The 2006 ACR Forum: Cardiovascular Imaging: Learning From the Past, Strategies for the Future

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This paper summarizes the 2006 ACR Forum, which explored the history of the relationship between radiology and cardiovascular imaging and sought to explore strategies by which radiology could cope with similar challenges in the future. Key topics include: competition between radiology and other medical specialties, the importance of cardiac imaging, the relative merits of cardiologists and radiologists as cardiovascular imagers, and specific recommendations for radiology leaders in the areas of education, research, clinical practice, and policy.

Key Words: Cardiovascular imaging, radiology, radiologists, education, economics

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Herb Abrams, one of the pioneers of cardiac imaging and professor emeritus of radiology at Harvard University and Stanford University, recalls a 2-hour conversation with one of the United States' most prominent radiologists. This leader was lamenting radiology's imminent demise. Neuroradiology was being captured by the neurologists and neurosurgeons, gastrointestinal radiology by the gastroenterologists, uroradiology by the urologists, musculoskeletal radiology by the orthopedists, and so on. What was precipitating what he called the "end of radiology?" Key factors included a lack of interest among radiologists, insufficient training and research, and a dearth of role models. As a result, radiology was about to be picked apart by other specialties, and no one seemed inclined to do much to stop it.

Although this gloomy forecast sounds familiar, this conversation did not take place earlier this year, but some 46 years ago, in 1961. The more things change, the more they remain the same. The bearer of this dark forecast, Leo Rigler, MD, did not foresee the introduction of completely new imaging modalities such as ultrasound, computed tomography (CT), and magnetic resonance (MR), as well as the development of new techniques in angiography and interventional radiology, innovations that would not only revive radiology but endow it with unprecedented strength. And yet his pessimistic forecast was not completely without merit. Radiology would soon largely cede to other specialties a number of these gains, including much of obstetrical ultrasound and most coronary angiography.

What happened, and what lessons can be drawn from this experience for radiology's future? To address these questions, the ACR convened its annual Forum in June 2006, in Reston, Va. The Forum is an annual long-range planning event of the college, which brings together individuals with varied viewpoints and perspectives on a topic considered to be of strategic importance to the specialty. The 2006 Forum was titled "Cardiovascular Imaging: Learning From the Past, Strategies for the Future." The Forum explored the history of the relationship between radiology and cardiovascular imaging and sought to devise strategies by which radiology could cope with similar challenges in the future.

Although cardiovascular imaging served as the focal point of the discussions, the ultimate goal was to look beyond the heart to better understand and respond to the challenges that radiology faces from other specialists across all organ systems and imaging modalities [1]. What follows is a synthesis of the discussions that took place among the Forum participants. The article concludes with consensus recommendations to the specialty on how radiology can better contribute to cardiac imaging.

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COMPETITION BETWEEN SPECIALTIES

Radiologic imaging of the heart takes a number of forms, including plain radiography, cardiac catheterization and coronary angiography, nuclear medicine, echocardiography, CT, and MR. Since the 1960s, however, cardiologists have virtually replaced radiologists in performing echocardiography and catheter cardiac imaging, and nuclear cardiac imaging has been slowly migrating from radiologists to cardiologists [2]. Forum participants identified a number of reasons for cardiology's success with these procedures.

Most significantly, cardiologists see patients clinically and are able to play the roles of both referring physician and imaging consultant, which is almost never the case for radiologists. In addition, the American Board of Internal Medicine required training in these cardiac imaging modalities to sit for its cardiology examination, whereas the American Board of Radiology's oral examination had no specific cardiac section. (A "virtual" cardiac section has recently been added to the American Board of Radiology's oral examination.) Many more cardiologists than radiologists received training in cardiac catheterization and coronary angiography, and cardiology contributed a greater proportion of the research [3]. As of 2003, radiologists were still performing more than 90% of cardiac CT and MR, but cardiologists are showing great interest in these modalities [4].

Today, just as in 1961, some radiologists see the specialty as under siege, even using the term *turf war* to describe the state of affairs [5,6]. They regard cardiac CT and MR as one such turf war, in which every gain by cardiology is a loss to radiology. One difficulty with this siege mentality is that it usually portrays radiology in the role of the besieged. In fact, however, radiology is not a perpetual loser. Over the past few decades, radiology has acquired much more territory than it has lost. As examples, interventional techniques have supplanted general surgery in areas such as abscess drainage and hemostasis, CT has largely replaced diagnostic peritoneal lavage and exploratory laparotomy in the evaluation of abdominal trauma, and positron emission tomography frequently replaces surgical biopsy and resection.

One area in which the role of radiologists has expanded dramatically is neuroradiology. Decades ago, most neuroradiology was performed by neurologists, neurosurgeons, and orthopedists. Over time, however, the new radiologic specialty of neuroradiology was introduced, and now radiologists do most neuroradiology. What happened? First, despite uncertain career prospects, a small number of radiologists dedicated themselves full-time to neuroradiology. Second, the specialty was formalized through fellowships, followed by formal testing by the American Board of Radiology. Third, the National Institutes of Health provided funding for such fellowships, which promoted substantial research in the field by radiologists.

Another area in which radiologists have assumed greater responsibility is breast imaging. This includes a substantial role in patient intake through screening mammography; in diagnosis through diagnostic mammography, aspiration, biopsy, and needle localization; and in management through active collaboration with surgery, oncology, and radiation oncology. Keys to this success included aggressive quality assurance measures such as accreditation, stringent continuing medical education requirements, board certification, and maintenance of certification. Organized radiology was highly supportive of the federal Mammography Quality Standards Act, which many believe was responsible for persuading nonradiologists to give up performing low-volume, low-quality mammography.

Radiology's history has been characterized by successive waves of innovation, in which radiologists develop, nurture, and refine new techniques, getting them reimbursed and simplifying them to the point that other specialties begin to move in. As long as radiology remains dependent on referrals from physicians in other fields, this is situation is likely to persist. One means of thriving in such a niche is to keep innovating, thereby ensuring that radiology is always at the front of the next new wave in innovation.

Cardiac Imaging

What makes cardiac imaging worthy of attention? According to the American Heart Association, approximately 6.5 million US patients visit emergency rooms each year with a chief complaint of chest pain [7]. Although in many cases, the cause of the pain turns out to be noncardiac, cardiac disease is usually the most important diagnosis to exclude. Moreover, the American Heart Association estimates that there are 13.2 million patients in the United States with coronary artery disease. Imaging of the anatomy of the heart and coronary arteries and various aspects of cardiac function is crucial in establishing such diagnoses. Ongoing research suggests that cardiac CT and MR may be able to provide imaging of these structures that is quick, noninvasive, very low risk, and substantially less expensive than other diagnostic alternatives.

Radiologists have other reasons to take a special interest in cardiac CT and MR. For one thing, if radiologists are willing to cede CT and MR of the heart to cardiologists, other specialists may ask why they should not assume responsibility for cross-sectional imaging of their particular organ systems. For example, neurologists and neurosurgeons may seek to take over responsibility for brain and spinal imaging. Orthopedists may argue that