



Using AI to Detect Myocardial Infarction

Take Home Point: The use of an occlusive myocardial infarction (OMI) artificial intelligence (AI) electrocardiogram (ECG) model has the potential to improve identification of acute coronary syndrome (ACS) by enabling timely and accurate detection of OMI regardless of the presence ST-segment elevation.

Citation: Herman R, Meyers H, Smith S, et. al. International evaluation of an artificial intelligence-powered electrocardiogram model detecting acute coronary occlusion myocardial infarction. *Eur Heart J Digit Health*. 2023 Nov 28;5(2):123-133. doi: 10.1093/ehjdh/ztado74

Relevance: One-third of non-ST-elevation myocardial infarction (NSTEMI) patients have an acute OMI. NSTEMI patients often experience delays in revascularization as the guidelines from American Heart Association (AHA) and American College of Cardiology (ACC) do not recommend immediate revascularization in patients without STEMI criteria. This can lead to poor outcomes in patients with OMI but without STEMI findings on ECG.

Study Summary: This was a retrospective study with 4 stages: 1) development of an OMI AI model for the detection of acute OMI using single-standard 12-lead ECGs as input (“derivation cohort”); 2) evaluation of a blinded AI model in a geographically distinct test set spanning Europe and the United States; 3) comparison of an AI model with the criteria detecting OMI using 12-lead ECGs; and 4) performance analysis of an AI model in several subgroups. The primary outcome was the AI model’s ability to identify patients with angiographically confirmed OMI using only single-standard 12-lead ECGs. The 18,616 ECGs from 10,543 patients (age 66± 14 years, 65.9% males, 22.9% OMI) with clinically validated outcomes were included in the AI model development.

The authors evaluated 3,254 ECGs from 2,222 patients (age 62± 14 years, 67% males, 21.6% OMI) on the AI ECG model. The OMI AI model achieved an area under the curve (AUC) of 0.938 in identifying the primary outcome. This

corresponded to an accuracy of 90.9% with a sensitivity of 80.6% and a specificity of 93.7%. Using STEMI criteria to detect OMI, on the other hand, which had an 83.6% accuracy, but only a 32.5% sensitivity. The model performance was comparable in both EU and US patients. The model was superior to conventional STEMI criteria for identifying OMI and comparable with interpretation by specialized ECG experts in detecting invasively confirmed OMI.

Editor’s Comments: The authors acknowledge that the study is not generalizable to a broader population of asymptomatic patients with other potential cardiac pathology. The model was not designed for other clinical endpoints such as mortality or major adverse cardiovascular events (MACE). This study does highlight the potential use of technology to aid daily clinical decision making. ■

Effects of Artificial Intelligence Assistance to Radiologist

Take Home Point: Artificial Intelligence (AI) assisted chest radiography (CXR) interpretation is not reliably helpful for radiologists at this time. The study suggests that predicting which radiologists will benefit from AI assistance is also unpredictable.

Citation: Yu F, Moehring A, Banerjee O, et. al. Heterogeneity and predictors of the effects of AI assistance on radiologists. *Nat Med*. 2024; 30(3): 837–849.

Relevance: As AI becomes more commonly integrated into clinical medicine, radiology has become one of the specialties of greatest interest for early adoption. However, there are still ongoing questions regarding its reliability in clinical practice and clinician’s ability to use AI safely and effectively.

Study Summary: This was a study investigating the predictors of heterogeneous treatment effects of AI assistance in radiology. The authors measured the performance of 140 radiologists with and without AI assistance on 15 chest X-ray diagnosis tasks. Participants received training on the assistive AI system before starting the experiment. They were shown examples AI predictions, which would help them calibrate their interpretation of AI predictions



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and inform their incorporation of AI.

The authors analyzed 324 patient cases and 15 pathologies with corresponding AI predictions among the participants. They found the existence of radiologist heterogeneity in treatment effects, which has substantial implications for both absolute and relative performance. It underscored the inadequacy of a one-size-fits-all approach to AI assistance and emphasized the importance of individualized strategies to maximize benefits and minimize potential harms. The years of experience, subspecialty, and familiarity with AI tools of the radiologists did not reliably predict how the radiologist would perform with AI assistance. Importantly, the researchers found that radiologists who initially performed poorly without AI assistance did not necessarily improve when provided with AI assistance compared to their higher-performing counterparts. ■

Editor's Comments: The authors' findings contradict prior studies about the role of experience in predicting how much radiologists might benefit from AI-assistance based on their experience. They admitted that the randomization of treatment conditions in the experiment prevented the analysis of temporal trends in radiologists' response to AI assistance. They were also unable to assess whether radiologists improved in incorporating AI prediction. This study is a good starting point for working to determine how the incorporation of AI will affect performance of various types of clinicians, so that any unforeseen risks may be better anticipated in premature application of this technology. ■

Sterile Water Injections for Pain Relief in Renal Colic

Take Home Point: In this study, intradermal sterile water injection (ISWI) had similar efficacy, faster pain relief, and lower need for rescue analgesia compared with diclofenac, paracetamol, and tramadol for the management of acute renal colic.

Citation: Az A, Sogut O, Akdemir T, et. al. Intradermal Sterile Water Injection: Safe and Effective Alternative for Relief of Acute Renal Colic in the Emergency Department. *J Emerg Med.* 2024 Feb;66(2):83-90. doi: 10.1016/j.jemermed.2023.10.014.

Relevance: Non-opioid methods to relieve pain for patients presenting to urgent care (UC) and emergency departments (ED) with renal colic is an important goal. Limited safe, effective, and widely available analgesic options for this painful condition exist.

Study Summary: This was a randomized, single-blinded, single-center study of patients admitted to an ED in Turkey due to renal colic. Patients were randomly assigned to 4 groups for intervention. The authors compared the efficacy of ISWI to intramuscular (IM) diclofenac (DI), IV paracetamol (PARA), and intravenous (IV) tramadol (TRAM). The patients receiving ISWI had injections of (0.5 mL per injection) at 4 different points around the most painful flank area. Other patients received 75 mg IM diclofenac, 1 g IV paracetamol, or 100 mg IV tramadol, respectively. Pain intensity was measured using a visual analog scale (VAS) before treatment and then at 15, 30, and 60 minutes after treatment.

The authors enrolled 320 participants (n=80 for each group). Somewhat surprisingly, they found VAS scores 15 and 30 min after treatment were significantly lower in group ISWI than in groups DI, PARA, and TRAM. ISWI was associated with faster pain relief than each of the other treatments. Fewer patients in the ISWI group required rescue analgesia compared with those in the tramadol group as well, but there was no difference between the ISWI group and those in the DI and PARA group in needing rescue analgesia.

Editor's Comments: This study has limited generalizability due to its single-center methodology. There was no comparison of ISWI in combination to other analgesics, which would more likely mirror a real-world application. The results of this study build on growing evidence that ISWI is a safe alternative to pharmacological therapies for treatment of renal colic and other pain conditions such as lower back, neck, and joint pain—although the mechanism for this effect remains unclear. While further evaluation of ISWI use in the UC setting would be helpful, there seems to be little risk in integrating this into practice, but only as part of a multimodal analgesia strategy. ■

Is There an Optimal Time for Influenza Vaccinations for Young Children?

Take Home Point: The birth month of a child influences the timing of a child's regular visits for preventative care. Children born in October were more likely to be vaccinated in October and least likely to contract influenza.

Citation: Worsham C, Bray C, Jena A. Optimal timing of influenza vaccination in young children: population-based cohort study. *BMJ* 2024;384:e077076 <http://dx.doi.org/10.1136/bmj-2023-077076>

Relevance: Influenza vaccination is particularly important for young children, who are at elevated risk of severe infection and complications of influenza.

Study Summary: This was a population-based cohort study of commercially insured children aged 2-5 who were vaccinated for influenza. Data was collated from a database of 30-40 million Americans covered by employer-sponsored health insurance plans each year. The authors evaluated rates of influenza diagnosis according to a vaccinated child's birth month. They examined whether young children tended to have annual visits near their birthday, calculating the proportion of children whose visits occurred within 2 weeks of their birth month. Finally, they compared distributions of vaccination timing across birth months.

The authors identified a total of 1,261,164 children, of whom 819,223 children received influenza vaccination between August 1 and January 31 of a given flu season. Overall timing of influenza vaccination followed a similar pattern each year, while timing of the peak of influenza diagnoses varied. October was the most common month for children to be vaccinated (37.3%). Children born in October had the lowest probability of being diagnosed with influenza (2.7%), whereas children born in August had the highest probability (3.0%). Being born in October versus August therefore was associated with an aOR of 0.88 for contracting influenza during early childhood.

Editor's Comments: Generalizability of results may be limited as all children were commercially insured. Given the seasonality of influenza has deviated from historical patterns since the arrival of COVID-19, these findings, while compelling and logical, may be of more historic significance. Regardless, this points to an important trend for clinicians caring for children to be aware of: birth month affects timing of health maintenance visits, which in turn may have other myriad other unintended effects. ■

Effective Communication Improves Antibiotic Stewardship

Take Home Point: The use of standardized communication templates with caregivers resulted in a trend towards more appropriate antibiotic prescribing for pediatric pharyngitis and a significant decrease in inappropriate antibiotics for acute otitis media (AOM)

Citation: Nedved A, Bizune D, Fung M, et. al. Communica-

tion Strategies to Improve Antibiotic Prescribing in Pediatric Urgent Care Centers. *Pediatr Emerg Care.* 2024 Apr 1;40(4):265-269. doi: 10.1097/PEC.0000000000002977

Relevance: Family expectations are commonly cited as a barrier by UC clinicians for following antibiotic stewardship guidelines.

Study Summary: This was a quality improvement project led by the Society for Pediatric Urgent Care (SPUC), the Centers for Disease Control and Prevention (CDC), Children's Mercy Kansas City, Children's National Hospital, and the Antibiotic Resistance Action Center. Participants were recruited via SPUC e-mails, newsletters, and webinars from free standing pediatric UC clinics. Participants were given a standardized diagnosis-specific script to use during their consultations, with the first script for AOM followed by other scripts for otitis media with effusion (OME) and pharyngitis. These scripts were introduced at staggered intervals to participants at monthly webinars, which were compulsory for participation in the project.

The authors recruited 104 participants from 14 UC clinics. In data collected from 1,183 encounters during the study period, 9.5% (n = 113) had OME diagnoses, 34.1% (n = 403) had AOM, and 56.4% (n = 667) had pharyngitis diagnoses. Clinicians prescribed antibiotics in 36 (31.9%) encounters for OME, 402 (99.8%) encounters for AOM, and 142 (21.3%) encounters for pharyngitis. Following the intervention period, inappropriate prescribing for AOM decreased from 34.3% at the beginning of the study to 8.8% (P = 0.02) by the end of the study. For pharyngitis, inappropriate antibiotic agent and prescribing antibiotics with a negative test trended downward from 3.9% and 5.3% to 0% and 0%, respectively (P = 0.17 and 0.21). However, inappropriate antibiotic prescribing practices in OME encounters trended upward from 30.8% to 46.7% (P = 0.34).

Editor's Comments: There is some limited generalizability in this study due to the self-selection of clinician participants, who are likely more motivated to pursue improvements in antibiotic stewardship than the average UC clinician. Additionally, all clinicians practiced in pediatric specific UC centers. However, this study does suggest that improving our communication around the rationale for antibiotic avoidance in appropriate cases can affect caregiver understanding of pediatric illnesses. Using preformatted scripts as were used in this study may make these conversations, which can be tiresome and frequent, less burdensome for UC clinicians. ■

Does My Patient Need Colchicine in Allopurinol Dose Escalation for Gout?

Take Home Point: Placebo therapy was non-inferior to colchicine in preventing gout flares in the 6-month initiation of allopurinol treatment.

Citation: Stamp L, Horne A, Mihov B, et. al. Is colchicine prophylaxis required with start-low go-slow allopurinol dose escalation in gout? A non-inferiority randomized double-blind placebo-controlled trial. *Ann Rheum Dis* 2023; 82:1626–1634

Relevance: Gout flares can occur during initiation of urate-lowering therapy, hence the current recommendation for concurrent colchicine use as prophylaxis by both the British Society for Rheumatology and European Alliance of Associations for Rheumatology.

Study Summary: This study was a placebo controlled, randomized, double-blind study conducted in 2 centers. Participants recruited were adults with gout defined by the 2015 American College of Rheumatology. Participants were randomized in a 1:1 ratio to colchicine 0.5mg daily or

placebo. All participants also were concurrently started on a urate lowering regime of 50mg daily in those with $eGFR < 60 \text{ mL/min/1.73m}^2$ and 100mg daily in those with $eGFR \geq 60 \text{ mL/min/1.73m}^2$. The allopurinol dose was increased monthly until their serum urate was $< 0.36 \text{ mmol/L}$ for three consecutive visits. Colchicine or placebo was continued daily for the first 6 months of the study period.

The authors randomly assigned 200 participants to each arm of the study ($n=100$ for each arm). They found that although there were more flares in the placebo group, it did not meet the non-inferiority margin. The number of gout flares per month between baseline and month 6 was 0.61 (0.47 to 0.74) in the placebo group compared with 0.35 (0.22 to 0.49) in the colchicine group, mean difference 0.25 (0.07 to 0.44) with a non-inferiority $p=0.92$. Over the entire 12-month study period, there was no difference in the mean number of gout flares per month.

Editor's Comments: The study omitted patients with severe chronic kidney disease and may not be generalized to this population. There was also no quantification of flares and relied on subjective patient reports. While these findings do cast doubt on the use of prophylactic colchicine during initiation of allopurinol, it was a relatively small study. It importantly does highlight that gout flares are unfortunately common during the initiation of urate lowering therapy. ■



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