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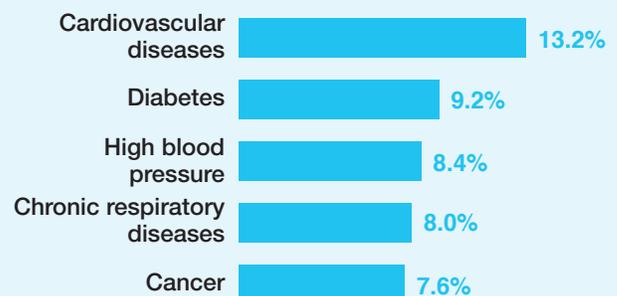
Assessment with Echocardiographic Strain Imaging May Improve Management Outcomes and Future Monitoring for COVID-19 Patients

COVID-19, the disease caused by SARS-CoV-2, has triggered a worldwide pandemic and affected millions around the world has been known to have a major effect on the lungs as a respiratory disease, but evidence suggests that the heart is also at risk. “Individuals with known cardiovascular disease are at an increased risk of more severe complications from respiratory viral illnesses, including the flu and COVID-19,” says Dr. Leslie Cooper, chair of the Department of Cardiology at Mayo Clinic.ⁱ Not only are patients with known heart disease at risk, but anyone affected by the virus SARS-CoV-2 can fall victim to heart damage or even death.

Echo speckle tracking strain imaging is a powerful quantification tool that can improve diagnostic assessment, standardize interpretation and assist in improving the monitoring of patients over time to optimize care. Recent studies have demonstrated both left and right ventricular (LV and RV) longitudinal strain to be useful when assessing and managing the COVID-19 patient population. In particular, RV strain imaging is proving to be a valuable biomarker in determining the mortality rate of COVID-19 patients and is playing a critical role in helping the medical community to better understand the virus’ long-term impacts on the human body.

With a growing number of cases, better tools to risk stratify patients have the potential to assist hospitals in allocating the growingly sparse resources in hospitals.ⁱⁱ Tools for monitoring this population over time may prove essential as we learn more about this virus. Additionally, COVID-19 can cause long-term effects for patients including damage of the lungs, heart and brain, which increases the risk of health problems.ⁱⁱⁱ

SARS-CoV-2 Mortality Rate After Previous Illness



Source: [dw.com/en/coronavirus-who-is-particularly-at-risk-and-why/a-52710881](https://www.dw.com/en/coronavirus-who-is-particularly-at-risk-and-why/a-52710881)

The Application of Echo Strain Imaging to Assist in the Management of COVID-19 Patients

Cardiac societies have stressed the use of appropriate use criteria as the first decision support tool to prioritize the use of cardiac imaging on case-by-case basis in the COVID-19 hospitalized patients.^{iv} In clinical practice, it is routine to evaluate RV function using conventional echocardiographic parameters recommended by guidelines, which include TAPSE, RVFAC, and S'.^v RVLS is a powerful and independent predictor of higher mortality, providing additive predictive value over other echocardiographic parameters in patients with COVID-19.^v

The COVID-19 infection adversely affects the cardiovascular system. Transthoracic echocardiography (TTE) has demonstrated diagnostic, prognostic and therapeutic utility.^{vi} In a recent study, TTE's were performed on patient's with COVID-19. All TTEs were reviewed by two expert echocardiographers and only patients with optimal visualization of both ventricles were included in the study.^{vi} Apical three-chamber, two-chamber and four-chamber views were used for LVGLS and an RV-focused four-chamber view was used for RVFWS and RVGS.^{vi} RV and LV dysfunction were reported in 41.7% and 58.3% of patients.^{vi} While LVGLS was decreased in all patients, RVGS and RVFWS were only significantly decreased in patients with adverse outcomes.^{vi} Right ventricular strain imaging provides fundamental information in the observation and prognosis of patient's with the COVID-19 infection.

A recent study published May 2021 in the Journal of the American Society of Echocardiography (JASE) entitled "Left Atrial Function in Patients with Coronavirus Disease 2019 and Its Association with Incident Atrial Fibrillation/Flutter," from Allison G. Hays, MD, Erin Goerlich, MD, et al. suggests the valuable information speckle tracking strain imaging provides when assessing left atrial strain in COVID-19 patients. Previous studies of complications and long-term effects of SARS-CoV-2 infection have found that patients who are hospitalized with COVID-19 have more than double the rate of arrhythmias, including atrial fibrillation and atrial flutter, a similar rapid rhythm that can lead to heart failure and stroke.^{vii} The research team who conducted this study found that the patients they analyzed (80 with COVID-19, 34 patients without COVID-19) with COVID-19 had a decrease in function in their left atrium. This suggests that



speckle-tracking analysis — and specifically, left atrial strain measurement — could be used to predict which patients with COVID-19 are at highest risk of arrhythmias and develop preventive treatments.^{vii}

Supportive Research

Speckle tracking strain imaging used to assess myocardial wall mechanics is a powerful quantification tool that has been shown to improve diagnostic analysis, standardize interpretation, and assist in monitoring patients over time to optimize care. Studies have demonstrated both left and right ventricular (LV and RV) longitudinal strain to be useful when assessing and managing the COVID-19 patient population.

In the June issue of the International Journal of Cardiology Heart & Vasculature, a research study was published entitled, "Subclinical Left Ventricular Dysfunction in COVID-19," by Harpreet S. Bhatia, Lori B. Daniels, et al. This study evaluated patients with COVID-19 subclinical LV dysfunction using Echolnsight strain imaging. Traditional values along with GLS were compared with the prior and subsequent echocardiographic values for the patients undergoing this study. The study concluded with evidence of patients with COVID-19 having reduced GLS despite their EF being preserved. This study demonstrates the value strain imaging brings to the assessment and monitoring to COVID-19 patients who have been affected by subclinical LV dysfunction.

The March issue of the Journal of Intensive Care Medicine also highlighted a research study regarding strain imaging and COVID-19 entitled, "Right Ventricular Strain is Common in Intubated COVID-19 Patients and Does Not Reflect Severity of Respiratory Illness," from Marvin Chang,

Lauren Gibson, et al. This study sought to determine the correlation between RV dysfunction and respiratory illness severity in critically ill COVID-19 patients. The study investigated RV free wall longitudinal strain (FWLS) with EchoInsight in patients receiving mechanical ventilation for COVID-19-associated respiratory failure. Based on biomarkers, chest imaging and other measures, the patients with abnormal RV strain did not exhibit increased severity of respiratory illness. The study concluded that RV dysfunction is common among critically ill COVID-19 patients but is not related to abnormal lung mechanics. Instead, patients with abnormal FWLS had more favorable lung compliance. RV dysfunction may be secondary to diffuse intravascular micro- and macro-thrombosis or direct myocardial damage.

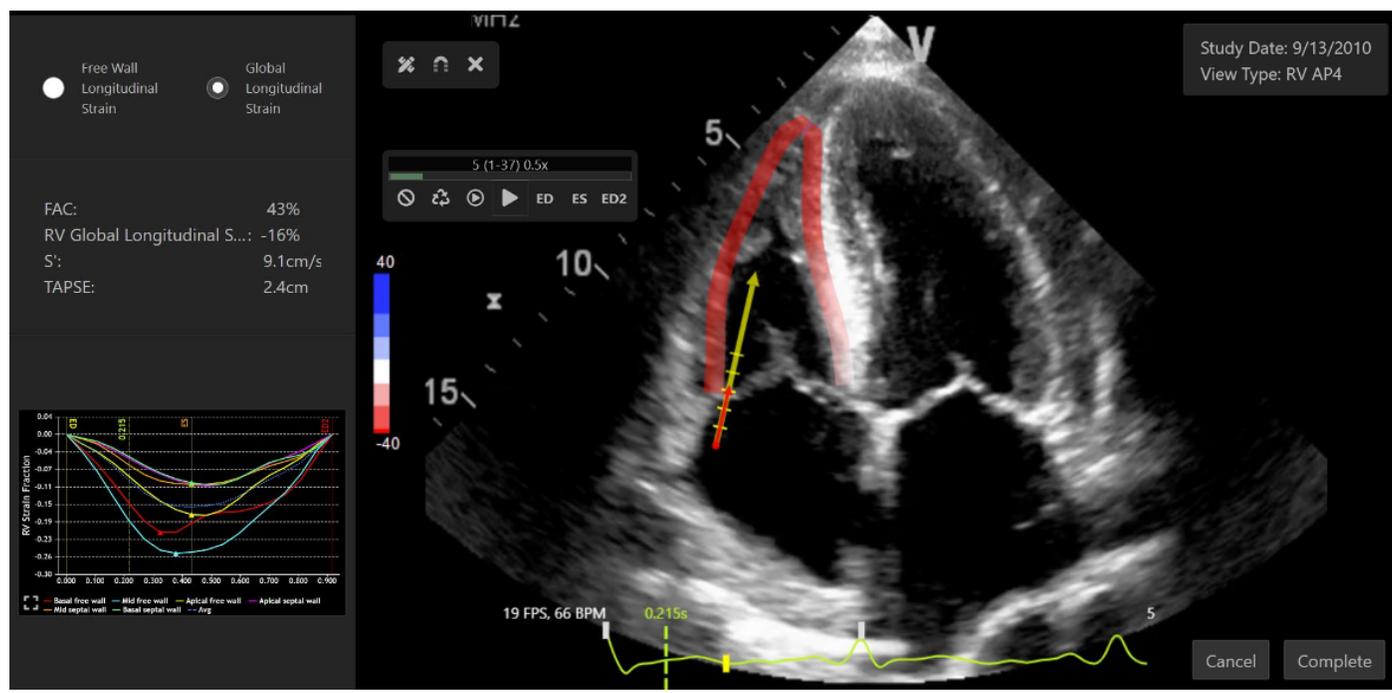
Achieve Efficient, High Quality Strain Imaging Analysis with EchoInsight for Assessment and Long-term Monitoring of COVID-19 Patients

By delivering valuable echo analysis tools that transform patient management, EchoInsight strain imaging is designed to improve diagnostic confidence, standardization and efficiency. EchoInsight provides a clinical suite of applications that manages a wide variety of indications across any echocardiography program. EchoInsight can assist echo labs and hospitals with the COVID-19 patient population as an offline, vendor neutral platform with tailored applications for analysis of the LV and RV, among other useful features.

With a limitation on time and PPE during the COVID-19 crisis, EchoInsight provides a multitude of features and benefits to assist cardiologists, sonographers and most importantly patients. The American Society of

EchoInsight Left Ventricle	EchoInsight Right Ventricle
Global and regional wall and chamber function analysis	Global, free and regional wall and chamber function analysis
Longitudinal, circumferential and radial strain imaging based on view type	Global and free wall longitudinal strain imaging
Automated systolic and diastolic volumes, EF and linear measurements	Automated systolic and diastolic areas and FAC
Bull's eye diagram	Automated TAPSE, S' and linear measurements

Echocardiography has recommended sonographers limit time acquisition with patients and to use abbreviated imaging protocols, along with lab clinician's conduct analysis offline as much as possible. EchoInsight is an offline software that enables an efficient, reliable workflow, allowing users to read from any workstation or device with a web-browser. Typically, EchoInsight is used as an integrated application within the cardiovascular information system (CVIS). **EchoInsight assists in saving time and limiting the amount of contact during study acquisition.**



Rapid, bedside assessment of the heart, chest, and vessels by point-of-care ultrasound (POCUS) has propelled this tool to the frontlines of the fight against the COVID-19 pandemic. EchoInsight analyzes data in DICOM format and can process cine clips for any ultrasound scanner (**NOTE:** acoustic rate data is recommended.)

EchoInsight provides tailored applications for the LV and RV with robust strain imaging and automated cardiac function measurements. These applications can be used in the same study instance – **there is no need to re-analyze the study in a separate application when assessing more than one chamber.** Additionally, EchoInsight provides serial comparison capabilities enabling clinicians to easily assess changes in heart function over time – ideal for long-term monitoring of the effected population if recommended.

Epsilon Imaging offers a EchoInsight LV Contrast application which has been shown to provide accurate assessment of global longitudinal strain when used with contrast enhanced echo studies. Contrast imaging can be of great importance to this patient population when myocardial walls are difficult to visualize, which is frequent with COVID-19 patients. Contrast enhancement of TTE images improves the accuracy and reproducibility of GLS measurements

in patients with poor image quality, resulting in better agreement with CMR, even in patients with suboptimal acoustic windows.^{viii}

EchoInsight for RV assists clinicians to quickly and easily integrate strain imaging into their program and improve patient management. Features include automated processing, rapid serial study comparison, global and regional longitudinal strain and FAC trending with percent change from baseline, automated TAPSE, S' and RV size, clear, concise, highly reliable, and detailed visual-based reporting to aid patient management and customized integration to customer healthcare IT workflow.

As an efficient vendor-neutral strain imaging platform for analysis of echo studies, EchoInsight provides valuable features that go beyond assessment and monitoring for the entire heart. With user-friendly applications, automated cardiac function measurements based on ASE guidelines and serial comparison capabilities, EchoInsight improves standardization and efficiency. As the COVID-19 pandemic continues strain imaging analysis must be considered as a critical indication when assessing and monitoring a patient's health and overall wellbeing.

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Learn how EchoInsight can assist your echo lab during the COVID-19 pandemic: [epsilon-imaging.com](https://www.epsilon-imaging.com)