

## Opening Keynote

[Bryan Vartabedian](#), MD, FAAP, Texas Children's Hospital

The Public Physician | Professional Wisdom for Life in a Connected, Always-on World

## Presentation

[Dr. Christoph U. Lehmann](#), UT Southwestern

Ethical Considerations for the Use of AI

Abstract:

Recent advances in the science and technology of artificial intelligence (AI) and growing numbers of deployed AI systems in healthcare and other services have called attention to the need for ethical principles and governance. We define and provide a rationale for principles that should guide the commission, creation, implementation, maintenance, and retirement of AI systems as a foundation for governance throughout the lifecycle. Some principles are derived from the familiar requirements of practice and research in medicine and healthcare: beneficence, nonmaleficence, autonomy, and justice come first. A set of principles follow from the creation and engineering of AI systems: explainability of the technology in plain terms; interpretability, that is, plausible reasoning for decisions; fairness and absence of bias; dependability, including “safe failure”; provision of an audit trail for decisions; and active management of the knowledge base to remain up to date and sensitive to any changes in the environment. In organizational terms, the principles require benevolence—aiming to do good through the use of AI; transparency, ensuring that all assumptions and potential conflicts of interest are declared; and accountability, including active oversight of AI systems and management of any risks that may arise. Particular attention is drawn to the case of vulnerable populations, where extreme care must be exercised. Finally, the principles emphasize the need for user education at all levels of engagement with AI and for continuing research into AI and its biomedical and healthcare applications.

## Focus Session: Artificial Intelligence and Machine Learning Transforming Health

[Dr. Jenny Weon](#), UT Southwestern

Outpatient Data Curation for Predictive Modeling of Iron Deficiency Anemia

Abstract:

Jenny L. Weon, MD, PhD<sup>1</sup>, Sameh N. Saleh, MD<sup>1,2,3</sup>, Yee S. Ng, MD<sup>1</sup>, Chenlu Tian, MD<sup>1</sup>, Andrew Quinn, MD<sup>1</sup>

<sup>1</sup>University of Texas Southwestern Medical Center, Dallas, TX; <sup>2</sup>Children's Hospital of Philadelphia, Philadelphia, PA; <sup>3</sup>University of Pennsylvania, Philadelphia, PA

Abstract:

Iron deficiency anemia (IDA) can herald malignancy and symptoms are often vague, causing the patient to present late in the disease process. An electronic health record (EHR)-based machine learning model to predict IDA in the outpatient setting at the point of care could facilitate early detection and treatment. An essential pre-requisite to an effective machine learning model is proper data curation, but in contrast to inpatient EHR data, there is a relative paucity of methods or best practices for longitudinal outpatient EHR data curation in the literature. We discuss a novel framework to design and curate outpatient EHR data for machine learning with the following components: (1) assess data counts and missingness over different time granularities, (2) define the prediction time horizon using available literature and expert consensus, (3) define the outcomes and generate all outcome permutations, and (4) compare summary statistics of laboratory data with expected values from performing laboratories. We conducted a retrospective observational cohort study of 509,807 adult outpatients across 3,139,395 encounters using native EHR data from a tertiary care academic medical center between January 2005 and December 2020. Types of clinical and laboratory data obtained included coded diagnoses, complete blood counts, basic metabolic panels, complete metabolic panels, iron studies, patient demographics, and Charlson Comorbidity Indices. Applying our framework, we reviewed 1554 lab components in total and reduced to 55 features based on lab component counts, biological plausibility to IDA, and grouping components with high confidence of similarity based on the component name and summary statistics. We also identified and eliminated several potential pitfalls due to variation in the timing and availability of laboratory data as well as anomalous data trends due to changing practices. Future work will focus on the development of an enduring model to predict IDA and integration of this model into clinical workflows.

[Ana Aleksandric](#), UT Arlington

Not all Emotions are Equal: Facebook Data, an Indicator of COVID-19 Vaccine Hesitancy in Texas

Abstract:

Ana Aleksandric, Henry Isaac Anderson, Sarah Melcher, Shirin Nilizadeh, Gabriela Mustata Wilson

Vaccination represents a major public health intervention intended to protect against COVID-19 infections and hospitalizations. However, vaccine hesitancy due to misinformation/disinformation, especially among ethnic minority groups, negatively impacts the

effectiveness of such an intervention. The aim of the study is to provide an understanding of how information gleaned from social media can be used to improve attitudes towards vaccination and decrease vaccine hesitancy. This presentation will highlight the relationship between vaccination rates across different Texas counties and the sentiment and emotional content of social media posts from these counties. Facebook data focused on Spanish-language posts, yielding a valuable dataset for investigating this minority group's opinions about the COVID-19 vaccine over time, while the sentiment of each post was obtained by using machine learning (ML) models. Results indicate that vaccination rates are positively correlated with positive sentiment and joy, while it is negatively correlated with negative sentiment and fear. These findings suggest that social media listening can be a valuable tool for measuring attitudes toward public health interventions.

[Dr. John Robert Bautista](#), UT Austin

Development and Validation of the AI Ethical Concerns Inventory - Healthcare (AIECIH)

Abstract:

John Robert Bautista, Postdoctoral Fellow, School of Information, UT Austin, [jrbautista@utexas.edu](mailto:jrbautista@utexas.edu) [presenter] Rhea Alex, Undergraduate Student, School of Human Ecology, UT Austin, [rheaalex@utexas.edu](mailto:rheaalex@utexas.edu) Kenneth R. Fleischmann, Professor, School of Information, UT Austin, [kfleisch@utexas.edu](mailto:kfleisch@utexas.edu)

The World Health Organization (2021) emphasizes the need to interrogate artificial intelligence (AI) ethical issues as a crucial step towards the development of ethical AI-based health technologies. However, one of the challenges in the field of AI ethics is the operationalization of AI ethical concerns that allows for comparisons among various stakeholders. Recently, Martinho et al. (2021) performed a literature review to generate 40 survey items (categorized in 15 clusters) that reflect AI ethical concerns in healthcare. This prior work represents a starting point toward developing a validated scale. To advance research on the operationalization and measurement of AI ethical concerns in healthcare, this study aims to develop and psychometrically validate the AI Ethical Concerns Inventory – Healthcare (AIECIH; pronounced as eye-see). In phase 1 (data collection in July 2022), six experts (in AI, ethics, and/or medicine) will evaluate the draft version of AIECIH for face and content validity. Experts' comments and suggestions will be used to revise AIECIH in preparation for phase 2. In phase 2 (data collection in August 2022), a pilot sample of 500 US physicians will be recruited to answer the revised AIECIH. Survey data will be analyzed using exploratory (first half of the sample) and confirmatory (second half of the sample) factor analyses to establish construct validity. Structural equation modeling will be performed to establish AIECIH's predictive validity (i.e., which AIECIH construct is associated with acceptance of AI for healthcare). We plan to present the results of phase 1 and 2 in September 2022 at THIAAC 2022. Results of phase 2 will be used to further revise AIECIH for a future nationally representative survey research involving multiple stakeholders. Future research will also involve using the psychometrically validated AIECIH to identify its predictors and outcomes, including differences in AI ethical concerns between health consumers and healthcare professionals.

[Dr. Shakera Moreland](#), HIM Concierge Services, LLC

Evidence-based Recruiting for Artificial Intelligence and Machine Learning Talent

Abstract:

**Background.** The application of artificial intelligence (AI) and machine learning (ML) analysis has become common in healthcare analytics, with the aim to improve patient care delivery. These two interactive methods of analysis have resulted in a unique category of skills that employers are looking for to support their informatics-based strategic planning, electronic health record (EHR) use, and patient care delivery initiatives. With the majority of U.S. healthcare organizations successfully completing or nearing completion of the implementation of EHRs, the goal is now to enhance usage by transforming how care is delivered. Health Informatics professionals with AI and ML skills can support clinicians by focusing on optimizing the EHR for better clinical decision support (CDS) and information exchange, as well as identifying and removing tasks that are of low value.

**Purpose.** Identification, attraction, and recruitment of potential employees with AI and ML skills requires a unique set of tools that must assess the associated specific characteristics of these individuals. Additionally, AI and ML career advisement for these potential recruits is imperative. This improved career planning will yield increases in job satisfaction and productivity for existing employees and increased job placement rates for students. The purpose of this study was to facilitate the best possible acquisition of healthcare professionals with the needed AI and ML skills.

**Study.** In this study, we identified characteristics associated with skills in AI and ML through qualitative and mixed methods analysis. Given that a platform for assessment of potential employment candidates in health information management was already in place, we applied the newly identified characteristics to that platform, allowing for significant expansion of scope for the types of potential employment candidates. The result of this approach can lead to a reduction in misaligned professionals, improved employee retention, and increased revenue.

## Poster Session

[Dr. John Hanna](#), UT Southwestern

Is It Time for Personalized Social Media Health Tabs?

Abstract:

Eleven years after WebConnect revolutionized advertising by allowing clients to select more relevant websites for their display advertisements (ads) to target the right users, Facebook pioneered the targeted ads experience in 2006. Big data enabled social media platforms to train algorithms to deliver ads to the target audiences based on their users' demographics and interests. Many health researchers took advantage of this detailed targeting to reach potential subjects based on studies' inclusion criteria. The low cost and high efficiency distinguished

targeted ads as a major research recruitment tool in the last decade. Even before launching ads, audience size estimates allowed researchers to model populations at-risk for diseases. Thanks to the advancement in ad allocation algorithms and the vast volume of available user's valuable data, not only did targeted ads reach efficiently many under-represented and difficult-to-reach populations, but also, they became more intrusive. However, while it varies between opt-in and opt-out strategies, social media users can control what type of ads they are interested in. Ethical and privacy concerns leaving an identifiable digital trail impair leveraging many of these ads capabilities, especially for vulnerable populations. This warrants social media platforms collaboration with national and local health communities in an analogous way to their response during the COVID-19 pandemic.

Such collaboration allows health communities to map populations at-risk in real-time, and to allocate personalized health ads with a focus on prevention before cure, targeting at-risk opt in online users with the right digital message in the right format at the right time, based on real-world data, driven from public health reports, while leveraging the vast volume of data on social media. As a social media user, I would appreciate a personalized health tab where I can access personalized health communications and recommendations tailored for me by trusted health organizations.

## [Dr. Saket Girotra](#), UT Southwestern

Ankle and Toe-Brachial Index for Peripheral Artery Disease Identification: Unlocking Clinical Data through Novel Methods

Abstract:

Julia E. Friberg\* MPH; Abdul H. Qazi\* MD; Brenden Boyle MD; Carrie Franciscus MA; Mary Vaughan-Sarrazin PhD; Dax Westerman, MS; Olga V. Patterson PhD; Sharidan K. Parr, MD, MSCI, MS; Michael E. Matheny MD, MPH; Shipra Arya MD, SM; Kim G. Smolderen PhD; Brian C. Lund PharmD; Glenn T. Gobbel DVM, PhD, MS;<sup>§</sup> Saket Girotra MD, SM<sup>§</sup>

Center for Access and Delivery Research and Evaluation, Iowa City Veterans Affairs Medical Center (JEF, CF, MVS, BCL) and Department of Medicine, University of Iowa Carver College of Medicine (MVS), Iowa City, IA; Massachusetts General Hospital, Boston, MA (AHQ); Division of Cardiovascular Medicine, University of Minnesota, Minneapolis, MN (BB); Salt Lake City Veterans Affairs Medical Center, Salt Lake City, UT (OVP); Tennessee Valley Healthcare System (MEM, GTG) and Vanderbilt University Medical Center (DW, SKP, MEM, GTG), Nashville, TN; Palo Alto Veterans Affairs Medical Center and Stanford University, Palo Alto, CA (SA); Department of Medicine and Psychiatry, Yale University School of Medicine, New Haven, CT (KGS); and Division of Cardiovascular Medicine, Department of Internal Medicine, University of Texas Southwestern Medical Center, Dallas, TX (SG)

Background: Despite its high prevalence and clinical impact, research on PAD remains limited due to poor accuracy of billing codes. Ankle and toe-brachial index (ABI, TBI) can be used to identify PAD patients with high accuracy within electronic health records (EHR).

Methods: We developed a novel natural language processing (NLP) algorithm for extracting ABI and TBI values and laterality (right or left) from ABI reports. A random sample of 800 reports from 94 Veterans Affairs (VA) facilities during 2015-2017 were selected and annotated by clinical experts. We trained the NLP system using random forest models and optimized it through sequential iterations of 10-fold cross validation and error-analysis on 600 test reports and evaluated its final performance on a separate set of 200 reports. We also assessed the

accuracy of NLP-extracted ABI and TBI values for identifying patients with PAD in a separate cohort undergoing ABI testing.

Results: The NLP system had an overall precision (positive predictive value) of 0.85, recall (sensitivity) of 0.93 and F1-measure (accuracy) of 0.89 to correctly identify ABI/TBI values and laterality. Among 261 patients with ABI testing (49% PAD), the NLP system achieved a positive predictive value of 92.3%, sensitivity of 83.1% and specificity of 93.1% to identify PAD when compared to a structured chart review. The above findings were consistent in a range of sensitivity analysis.

Conclusion: We successfully developed and validated an NLP system for identifying patients with PAD within the VA's EHR. Our findings have broad implications for PAD research and quality improvement.

### Dr. Mark Mann, Texas Woman's University

A 21st Century Game Programming Paradigm

Abstract:

The purpose of this presentation is to examine the effectiveness of an experimental instructional method of delivering self paced educational material using a web browser and an adaptive hypermedia system (AHMS). The experimental adaptive hypermedia system used a type of adaptive navigation support called "link hiding" with a database in the background logging participant feedback and using artificial intelligence to make available various links on the site when the expert system (AI) deems the participants are ready for the material behind the link. Participants in the study were 42 students at a US University. The subjects were prospective preservice teachers in a course on educational media. Total scores on the HTMLCE showed that application of the treatment (AHMS) to the experimental group created a significant difference in scores on the HTMLCE between the control and experimental groups. Such results can be applied to expert systems using (AI) to foster improved public knowledge of important health related instructional curriculum.

### Carolina Ramierz Tamayo, UT San Antonio

Differentiating Experience Level of Radiologists: An Educational Framework to Improve the Quality of Chest X-ray Scanning

Abstract:

Carolina Ramirez-Tamayo, Stanford Martinez, Syed Hasib Akhter Faruqui, Kal L. Clark, Adel Alaeddini, Nicholas Czarnek, Jeffrey R. Mock, Edward J. Golob

Perceptual errors in radiography represent most of the errors while scanning Chest X-rays and lead to mostly misdiagnosis. Considering this scenario, radiologists train themselves by reading x-rays in such a way that they create their own search-pattern strategy. However, these strategies are not reliable due to the lack of quantitative descriptions and are not transferable. For this reason, the use of spatiotemporal feature encoding method is proposed. This feature describes the movement of the eyes when a subject is scanning a Chest X-ray. We use

Eye-Tracking technology to extract data. Using machine learning, this feature encoding method aims the discriminability of subjects, identifying this way whether the person who is scanning a Chest X-ray is an expert or novice. After this, an educational framework to improve the quality of the scans is proposed, taking data from both experts and novices', and stratifying them in different metrics, such as: time to review a scan, number of interruptions, homogeneity, and coverage. This educational framework helps radiologists not only to improve the quality of their Chest X-ray scans but to develop more accurate search patterns considering the measured metrics. The results prove how important are of feedback and intervention when improving radiologist's skills and accuracy levels.

## **Panel Session: Who is responsible? AI Legal and Ethical Implications in Healthcare**

### [Dr. Ronald Peshock](#)

Vice Chair, Imaging Informatics  
Professor, Radiology, Internal Medicine  
UT Southwestern Medical Center

### [Dr. Jennifer Roye](#)

Assistant Dean for Simulation and Technology  
Clinical Assistant Professor  
College of Nursing and Health Innovation  
University of Texas at Arlington

### [Dr. Usha Sambamoorth](#)

Professor of Pharmacotherapy, Associate Dean for Health Outcomes Research  
The University of North Texas, Health Science Center at Fort Worth

### [Edward H. Shortliffe](#), MD, PhD

Chair Emeritus & Adjunct Professor in the Department of Biomedical Informatics at Columbia University's Vagelos College of Physicians and Surgeons  
Adjunct Professor of Biomedical Informatics in the College of Health Solutions at Arizona State University  
Adjunct Professor of Population Health Sciences (Health Informatics) at Weill Cornell Medical College

### [Dr. Mari Tietze](#)

Myrna R. Pickard Endowed Professor  
College of Nursing and Health Innovation  
University of Texas at Arlington

# Lightning Talks: Emerging Technologies to Solve Complex Challenges

[Dr. Jawahar Jagarapu](#), UT Southwestern

Breastfeeding and COVID-19: A Discussion on Twitter

Abstract:

Jawahar Jagarapu<sup>1,4</sup>, Marlon I. Diaz<sup>2</sup>, Christoph U. Lehmann<sup>1,2</sup>, Richard J. Medford<sup>2,3</sup>

<sup>1</sup>Department of Pediatrics, University of Texas Southwestern Medical Center, Dallas, Texas

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Breastfeeding is a critical health intervention in infants. Recent literature reported that the COVID-19 pandemic resulted in significant mental health issues in pregnant and breastfeeding women due to social isolation and lack of direct professional support. These maternal mental health issues affected infant nutrition, such as decreasing breastfeeding rates, during COVID-19. “Twitter,” a popular social media platform, can provide insight into public perceptions and sentiment about various health-related topics. With evidence of significant mental health issues among women during the COVID-19 pandemic, the perception of infant nutrition, specifically breastfeeding, remains unknown.

Objective:

We aim to understand public perceptions and sentiment regarding breastfeeding during the COVID-19 pandemic through Twitter analysis using machine learning and natural language processing techniques.

Methods:

We collected and analyzed tweets related to breastfeeding and COVID-19 during the pandemic from January 2020 to May 2022. We used Python software (v3.9.0) for all data processing and analyses. We performed sentiment and emotion analysis of the tweets using natural language processing libraries and topic modeling using an unsupervised machine learning algorithm.

Results:

We analyzed 40,628 tweets related to breastfeeding and COVID-19 generated by 28,216 users. Emotion analysis revealed predominantly “Positive emotions” (trust, joy, anticipation, surprise) regarding breastfeeding, comprising (72%) of tweets. The overall tweet sentiment was positive, with a mean weekly sentiment of 0.25 (scale +4 to -4) throughout the study, and was affected by external events (Figure 1). Topic modeling revealed six significant themes related to breastfeeding and COVID-19. Passive immunity through breastfeeding after maternal vaccination had the highest mean positive sentiment score of 0.32.

Conclusions:

Our study provides insight into public perceptions and sentiment regarding breastfeeding during the COVID-19 pandemic by leveraging machine learning and natural language processing tools.



Contrary to other topics we have explored (ivermectin, disinformation), we found that breastfeeding had an overall positive sentiment during the pandemic despite the rise in mental health challenges in pregnant and breastfeeding mothers. The wide range of topics on Twitter related to breastfeeding provides an opportunity for active engagement by the medical community and timely dissemination of advice and guidance. Future studies should leverage social media analysis to gain real-time insight into public health topics of importance and apply targeted interventions.

## [Dr. Estefanie Garduno](#), UT Southwestern

Predicting heart disease through supervised machine learning algorithms

Abstract:

Significance: ML is a promising new tool to improve healthcare diagnostics and risk prediction in cardiovascular disease.

Objective: To develop an effective machine learning-supervised model capable of accurately diagnosing heart disease based on individual features.

Methods: In this project, three machine learning models were used (Elastic net, logistic regression, and random forest) to identify individuals with heart disease. The discovery dataset used for model development included 303 subjects (138 with heart disease and 165 controls) and 14 predictor variables (Including traditional cardiovascular risk factors). The outcome variable was diagnosis of heart disease. The discovery dataset was split into training (70%), validation (10%), and testing (20%) subsets. Model development for elastic net and random forest was accomplished using the training and validation splits, whereas logistic regression was fit using only the training split. Hyperparameter selection was performed for elastic net model through cross validation (CV), and for logistic regression backward stepwise selection was used to select the predictors. Predictions were calculated using the testing split and the performance of the classifier was chosen based on the area under the receiver-operating-characteristic curve (AUC). Lastly, an external validation dataset (n=295, 107 cases and 188controls) was used to make predictions.

Results: In the testing dataset, the elastic net model achieved AUC=0.90 and accuracy of 0.88%, the logistic regression AUC of 0.95 and accuracy of 0.84%. For the Random Forest model an Out-of-Box error was 25.21%; the number of variables used at each split were 3 and the accuracy in the testing test was 0.81%.

Conclusion: The logistic regression model outperformed the other models with an accuracy of 0.88% and an AUC of 0.95. In the external validation dataset, the accuracy was 77%. The final model included 6 variables: Sex, heart rate, ST depression induced in exercise, typical and atypical anginal pain and non anginal pain.

## [Christian Lee](#), TCU School of Medicine

Predictive features of cardiac arrest in COVID-19 patients using machine learning

Abstract:

Christian A Lee, Mario Tovar, Amir Mostafavi, Eric H Chou

### Introduction

Nearly 300,000 in-hospital cardiac arrests (IHCAs) occur each year in the United States and only 25% of patients survive until discharge. Despite an overall decrease in hospital admissions during the COVID-19 pandemic, there has been an increase in the rate of IHCAs. Additionally, patients that experienced IHCA while infected with COVID-19 had lower survival rates. However, there is limited research exploring risk stratification and clinical variables that correlate with IHCAs in this sub population of patients.

### Methods

COVID-19 patients admitted from the emergency departments (EDs) of five hospitals in Texas between March and November 2020 were included. All patients had a positive SARS-CoV-2 reverse transcription PCR test and received a chest X-ray. We developed a Random Forest model to predict IHCA in patients admitted to the ED with COVID-19 and suspected pneumonia. We analyzed the variability and associations of clinical variables that were identified as important predictors by the models to further our understanding of the risk factors and underlying disease processes. Clinical features and IHCA statuses were extracted from the electronic medical record. Feature importance was measured by Gini impurity. Two-sided Wilcoxon Rank Sum tests and Fisher's exact tests were used to compare subgroups of patients and to examine the co-occurrence of features, respectively.

### Results

During the study period, 1,485 records were included for final analysis. The top five features of the Random Forest model included age, oxygen saturation at triage, activated partial thromboplastin time, lactic acid, and lactate dehydrogenase levels (Figure 1). Ongoing analyses are examining the co occurrence and correlations of all significant features.

### Conclusion

Machine learning improves risk stratification of COVID-19 patients for IHCA and highlights important clinical features that may guide clinical decision making.

## [Dr. Shirin Nilizadeh](#), UT Arlington

Twitter Users' Behavioral Responses to Toxic Replies

Abstract:

Ana Aleksandric, Sayak Saha Roy, and Shirin Nilizadeh

Online hate speech has been linked to increased offline violence and negative psychological effects on hate targets. However, no work has studied the impact of online hate on users' online behavior. In this paper, we investigate how users on Twitter react to toxic replies to their posts. Through a longitudinal study, we tracked behavioral reactions of 72.2k Twitter user accounts for nine weeks. Then, by quantitatively analyzing and statistically comparing over 9.4K toxic and 66K non-toxic conversation threads, we found that hate targets show a combination of the following behavioral reactions: avoidance, revenge, countermeasures, and negotiation. We found that while a small percentage of hate targets deactivate their accounts (about 0.9%), make their accounts private (about 1%), and remove the replies (about 4%) (all examples of avoidance), most of them (about 60.2%) further engaged in the conversation (a measure of negotiation), with 13.2% of hateful conversations involving at least one toxic reply from the main author, implying that hate targets are likely to respond to hate instigators in a toxic way (an example of revenge). We also found that 16% of users unfriend/unfollow the hate instigators (an instance of countermeasures). We believe our results can assist further studies in developing more effective intervention methods for reducing the negative consequences of toxicity on social media.

[Paul Murdock](#), TCU School of Medicine

Evaluating the Use of HoloLens for Patient Education Pre- and Post-Op

Abstract:

Paul Murdock, MS<sup>1</sup> and Yinn Cher Ooi, MD<sup>2</sup>

<sup>1</sup>TCU School of Medicine; <sup>2</sup>Texas Health Resources

Virtual reality (VR) is a computer-generated environment containing scenes and objects that appear real. Its applications are extensive and include gaming, education, and business. The full potential of VR is still unrealized. This project is significant because of the increased adoption of VR over the last few years. VR growth in healthcare is projected to continue and will likely double in the near future. There have been limited studies supporting VR use for patient education, most research found was designed for providers or students. Our study is novel because of our approach to use VR for patient education. We plan to use this widely supported technology to improve care delivery by supporting patient education.

Surgical candidates who agree to participate in this study will be given a Microsoft HoloLens and will be walked through a PowerPoint deck and 3D anatomy model that illustrates a cerebral angiogram procedure. The medical student will provide the patient with an introduction to how the HoloLens system works. Afterwards, Dr. Ooi will walk the patient through their surgical procedure using a HoloLens. All participants will be provided with a HoloLens. Participation will occur at a single office visit with Dr. Ooi. Before the pre-surgical visit, the patient will be provided with a survey to assess their understanding of cerebral angiograms. After the pre-surgical visit, the patient will be given the same survey to assess whether their understanding has improved.

We anticipate that patients will have a better understanding of the surgical procedure after the HoloLens session. We also anticipate that the technology will be easy to use and widely

accepted by patients. The impact will be vast and will further encourage the design of health information systems for patient education.

## Closing Keynote

[Edward H. Shortliffe](#), MD, PhD

The Evolution of AI in Medicine: How the Past Informs the Future

Abstract:

Five decades have passed in the evolution of Artificial Intelligence in Medicine (AIM), a field that has evolved substantially while tracking the corresponding changes in computer science, hardware technology, communications, and biomedicine. Emerging from medical schools and computer science departments in its early years, the AIM field is now more visible and influential than ever before, paralleling the enthusiasm and accomplishments of AI more generally. This talk will briefly summarize some of AIM history, providing an update on the status of the field as we enter our second half-century. My remarks on this subject will emphasize the role that Stanford played in the emergence of the field. They will also offer the perspective of an informatics journal editor-in-chief who has seen many state-of-the-art AIM papers and thereby recognizes the tension between applying existing methods to new problems and developing new science that advances the field in a generalizable way. In addition, the inherent complexity of medicine and of clinical care necessitates that we address not only decision-making performance but also issues of usability, workflow, transparency, safety, and the pursuit of persuasive results from formal clinical trials. These requirements contribute to an ongoing investigative agenda that means fundamental AIM research will continue to be crucial and will define our accomplishments in the decades ahead.