

# Advancement of echocardiography workflows for heart failure

It's not just recognizing the early onset of heart failure.  
**It's helping to improve cardiac efficiency, diagnosis and outcomes.**

## Challenge

Heart failure is prevalent worldwide, and accurate assessment of heart function using echocardiography is essential.<sup>1,2</sup> Incorporating strain and 3D assessment of the LV and RV has historically been challenging and required specialized skill sets.

## Solution

Philips IntelliSpace Cardiovascular multimodality image and information management solution offers a complete look at a patient's cardiac history. The AI-enabled automation of Philips EPIQ CVx cardiovascular ultrasound system and TOMTEC-ARENA quantification tools provides efficiency and reproducibility during echocardiography studies. These tools can be confidently used while treating a patient before, during and following a heart failure treatment plan. Workflow can be simplified with the remote capabilities of Collaboration Live, the automation of AutoStrain, and AI-enabled tools such as Dynamic HeartModel, 3D Auto RV and 3D Auto MV.

## Results

Combining the exceptional image quality of the EPIQ CVx cardiovascular ultrasound system with TOMTEC-ARENA and the IntelliSpace Cardiovascular multimodality image and information management solution allows for advanced quantification and analysis, with access to information anywhere, anytime across the enterprise. AI-enabled, automated tools for visualization, analysis and streamlined reporting offer robust, reproducible results to help make the effective management of heart failure a reality.

Heart failure is a heterogeneous disease state that can be caused by a variety of underlying conditions, including coronary artery disease, valvular disease, arrhythmias, myocarditis, infiltrative disorders (such as amyloidosis), and from chemotherapy. Heart failure is associated with substantial morbidity and mortality, and is costly to the healthcare system.

Regardless of etiology, the tools to manage it effectively are key to improving outcomes in heart failure. **Heart failure has traditionally been described in terms of LV systolic function: LVEF >50%, termed heart failure with preserved EF (HFpEF), and LVEF <40%, termed heart failure with reduced EF (HFrEF).**<sup>2</sup>

Robust and reproducible imaging tools are important to diagnose and monitor disease progression in heart failure. Current guidelines support the use of advanced echocardiography tools such as longitudinal strain and 3D assessment of LV and RV volumes and function. Artificial intelligence (AI) and advanced automation can help bring the necessary level of reproducibility and robustness to efficiently complete studies and return results to the referring physician.

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– Dr. Akhil Narang  
Northwestern Medicine, Chicago, IL, USA

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## The burden of heart failure is growing

Heart failure generates an enormous clinical, social and economic burden, and is likely to increase in the coming years, with an aging population and a greater number of therapies to treat heart failure. This burden especially affects areas of lower socio-demographic regions that lack the healthcare infrastructure to meet the challenge effectively.<sup>1</sup> The estimated current worldwide economic burden of heart failure is \$346.17 billion.<sup>1</sup> Clearly, new answers are needed. Robust and reproducible 2D and 3D echocardiographic data obtained quickly are key to diagnosing and managing heart failure.

## Clinical perspectives: the value of 2D and 3D echocardiography

Echocardiography is the most commonly utilized imaging test in heart failure.<sup>2</sup> It provides immediate information on chamber volumes and function, valve function, diastolic function and hemodynamics.<sup>2</sup> Bringing advances in AI and automation to echocardiography provides the robust, reproducible results essential for effective diagnosis and management of heart failure.

Dr. Akhil Narang, cardiology specialist and echocardiographer, Northwestern Medicine in Chicago, IL, says, "Echo is often the first cardiac imaging test that's performed for patients with suspected heart failure. An echocardiogram gives us a wealth of information on cardiac structure and function using both 2D and 3D tools. Echocardiography can help us understand the etiology of heart failure in many situations. I routinely use information derived from both 2D and 3D analysis and strain to better understand my patients. AutoStrain, Dynamic HeartModel and Auto RV are invaluable tools that are used both in the diagnosis and surveillance of patients with heart failure.

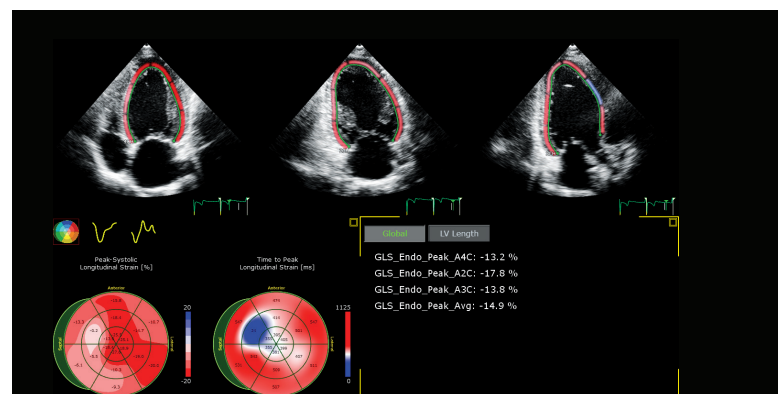
"Our sonographers are our partners in echocardiography, and I think the tools on the Philips platform have made it easy for them to provide us with clinically relevant information. With a simple push of a button, they can get three-dimensional information of both the LV and RV. Compared to the reference standard of cardiac MRI, 2D echocardiography underestimates LV volumes. HeartModel has revolutionized our ability to accurately capture volumetric assessment of the LV by providing accurate 3D information that is readily obtained. Accurate volumetric assessment is particularly important in patients with cardiomyopathies or heart failure, where it's important to understand how our medical therapies impact LV volume and function. With Dynamic HeartModel, we can also assess LV volumes throughout the cardiac cycle – from diastole to systole. Similarly, 3D Auto RV allows us to analyze the volume and function of the right ventricle. The EPIQ platform also includes AutoStrain for both the LV and RV. There is a lot of emerging data that demonstrates the value of strain assessment in a variety of disease states, so tracking these parameters is also very important to my understanding of patients with heart failure," he says.

## The importance of going beyond ejection fraction

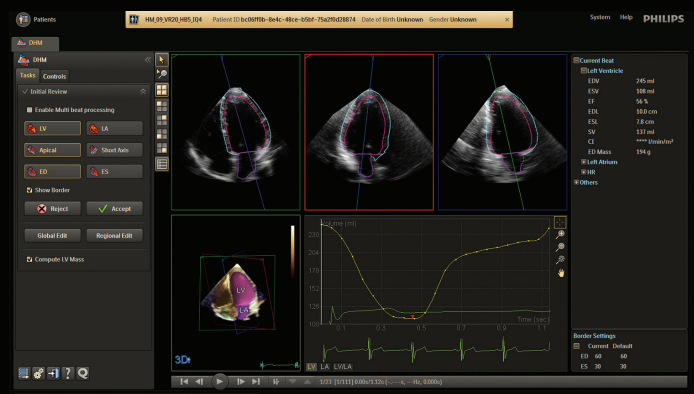
Dr. Marcus Stoddard, Director, Non-invasive cardiology, University of Louisville School of Medicine in Louisville, KY, says with regard to the subclinical detection of myocardial disease, "We apply two-dimensional strain imaging, and this allows us to look for predominantly longitudinal shortening of the muscle to see not only how much percentage-wise is shortened, but also peak systolic and diastolic strain rates. For this particular population – for subclinical detection of myocardial disease – these are useful modalities that you otherwise might not have thought much about because ejection fraction came back to be 55% and you weren't worried about it, but you should be because you have abnormalities in myocardial mechanics. These are the parameters that are going to tip us off about what is normal and what is abnormal."

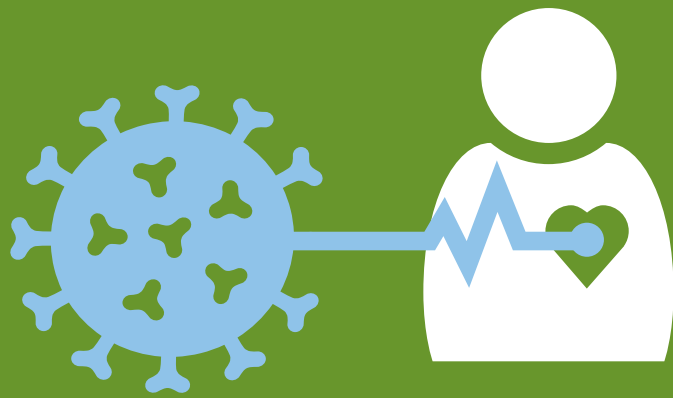
"Two-dimensional strain imaging allows us to look for predominantly longitudinal shortening of the muscle."

– Dr. Marcus Stoddard  
University of Louisville School of Medicine, Louisville, KY, USA



Automation for robust, proven reproducible cardiac quantification in both 2D and 3D.





## COVID-19 may be associated with heart failure, even in patients without history of cardiovascular disease

Research suggests that patients hospitalized with COVID-19 could be at risk of developing heart failure, even if they have no prior history of cardiovascular disease or cardiovascular risk factors. A retrospective analysis of electronic medical records of hospitalized patients with confirmed COVID-19 found that eight out of the 37 patients who had developed new heart failure had no prior history of cardiovascular disease or cardiovascular risk factors. The patients tended to be younger and with leaner body mass than typical patients presenting with heart failure.<sup>3</sup>

## Fast and reproducible tools with integrated workflows

Philips echocardiography solutions (featuring AI and advanced automation) can help bring the level of reproducibility and robustness to echocardiography without impacting overall exam time, making it practical to assess and follow heart failure over time with 2D and 3D echo.

Fast, reproducible 2D strain quantification for the LV, LA and RV can be fully integrated and powered by TOMTEC-ARENA. Full 3D quantification for volumes and functional assessment is provided for the LV, LA and RV through Dynamic HeartModel and 3D Auto RV in QLAB. The mitral valve analysis function offers dynamic analysis of the mitral valve. TOMTEC-ARENA can be launched from within IntelliSpace Cardiovascular, providing powerful quantification and easy access to prior studies and images.

Dr. Jorge Solis, director, noninvasive cardiology area and valvulopathies unit, Hospital Universitario 12 de Octubre in Madrid, Spain, uses TOMTEC-ARENA off-cart on IntelliSpace Cardiovascular to easily calculate strain on virtually all of his patients to assess for early indication of patient deterioration. He says, "Now we can analyze strain off-cart in two to three clicks; it's very easy."<sup>\*</sup>

**"Cardiovascular disease has high prevalence and high complexity, and clinical, cardiac imaging and interventional need to be linked by an information management system in order to work together as a team."<sup>\*</sup>**

– Dr. Jorge Solis  
Hospital Universitario 12 de Octubre, Madrid, Spain

## Integrated solutions for echocardiography

### Philips IntelliSpace Cardiovascular

Accessible anytime and virtually anywhere, IntelliSpace Cardiovascular is a scalable and interoperable multimodality image and information management solution designed to help streamline the cardiovascular workflow and enhance operational efficiency of the entire cardiovascular service line across departments and the enterprise.<sup>\*\*</sup> A timeline view of imaging and information can empower clinicians to turn clinical findings into a decisive actionable plan and streamline efficiency with access to advanced clinical tools and integration with EMR/HIS systems from a single location.

### Philips EPIQ CVx cardiovascular ultrasound

Exceptional imaging capabilities, combined with automated tools for visualization and analysis for robust, reproducible results and workflow efficiencies, are making the effective management of heart failure with ultrasound a reality. The latest release of EPIQ CVx integrates numerous significant quantification features including 3D Auto MV, 3D Auto RV, and the AutoStrain suite of tools for robust and reproducible measurements that can be confidently used while treating a patient before, during and following any treatment plan.

### Philips Collaboration Live

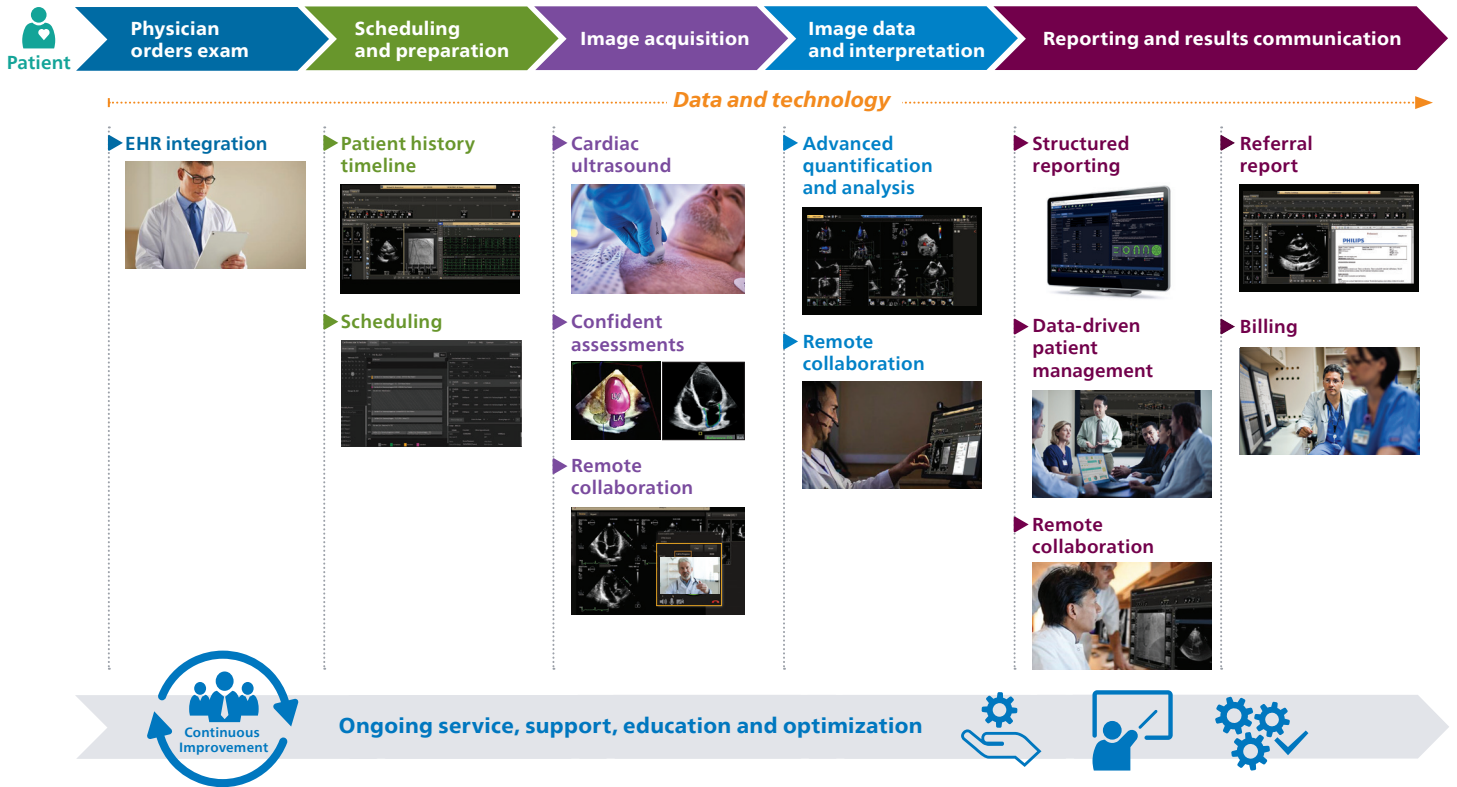
Teams are using Philips Collaboration Live to extend their capabilities by being able to quickly and securely talk, text, screen share and video stream directly from the ultrasound system to other team members for remote support.

### TOMTEC-ARENA AI-enabled applications

Philips extensive expertise in image recognition and segmentation is complemented by the proven, robust quantification capabilities of TOMTEC-ARENA. This helps strengthen diagnostic confidence and treatment planning by optimizing workflows and elevating cardiology performance through AI-enabled applications.

<sup>\*</sup> As mentioned during the Philips Live APAC webinar "Cardiac Imaging Units: The connecting link in the organization of Cardiovascular departments" in 2020.  
<sup>\*\*</sup> It is the user's responsibility to ensure that Philips network requirements (such as performance, VPN) for IntelliSpace Cardiovascular are met.

# Advancing echocardiography workflows



## Conclusion

Powerful workflow advances in echocardiography include a combination of AI-enabled and automated tools. IntelliSpace Cardiovascular multimodality image and information management, EPIQ CVx cardiovascular ultrasound system, TOMTEC-ARENA, and AutoStrain, Dynamic HeartModel and 3D Auto RV in QLAB all aid in the effective management of heart failure. This helps clinicians efficiently stratify heart failure patients, allowing for treatment plans using robust and reproducible methods.

To learn more, visit [www.philips.com/echocardiography](http://www.philips.com/echocardiography).

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3. Alvarez-Garcia J, Jaladanki S, Rivas-Lasarte M, et al. New heart failure diagnoses among patients hospitalized for COVID-19. *Letter. J Am Coll Cardiol.* 2021;77(17):2260–2262.

Results from case studies are not predictive of results in other cases. Results in other cases may vary.

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