in left ventricle volume, ejection fraction, and the global myocardial work index (Fig1). As the duration of LBBB increase, there was further deformation of key parameters and the distribution of the segmental myocardial work (Fig1). SPECT detected heterogenous perfusion defects (Fig2). Furthermore, gross anatomical and myocardial pathological changes manifested as cardiomegaly, flaky or focal grayish thickening of the endocardium (Fig3), myocardial fibrosis and degeneration of cardiomyocytes (Fig3B).**Conclusion:** Isolated LBBB is not benign. LBB trunk ablation in beagles over a 12 month period provide a useful model of LBBB-induced cardiomyopathy, manifesting as left ventricular (LV) dysfunction and remodeling, heterogenous hypoperfusion, and pathological alternations. The reduction in LV efficiency and performance deteriorated with the duration of LBBB .

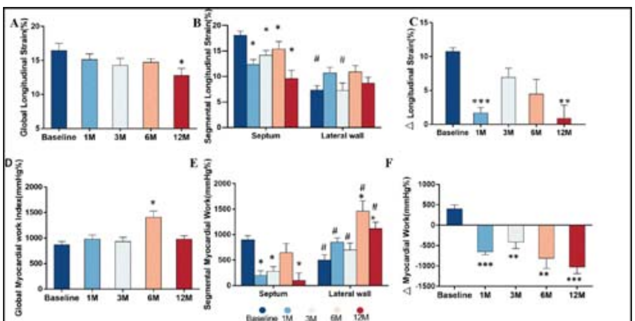


Fig1 Changes in Global and Segmental longitudinal Strain and Myocardial Work Parameters in LBBB dogs
*p < 0.05,**p < 0.01,***p < 0.001 vs baseline ; #p < 0.01, compared with the septal data at the specific stage.

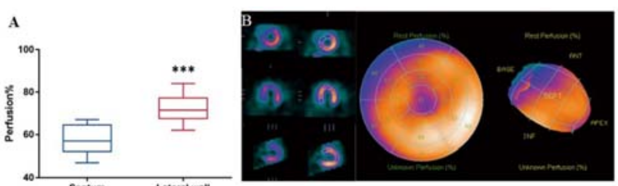


Fig2 Heterogenous Perfusion Defects in LBBB Dogs
(A) The histogram of segmental basal myocardial perfusion in LBBB dogs .(B) Polar map reconstruction of the myocardial perfusion SPECT of a representative LBBB dog.
***p < 0.001, compared with the septal myocardial work.

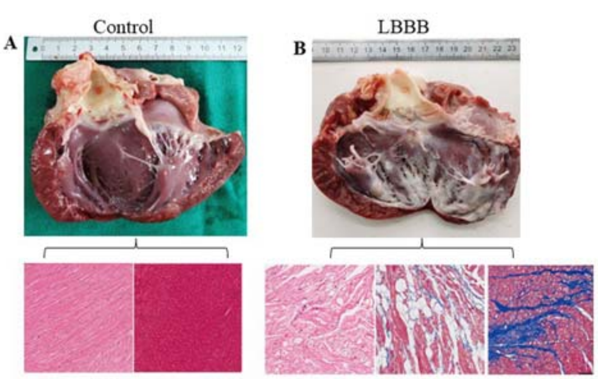


Fig3 Gross Pathology and Pathological Changes
(A) Ventricular myocytes in the control group. (H&E and Masson staining).
(B) Ventricular myocytes from the LBBB showed cellular swelling, fatty degeneration and myocardial fibrosis.

P3-35

Presence of Moderate-to-Severe or Severe Mitral Regurgitation is Associated with an Increase in Left Atrial Appendage Emptying Velocity

Carine A. Tabak, Sarah Baghdadi, Ross Smith, Riya Parikh, Matthew Bajaj, Cody Uhlich, Robert Enders, Ethan Morgan, Jake Baer, Sania Jiwani, Christopher J. Harvey, Amit Noheria. University of Kansas School of Medicine, Kansas City, KS

Background: Atrial fibrillation (AF) is the most common arrhythmia and mitral regurgitation (MR) is a common valvular disease. Both pathologies can coexist with each other. In the setting of AF, left atrial appendage (LAA) dysfunction may lead to increased thromboembolic events such as stroke. LAA emptying velocity (LAAev), as assessed on transesophageal echocardiogram (TEE), is a surrogate for susceptibility to LAA thrombogenesis. While AF is associated with reduced LAA contractility and stasis of blood, MR is characterized by turbulent flow in the left atrium that could have a protective effect against the formation of LAA thrombi. There is little known about the relationship between MR and AF related stroke. In this study, we sought to evaluate the presence of mitral regurgitation as a predictor of LAAev. **Methods:** We searched TEE reports from 2016-2022 at KUMC. Additional information was extracted from review of TEE imaging, transthoracic echocardiogram reports, and medical charts. MR was assessed with TEE and/or transthoracic echocardiogram. The association between moderate-to-severe or severe MR and LAAev was assessed using univariate and multivariate linear regressions. Covariates included in the multivariate model were age, sex, and significant univariate predictors – presence of or history of AF or atrial flutter, type of AF, hypertension, history of venous thromboembolism, coronary artery disease, peripheral artery disease, left atrial size, left ventricular ejection fraction, platelet count, estimated glomerular filtration rate and general anesthesia. **Results:** The analysis included 838 TEEs (61.3% men, age 70.2±13.1 years, 88.8% white). The mean LAAev was 42.2±21.1 cm/s. Forty-six (5.5%) patients had moderate-to-severe or severe MR, and this was associated with 7.2±3.2 cm/sec increase in LAAev (p=0.02). This association between MR and LAAev remained statistically significant on multivariable analysis, with an estimated LAAev increase of 6.3±3.2 cm/sec (p=0.05) attributable to mitral regurgitation. **Conclusion:** Mitral regurgitation increases the LAA emptying velocity, indicating that this form of valvular disease may be protective against AF-related stroke. MR should therefore be evaluated as a negative risk predictor in future AF-related stroke risk models.

POSTER SESSION 4 (P4)

Presented Sunday, June 25, 2:00 PM - 2:45 PM

Artificial Intelligence / Machine Learning
P4-01 through P4-17

Developing Technology and Innovation
P4-18 through P4-26

Doppler / Hemodynamics
P4-27 through P4-36

P4-01 - Oral

Enhancing Patient Comprehension of Echocardiography Reports Through Artificial Intelligence-powered Chat Interactions

Joseph Kassab, Michel Chedid El Helou, Joseph El Dahdah, Habib Layoun, Serge C. Harb. Cleveland Clinic Foundation, Cleveland, OH

Background: The rise of online chat-based artificial intelligence (AI) models has opened up new possibilities in the field of medicine. One of the key contributions of AI chatbots in medicine could be their ability to provide accurate and accessible medical information to patients. This could help bridge the gap between patients and healthcare providers, especially in under-resourced areas where access to medical information and care is limited. An echocardiography report can contain complex medical terminology and results that may be difficult for patients to comprehend. We aimed to evaluate whether AI chatbots could provide patients with accurate explanations to echocardiography-related questions in a conversational and accessible manner. **Methods:** We chose 10 questions that contained complex echocardiography terms and abbreviations commonly found on patients' reports. These questions were submitted to a commercially available online AI interface, and the responses were recorded and evaluated by three experienced cardiac imaging specialists. To ensure consistency, each question was asked three times. Each answer was rated as "accurate," "inaccurate," or "harmful" based on the specialists' clinical judgment and the content of the response. A response was considered accurate if it included all essential information, inaccurate if relevant information was missing or false but non-harmful information was provided, and harmful if it included potentially harmful information that could negatively alter the patient's understanding of the topic. **Results:** The AI model's responses to 8 out of the 10 questions (80%) were deemed accurate by the experienced cardiac imaging specialists. Two responses were rated as inaccurate (20%) but no responses were rated as harmful (0%). The AI model was consistent throughout all answers. **Conclusion:** We found that a popular online AI model provided largely accurate responses to commonly asked echocardiography questions. The use of chat-based AI in medicine is still in its early stages. While current models are not intended for medical use, the potential for such technology to improve the healthcare experience for patients is significant.

Assessment of the Chat-Based AI-Model's Explanation of Common Echocardiographic Terms		
Question	Accuracy Graded by Imaging Specialists	Consistency
What is meant by ejection fraction (EF)?	Accurate	Consistent
What is the meaning of left ventricular end-diastolic volume (LVEDV)?	Accurate	Consistent
What is meant by diastolic dysfunction?	Accurate	Consistent
What is meant by LV strain?	Inaccurate	Consistent
Can you explain what LV stroke volume is?	Accurate	Consistent
Can you explain what is meant by left ventricular outflow tract (LVOT)?	Inaccurate	Consistent
Is mitral regurgitation considered a serious condition?	Accurate	Consistent
What is pulmonary hypertension?	Accurate	Consistent
What is the difference between moderate and severe aortic stenosis?	Accurate	Consistent
Can you explain what color Doppler is in echocardiography?	Accurate	Consistent

P4-02 - Oral

Fully Automated Echocardiographic Estimation of Right Atrial Pressure

Ghada Zamzmi[1], Sameer Antani[1], Li-Yueh Hsu[2], Wen Li[3], Vandana Sachdev[3]. [1]National Library of Medicine, National Institutes of Health, Bethesda, MD; [2]Clinical Center, National Institutes of Health, Bethesda, MD; [3]National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, MD

Background: Right atrial pressure (RAP) estimated by echocardiography from the collapsibility index of the inferior vena cava (cIVC) plays a significant role in the assessment of fluid status in heart failure and in other critically ill patients. Manual measurements of the IVC are limited by inconsistent locations of linear measurements and respiratory variations. While many existing artificial intelligence (AI) reports focus on automating echocardiographic analyses, this is the first work that presents an automated pipeline for cIVC tracking and RAP estimation. **Method:** Using 264 echocardiograms, we trained and evaluated an AI system to identify IVC views, select good quality images, segment IVC region, and quantify IVC diameter. Our system enables the temporal tracking of IVC diameter in real-time and facilitates the automated estimation of RAP based on the collapsibility formulated by the American Society of Echocardiography (3, 8, and 15 mmHg). The automated measurements were compared with the manual values of IVC and RAP obtained from routine clinical echocardiography. Pearson correlation, Bland-Altman (B&A) analysis, and confusion matrix were used to evaluate the system. **Results:** Our system accurately quantified IVC diameter in serial frames and estimated RAP based on cIVC. Figure 1 shows qualitative and quantitative results for automating IVC. Based on correlation (r= 0.96) and B&A plots, there is an excellent match between the automated and manual IVC values. For the RAP comparison, Figure 2 shows the confusion matrix and demonstrates that the proposed pipeline achieved promising results with a macro accuracy of 0.85. **Conclusion:** Our system provides real-time IVC tracking and RAP estimation with results comparable to human measurements. Further, it incorporates variational analysis of cIVC at different spatial locations and various temporal time points to provide more reliable measurements; our system may be easily incorporated into larger AI algorithms for automated echocardiography interpretation.

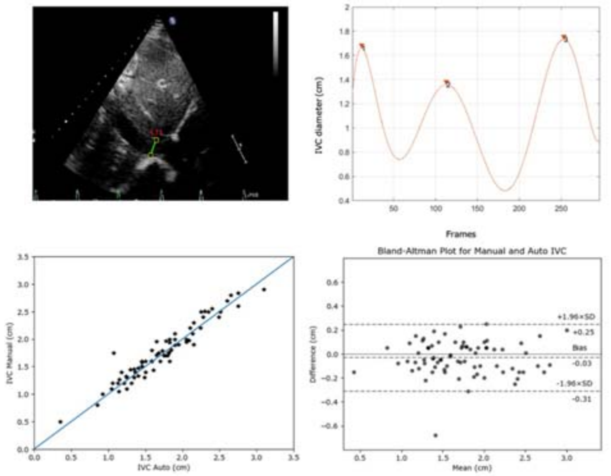
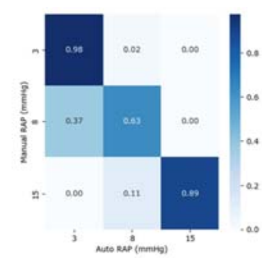


Figure 1. Top left: automated IVC diameter (1.73 cm) in a frame 253. Top right: IVC in each frame of the video. Bottom left: correlation between automated and human IVC for all videos in the test set. Bottom right: Bland-Altman plot for the same set.



RAP	Precision	Recall	F-score
3	0.98	0.80	0.88
8	0.63	0.89	0.74
15	0.89	1.00	0.94

Figure 2. Left: the confusion matrix between the manual and automated RAP values. Right: the performance for the three classes.

P4-03 - Oral

Automated Transcranial Doppler Ultrasound Coupled with A Deep Learning Algorithm for Identification and Grading of Patent Foramen Ovale

Corey M. Thibeault, Robert B. Hamilton. NovaSignal Corp., Los Angeles, CA

Background: The introduction of closure devices for patent foramen ovale has heightened the need to positively identify patients with clinically significant right-to-left shunts (RLS). The complementary value that transcranial Doppler ultrasound (TCD) offers to both Transthoracic and Transesophageal Echocardiography has been well established. However, the difficulty in collecting and interpreting the results for non-expert users has hindered its adoption outside of specialized clinical units. In this work, we combine fully automated TCD with a deep-learning algorithm for interpreting and grading an RLS, called auto shunt grade assist (ASGA), to demonstrate how readily TCD studies can be introduced in any clinical setting. **Methods:** The ASGA model employs a stereotypical image classification network configuration. The bottom layers consist of convolutions of increasing filter size, with two fully connected dense layers feeding a softmax-activated output. The training data for ASGA was created by computationally simulating the Doppler-shifted ultrasound response to blood cells and gaseous emboli in pulsatile flow. The data was created in 60-second Power M-Mode segments with 33 depths. A total of 100,284 segments were generated for training (80%) and validation (20%). Validation was completed using data from the multi-center, prospective, single-arm BUBL study (WCG WIRB: 11JUN2020). Evaluable subjects with embolic stroke of undetermined source, according to standardized