the effect of lowering overall costs for the providers.

AI systems’ ability to learn from an array of patient histories, medical tests and diagnostic tests makes them ideal tools for care. However, getting access to health data required for better outcomes can be a bottleneck.
Drugmakers Turn to Data Mining to Avoid Expensive, Lengthy Drug Trials

Pfizer, Johnson & Johnson and Amgen try to win drug approvals by analyzing vast data sets of electronic medical records.

For the companies, the use of real-world data can cut costs and shorten drug-development times. Instead of finding trial subjects, companies simply mine hospital and doctor files for cases where patients already took a drug in routine medical care, looking for changes in blood pressure, tumor size and other readings to see if the medicine is helping or causing a side effect.

This real-world evidence is sometimes used in lieu of a clinical trial’s control arm, to compare outcomes for past patients who got a standard treatment against people who are taking a new drug in a clinical trial. Such analyses can take months, compared with years for prospective clinical trials.

Some doctors worry about forsaking clinical trials, which are carefully designed and conducted in patients to get a sound read on a drug’s safety and efficacy. Health records often have errors, the skeptics say, and even an analysis of records that are error-free doesn’t have the same scientific rigor as a clinical trial in sizing up a drug.
Google Algorithm Aims to Identify At-Risk Kidney Injury Patients

DeepMind unit’s effort marks new application of machine learning in health care, but experts say model needs further testing before being applied in a live hospital setting

The algorithm could predict the sudden deterioration of kidney function, called acute kidney injury, two days before the potential injury with 55.8% accuracy, according to a paper published in the journal Nature on Wednesday. For the more severe kidney injuries, like cases that later required dialysis, the accuracy was closer to 90%.
Google confirms it’s pulling the plug on Streams, its UK clinician support app

The Streams story has plenty of wrinkles, to put it politely.

For one thing, despite being developed by Google’s AI division — and despite DeepMind founder Mustafa Suleyman saying the goal for the project was to find ways to integrate AI into Streams so the app could generate predictive healthcare alerts — the Streams app doesn’t involve any artificial intelligence.

https://techcrunch.com/2021/08/26/google-confirms-its-pulling-the-plug-on-streams-its-uk-clinician-support-app/
AI Can’t Reason Why

The current data-crunching approach to machine learning misses an essential element of human intelligence.

Beware of Spurious Correlations

Number of people who drowned by falling into a pool correlates with Films Nicolas Cage appeared in

https://www.tylervigen.com/spurious-correlations
Many Health Studies Confuse Correlation with Causation

Everything we eat both causes and prevents cancer

SOURCE: Schoenfeld and Ioannidis, American Journal of Clinical Nutrition
Wearing Masks Stops Covid?

Not masking a lot
Growth of covid-19, by country or region
First 60 days after reaching 30 confirmed cases

<table>
<thead>
<tr>
<th>Region/country</th>
<th>Total cases</th>
<th>Avg. daily growth rate, %</th>
<th>Measures taken</th>
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Sources: De Kai et al.; Johns Hopkins University CSSE; The Economist

The Economist
Wearing Masks Stops Covid?

Mask-wearing and control of SARS-CoV-2 transmission in the USA: a cross-sectional study

Benjamin Rader, MPH  Laura F White, PhD  Michael R Burns  Jack Chen, PhD  Joseph Brilliant, MBA
Jon Cohen, MA  et al.  Show all authors

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% of respondents “very likely” to wear a mask

https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30293-4/fulltext
RCTs: Best Way to Distinguish Causation from Correlation

Covid-19 cases in the placebo group overtake the vaccine group soon after first dose

Source: Pfizer/BioNTech
© FT
But Can’t Always Get Data Good Enough That You Don’t Need Econometrics

Statistics Tip: Always try to get data that’s good enough that you don’t need to do statistics on it.
Key Issue with Observational Data: Omitted Variable Bias

Omitted variable bias occurs when we omit a variable from the regression that affects both X and Y.

- Omitting that variable — denoted W — means the error term is correlated with the regressors (a technicality violates assumptions for OLS).
  - We often refer to W as a confound.
  - We wish we had data for W but we don’t :(.

- Example: regression of health insurance on health outcomes omits income, finds positive effect.
  - higher income → more likely to have insurance (↑X)
  - higher income → better health (↑Y) irrespective of health insurance.

By omitting W, we will mistakenly conclude that all of the impact on Y comes from X, even though part of it actually came from W.
Bald Men At Higher Risk Of Severe Coronavirus Symptoms

Marla Milling Contributor

Healthcare

I am a Forbes.com Contributor specializing in geriatric health and women's health articles.
Updated (6/8/20) This piece has been clarified to note that the study did not control for age, which is a risk factor for hair loss and severe Covid-19.

New research is showing why a larger percentage of men—particularly bald men—are...
Goal: Use AI/ML + Econometrics to Get Around Omitted Variable Bias

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<table>
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<td>First-Stage F-Stat</td>
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EPO doses winsorized at 99th percentile and measured in thousands of IU. PPS is an indicator variable for post 2011. Observation is a patient-month. Sample consists of observations from January 2009 to December 2012. Patient controls include dummy variables for comorbidities from medical evidence forms, facility elevation, patient demographics, age, and dialysis tenure. Standard errors clustered by facility in parentheses. *, **, and *** indicate significance at the 5%, 1%, and 0.1% level, respectively.

Ultimate Goal: Use AI/ML + Econometrics to Focus Efforts & Reduce Costs

Covid Hospitalizations per Thousand ESI Beneficiaries

Source: League et al. (2022) unpublished manuscript
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Panel Discussion

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Thank you.

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