

ORIGINAL ARTICLE

Congenital Heart Disease

MRI of Congenital Heart Disease: A Paradigm of Collaboration. New Suggestions for a Team Approach from Madigan Army Medical Center*

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ABSTRACT

Over the past decade, there has been increasing use of cardiac MRI in the evaluation of children with congenital heart disease. There has also been an increased number of radiologists and pediatric cardiologists desiring to perform cardiac MRI in the evaluation of these patients. At the present time, the number of pediatric cardiologists and radiologists fully trained in the use of MRI studies for CHD is inadequate to provide this modality at all institutions with MRI capabilities. This article describes the collaborative approach between pediatric cardiology and radiology at Madigan Army Medical Center and its implications for patient care and credentialing.

*The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or reflecting the views of the Department of the Army or the Department of Defense.

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INTRODUCTION

Over the past four decades, American physicians have experienced astonishing growth in their collective knowledge base. However, American physicians have been slow to develop appropriate new guidelines for the division of responsibility in areas where advances in technology bridge the boundaries that have traditionally divided the various specialties. Using computer-assisted resources and documented advanced training opportunities, a physician from one specialty may request privileges that expand his practice into an area which is traditionally the dominion of another specialist. Ten years ago when body magnetic resonance imaging (MRI) first became available at Madigan Army Medical Center (MAMC) for the evaluation of cardiac structures, physicians were confronted by a representative issue of dominion since both the pediatric cardiologist and a radiologist wanted to perform cardiac MRI on children who had congenital heart disease (CHD). The two physicians, however, determined that neither had the technical and clinical expertise to design and perform the study alone. Each physician inquired of his respective discipline and found that few institutions offered any opportunity for training in the MRI evaluation of CHD. Additionally, the pediatric cardiologist was quick to recognize that no amount of formal instruction would insure his access to a magnet receipted to the department of radiology. The physicians concluded that they would be required to collaborate in order to produce a diagnostic study. Early in the experience, appropriate algorithms were introduced eliminating any confusion as to the objectives of a study.^[1] What evolved over five years was a pattern of responsibility for each of the collaborating specialists.

This paper outlines a strategy with specific relevance to MRI of CHD and, as such, might serve as an additional strategy to the recommendations of the Society for Cardiovascular Magnetic Resonance (SCMR) for credentialing in cardiovascular MRI.^[2] There are relatively few cardiovascular radiologists with expertise in MRI applications for CHD. Also, the vast majority of MRI trained general radiologists as well as the smaller number of cardiologists trained in cardiac MRI have received no significant training in CHD. Furthermore, there is a dearth of training sites available, where a pediatric cardiologist can receive MRI training specific to his

discipline. These factors in the current environment create the need for an alternate approach so that the modality of MRI can be more widely applied to patients with CHD.

FORMALIZING THE "TEAM APPROACH"

From 1991, when a new hospital building was inaugurated at MAMC, to 1996, over 300 cases of CHD were studied by MRI under the combined supervision of a pediatric cardiologist and a radiologist. Over time, the pediatric cardiologist present at each study learned to prescribe the MRI study and reformat the MRI images. Conversely, the radiologist became increasingly proficient in recognizing the anatomy typical of the various lesions and learned to appreciate the pertinent negative findings.

As with most military facilities, after a period of time a scheduled rotation of personnel required one of us to relocate. Because the institution wished to ensure the continuation of the program, it sought to formalize the cooperative relationship between radiology and pediatric cardiology through the credentialing process. In this way, the program could continue despite changes in personnel. Therefore, the radiology department solicited consultation from senior experts at large neighboring academic institutions. The consultants were asked to review the program and make suggestions for preserving it as part of the administrative infrastructure of MAMC.

The consultant identified the following areas of expertise as critical to the program:

1. Thorough knowledge of MRI physics.
2. Proficiency in prescribing and interpreting the newer MR angiography pulse sequences (e.g., ciné phase contrast pulse sequences and Gd-enhanced MR angiography) with the ability to reduce common artifacts.
3. Expertise in the prescribing, reading and reformatting of traditional T1-weighted spin-echo anatomical studies.
4. Thorough knowledge of normal and abnormal anatomy (CHD and postoperative anatomy).
5. Comprehensive knowledge of cardiac physiology.

6. Proficiency in performing and reading 2D cardiac echo and Doppler studies.

In addition, the consultants recommended that the selective expertise of the presently involved physicians be documented and used, respectively, as the criteria for future credentialing.

In our institution the radiologist has primary responsibility for MR physics, artifact recognition, and extracardiac anatomy; the pediatric cardiologist has primary responsibility for ultrasonography, cardiac physiology, and clinical evaluation. Both physicians share in the interpretation of images and the prescription of scan sequences.

As at other institutions, privileging at Madigan is the responsibility of a senior level interdisciplinary committee guided by its mission statement: "Privileging is directed solely and specifically to the provision of quality care." The credentials committee found team privileging to be a unique concept but also recognized the depth of experience and knowledge that the team approach brought to the "provision of quality care."^[3]

The team concept was in recognition that a full complement of expertise was required to perform patient studies of diagnostic quality but, as personnel changed, and as cardiac MRI evolved, the contributions of the individuals in their areas of expertise might change as well. The important ingredient was that working together as a team, all relevant and necessary areas of expertise could be covered. The areas of overlapping knowledge provided the possibility for personal development, peer review, and a first level of quality assurance. In this team model, either the pediatric cardiologist or radiologist might perform the final reading; however, this final reading would always reflect the consensus interpretation of both individuals.

Convinced there was no firm precedent to be honored, nor accredited training to be offered, the MAMC 14-member credentialing committee voted unanimously to award credentials to the then current team composed of a pediatric cardiologist and a radiologist to perform the cardiac MRI studies on children and young adults with CHD. The committee stated that the strength of the proposal resided in having both members present at each study. The committee determined that as the exception only studies using more limited predetermined protocols (e.g., coarctation of the aorta) should be performed in the absence of one of the principal physicians. The committee also required that all future privileging actions would be based on the combined credentials of the pediatric cardiologist and/or radiologist.

Our credentialed team approach to the management of a single study is not a unique concept. There exists a clearly recognizable precedence from the early days of cardiac catheterization, especially for CHD. Each time the radiologist responded to an impromptu call from the cardiac cath lab for assistance in performing angiocardiology, he/she and the attending cardiologist became, de facto, a team. In our approach each physician's role is formally acknowledged and their anticipated contribution clearly understood. The model has run smoothly in providing presurgical patient care for over 300 studies at MAMC over the past five years and will work well for other managed care facilities where overall costs are an issue.

DISCUSSION

Implications for Credentialing

The paradigm described in this report addresses issues that may arise whenever a new technology is developed and applied to a recognized clinical problem. In order to assure high quality patient care, individuals who seek to perform new complex diagnostic or therapeutic procedures should attain a certain defined level of competency based on a thorough knowledge of the technology, its inherent limitations and complications, and a comprehensive understanding of its application to specific clinical problems. This level of competency is usually achieved by a combination of didactic course work, self-study of the medical literature, preceptorship, and hands-on supervised experience. Formal training may result in certification which might be required for privileging.

There are many recent examples where advanced technology has spawned new procedures that are claimed by members of several specialties as "belonging" to their specialty, e.g., liposuction. "Turf" battles over imaging techniques are among the most common of these conflicts.^[4] In a number of instances criteria have been developed that permit individuals with different specialty back-ground to perform a given procedure for which they have been specifically trained and have had supervised experience.^[3,5-8] These criteria must be absolutely uniform and attainable by all potential participants recognizing that there may be different pathways that will be used to achieve competency. In many ways this levels the playing field, although "turf" issues often remain and patient safety or care can be compromised by inferior levels of performance, when financial incentives work against fair competition. It is the responsibility of

the hospital medical staff credentials committee to ensure that patient care is the primary concern.

When new procedures become so complex that they require expertise in more than one field, it can be expected that only a few individuals will attain sufficient competency to master all of the skills necessary. In such cases, as described for MRI study of CHD in this communication, a team approach is sensible, efficient, and provides for optimized patient care.

The conditions at MAMC, where physicians are salaried, do not necessarily apply to other types of physician payment plans and our experience does not address the issue of reimbursement. A suitable payment schedule, if needed, must recognize the contributions of each member of the team. Factors that would need to be considered in such an arrangement include scanner and technologist supervision, patient/family discussions, anesthesia or conscious sedation, operational issues, procedure supervision, reformatting and post-procedure image data processing, and interpretation of results. As in the present paradigm, interpretation should ideally be a joint effort, although one individual should be designated as the "official" interpreter for a given study.

Cardiology is a specialty that has succeeded in becoming proficient and independent in a number of imaging techniques originally developed by radiology (e.g., angiography, ultrasound, nuclear imaging) so that, at present, virtually all cardiac imaging except MRI is performed by cardiologists. As MRI and functional techniques for the heart and coronary vessels undergo further development, cardiologists will increasingly seek to include this modality into their practice. Hence, the importance of organizations, such as SCMR and other cardiology groups, that educate cardiologists in cardiovascular MRI applications and serve as sources of information and open dialogue with specialists from many disciplines.

Similarly, radiologists who have not received training in cardiac physiology and the complexities of congenital heart or acquired heart disease, are being encouraged to gain this knowledge through training programs, courses and other educational formats. The authors believe that, for the foreseeable future, the number of fully trained pediatric cardiologists or radiologists that have the knowledge and expertise to both supervise and interpret MRI studies for CHD will be inadequate to provide this

modality of patient care at all institutions with MRI capabilities.

Further, we believe that it is in the best interest of patient care to utilize MRI, and that this can best be accomplished currently using the joint approach to credentialing described herein.

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