

Bringing Together Cardiovascular MR Imaging and Echocardiography with *syngo* Dynamics: How We Report it

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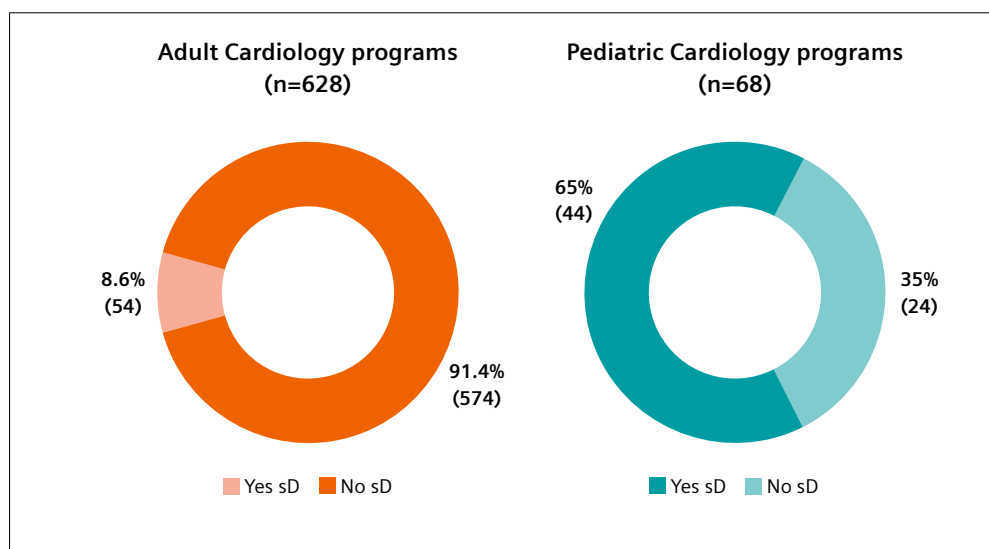
The *syngo* Dynamics team, Circle Cardiovascular Imaging, and the Society for Cardiac Magnetic Resonance (SCMR) are planning to integrate MRI and cardiac ultrasound by creating structured clinical reports that take advantage of the powerful tools of semantic interoperability. More than four years of hard work and dedication between *syngo* Dynamics and the SCMR's Congenital Heart Structured Report Group (CHSRG) have resulted in a reporting template that captures the complex anatomy of congenital heart malformations, cardiac function, strain, 2D and 4D cardiovascular flow, and contrast-enhanced assessments of cardiac fibrosis. This step forward has been a long time coming.

The historic bifurcation of cardiovascular MR and echocardiography: getting back to collaboration and efficiency

The late David J. Sahn, a pioneering echocardiographer, told this apocryphal story: Fifty years ago, the largest

medical imaging companies gathered the leaders of clinical radiology and cardiology. Radiologists, unimpressed with the prospects for echo, chose to follow MRI into the future while cardiologists committed themselves to echo research and its clinical applications. This created a bifurcation that resulted in MRI training for both technologists and clinicians becoming centered in radiology, whereas schools for echo technologists developed independently of MRI and other radiology programs. University cardiology programs that collaborated with industry discovered clinical modalities such as intravascular ultrasound, 2D echo, color flow Doppler, and 3D echo.

Echo and cardiovascular MR (CMR) capabilities are in fact complementary. Researchers, clinicians, and patients have much to gain from the cross-fertilization of these two powerful imaging tools. CMR reveals cardiovascular structure, flow, metabolism, and function using exquisite cross-sectional, 3- or 4-dimensional formats. Yet it will be a long time before CMR can mimic the frame rates, portability, and convenient patient interface of echocardiography.



1 Use of *syngo* Dynamics. Survey of SCMR member adult and pediatric cardiology programs.

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There are important questions that can only be answered by bringing echo and CMR clinical care together.

An unanticipated and unfortunate outcome of this bifurcation was that CMR and echo practitioners found themselves in competition. This had a chilling effect on research collaborations and efficiency. Our new *syngo* Dynamics CMR congenital heart reporting solution is designed to eliminate wasted effort from image acquisition through to post-processing, report generation, and collaboration, all with the overarching goal of serving our patients.

The SCMR and *syngo* Dynamics collaboration

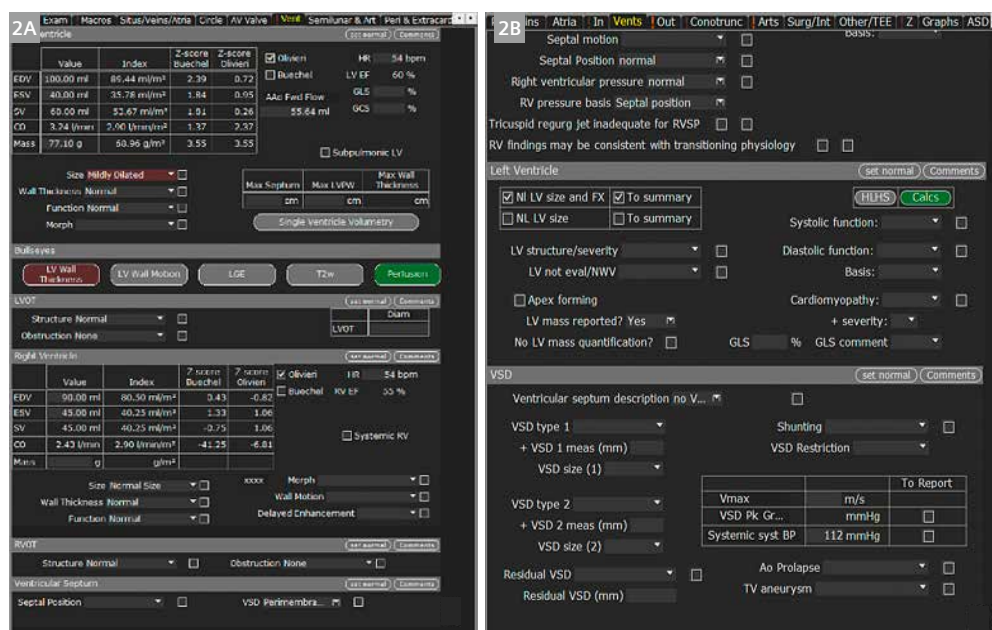
For many years the *syngo* Dynamics echocardiography report has been the mainstay for congenital heart disease reporting in the U.S. As *syngo* Dynamics' interest in CMR reporting grew, and knowing that 65% of the SCMR pediatric institutional membership use the solution for echocardiography (Fig. 1), the team reached out to the SCMR Pediatrics group to explore their interest in developing a structured reporting template for congenital heart disease cases.

For their part, the members of the SCMR Pediatrics group recognized the value of a platform that mirrors the *syngo* Dynamics echo template, its simple interface, logical algorithm, and visual elegance. They seized upon an opportunity to create a CMR structured report that could facilitate multicenter collaborative studies. Figure 2 compares the similar appearance of *syngo* Dynamics' CMR and echo reports.

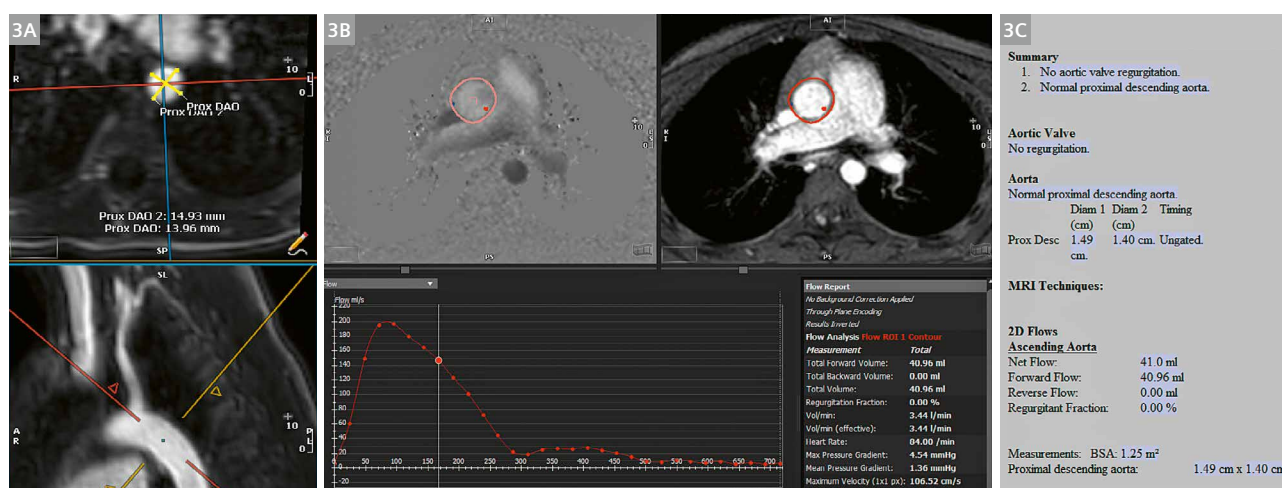
SCMR's Congenital Heart Structured Report Group, the CHSRG (Brian Fonseca, Lars Grosse-Wortmann, Josh Robinson, Animesh Tandon, Andrew Powell, and Michael Silberbach), also knew that the greatest obstacle was not the report format itself. Rather, two issues needed to be addressed: First, consensus on how to manage the labyrinthine complexity of cardiac malformation nomenclature. All agreed that following the nomenclature of the International Paediatric and Congenital Cardia Code (IPCCC) was the way to go [1]. The *syngo* Dynamics team had already created an MRI report for the adult cardiology group at the Cleveland Clinic that contained 506 data elements. Building on the foundation of the adult CMR report, the CHSRG has now constructed a congenital heart report that includes 1,554 data elements. Second, there needed to be a report architecture that facilitates multicenter studies that readily communicate with the National Institutes of Health, academic institutions around the world, industry partners, and other entrepreneurs and collaborators in the private sector. In other words, the new report needed to incorporate semantic interoperability, which is the modern-day sine qua none of all large information systems.

Circle Cardiovascular Imaging joins the project with cvi42

As luck would have it, efforts had begun to tackle the interoperability problem during the Cleveland Clinic project when the *syngo* Dynamics team established a fruitful collaboration with the industry leader in CMR post-processing: Circle. Together, Circle and *syngo* Dynamics established an integration between their two solutions that



2 Comparison between CMR and echocardiographic reporting in *syngo* Dynamics. (2A) shows the ventricular tab in the CMR reporting template, which is structurally very similar to the corresponding ventricular tab in the echocardiographic report template in (2B).



3 syngo Dynamics congenital CMR reporting data flow. Linear measurements (3A) and flow measurements (3B) are imported directly into the syngo Dynamics report. Measurements and flow data are displayed in the measurement section of the report and can be used to guide qualitative assessments in the body and summary (3C).

instantaneously populates important quantitative data from cvi42, such as ventricular function, and parametric mapping values to the syngo Dynamics CMR report. The new syngo Dynamics congenital heart report expands this transfer to include flow and linear measurements specific to congenital CMR reporting (Fig. 3). The group is excited to be working alongside Circle's new CEO, Erkan Akyuz, an industry leader in designing and launching interoperability platforms between disparate healthcare systems.

The future looks bright

The CHSRG will be initiating multicenter studies involving the SCMR's 62 institutional members that already use both syngo Dynamics and cvi42. Moving forward, as the American Society of Echocardiography (ASE) group establishes a syngo Dynamics structured report employing the same IPCCC nomenclature, key ASE-SCMR collaborative efforts will unfold. For example: studying the relative strengths of echo vs. CMR; determining distinguishing characteristics of the two modalities and emphasizing information gaps; evaluating outcomes; and conducting multicenter studies. Even as these projects emerge, our priority is to write a comprehensive whitepaper that will encourage others in the industry to create compatible reports that enable collaborations across platforms throughout the U.S. and the world. We envision successes that emulate the remarkable advancements in cancer therapy achieved by the multicenter Children's Oncology Group [2].

References

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- 2 O'Leary M, Krailo M, Anderson JR, Reaman GH, Children's Oncology Group. Progress in childhood cancer: 50 years of research collaboration, a report from the Children's Oncology Group. *Semin Oncol*. 2008;35(5):484–93.



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