PRECISION IMAGE ANALYSIS

Improving Patient Management with Cardiac MRI and Innovative Remote Post-Processing Analysis

Hawaii Pacific Health, Straub Clinic and Hospital

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Board Certified in Radiology, Dr. Mitsumori holds a Master's of Science in Bioengineering from the University of Washington and a Doctor of Medicine from the John A. Burns School of Medicine at the University of Hawaii. Dr. Mitsumori completed his residency in Diagnostic Radiology and a body imaging fellowship at, and was a staff radiologist and associate professor at the University of Washington with a subspecialty focus in cardiovascular imaging. He recently joined a physicians practice at Hawaii Pacific Health to be closer to family.

About 600,000 people die of heart disease in the United States every year– 1 in every 4 deaths, and it is the leading cause of death for both men and women.[1] Heart disease alone costs the United States $108.9 billion each year[2], a total that includes the cost of health care services, medications, and lost productivity. Cardiac MRI is a non-invasive study that can reduce number of diagnostic procedures, and can result in faster detection and fewer repeat examinations for patients. Cardiac MRI (CMR) is considered the most accurate and reproducible tool for functional analysis of the heart and is considered first line imaging modality for multiple standard indications including heart failure, cardiomyopathy, pulmonary hypertension, constrictive pericarditis, and congenital heart disease.

The Straub Clinic and Hospital is a fully integrated nonprofit health care system with a 159 bed hospital and more than 350 physicians providing patient care in 32 medical specialties. Founded in 1921, Straub continuously strives to bring new technologies and innovative practices to Hawaii. In 2013, Dr. Mitsumori and team initiated a cardiac MR service at Straub. As a completely new clinical service, there were several barriers that needed to be overcome. Vendor applications were scheduled for technologist training and to set up a base set of cardiac MR sequences optimized for the site's 1.5T scanner. In addition to patient scanning capabilities, the cardiac MR service also needed image post-processing capabilities to perform functional and flow analyses on the CMR data sets, which would require the purchase of the necessary software and the acquisition of the skill and knowledge to perform the analyses.

As the CMR post-processing can require a significant amount of time, different workflow models needed to be evaluated based upon site preferences.

Typically, at academic institutions, the majority of the post-processing is often accomplished by residents and fellows, while physician groups may select to train technologists or have the interpreting physician perform the analyses.

"At the University of Washington, I needed to learn how to use different vendor types of software solutions for cardiac MRI analysis, not only to perform the analyses for our clinical exams, but also to train our residents and fellows. During the first few months of every academic year the attending physician would spend time teaching the trainees. Once proficient, the cases would then be pre-read and analyzed by the trainees and then over-read and modified by the attending physician. This process took considerable amount of time, and with each new trainee there was variability in the quantitative results" said Dr. Mitsumori. "Now in this physicians practice, our team had the opportunity to explore alternative workflows that hopefully would be economical and more efficient, yet high in quality"

"As we researched solutions for post-processing analysis, we discovered Precision Image Analysis (PIA). PIA is a vendor independent remote image post-processing analysis service for MRI and CT studies. For our practice, the advantages of using PIA was that we would be able to immediately begin scanning patients and have access to results of quantitative analyses. We would not need to purchase vendor software and did not need to spend the time and resources to train personnel on its use."

In November 2013, after completing application training and performing studies on volunteers, we began our clinical CMR service using PIA for our functional and flow analyses. Once a CMR exam is completed, the technologist sends the study images to PIA directly from the scanner console. Orders are placed by the interpreting physician through a web portal that can be accessed from any computer with internet access at any time of the day. The analyses are performed by the PIA team and the results are returned by our desired turnaround time through the same portal used to place the order. During this time, the qualitative aspects of the exam are evaluated and entered into the report. The quantitative results are added into the report after they are received from PIA and reviewed. This workflow has been very time efficient for our practice as the interpreting physician is freed from performing the time-consuming analyses. As a new service, the use of PIA has been cost effective, in that we are currently pay-per-case and did not have to purchase software that would cost over $50,000. An unforeseen benefit with PIA's service has been that their team of analysts are certified and overseen by Dr. Scott Flamm, Past-President of the Society for Cardiovascular Magnetic Resonance. There have been several exams where we have directly benefited from Dr. Flamm's input and expertise. For example, we recently had a complex congenital heart with single ventricle physiology where the quantitative analysis was discordant with the qualitative interpretation and echocardiography findings. Without Dr. Flamm's assistance, we would have generated a report that our referring clinician may not have trusted and thus lessen the chance of subsequent CMR requests.

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[1] Murphy SL, Xu JQ, Kochanek KD. Deaths: Final data for 2010. Natl Vital Stat Rep. 2013;61(4).

[2] Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Blaha MJ, et al. Heart disease and stroke statistics—2014 update: a report from the American Heart Association. Circulation. 2014 ;128.

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