

# The Imaging Revolution: Challenges & Opportunities



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*Among the most breathtaking and rapid of changes in medicine is the fundamental transformation of radiology from a traditional, static diagnostic tool to a proactive, imaging-based interventional treatment and diagnosis discipline. Driven by transformational and disruptive advances in engineering and the computational sciences, demand for imaging is burgeoning both in terms of greater utilization and its expanded application. Concurrently, while the financial and clinical resources required to deliver state-of-the-art imaging services have correspondingly grown greater, they have in practice become markedly harder to obtain and manage. Hospitals across the country are seeking ways to offer advanced imaging capabilities to their patients while ensuring that they can access the capital, constructively align with their physicians, and attract and retain the technical staff necessary to deliver them. These countervailing forces are creating unique challenges and opportunities for hospital leaders. The purpose of this paper is to explore the strategic implications for providers of the evolving role of imaging in clinical care and the burgeoning demand and related resource challenges of imaging services.*

### Burgeoning Demand

Imaging in the United States has experienced explosive growth. Expenditures for imaging services grew from an estimated \$20 billion in 1990<sup>1</sup> to \$200 billion in 2005,<sup>2</sup> a 16.6% compounded annual growth rate that is more than twice the 7.8% compounded annual growth rate of the nation's overall healthcare expenditures during the same period. Over the same time span, imaging services as a percent of total health expenditures climbed from 2.8% to 9.1% ranking it now as the third largest health care expenditure category after hospital care and physician services respectively.

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The growth in the raw number of imaging procedures is equally staggering and is projected to continue unabated. In 2003, there were 459 million annual imaging procedures (85 million inpatient procedures and 374 million outpatient procedures). By 2008, aggregate inpatient and outpatient imaging procedures are predicted to rise by more than 30% to over 600 million.

The majority of this growth is expected to occur in outpatient settings (34%) vs. inpatient settings (18%). This growth will be led by CT (9.3%), MRI (12%) and PET (18%). Of this growth, 57% is estimated to be a function of increased utilization and 43% a function of new applications and expanded uses of imaging in existing fields.<sup>3</sup> This growth is driven by three distinct, yet overlapping, trends:

- 1. Emerging imaging capabilities at the cellular and molecular levels and of rapidly moving tissue, enabling earlier and less invasive diagnosis and treatment.** Today's advanced imaging technologies can diagnose disease far earlier, frequently before symptoms are noticeable. By more precisely imaging the heart, small vessels and other rapidly moving organs and tissues, physicians can replace more invasive techniques and reduce risk. These capabilities are having a significant impact on the diagnosis and treatment outcomes of diseases of the heart and brain and an increasing number of other conditions. As a result, these capabilities are driving greater imaging utilization by both enabling new diagnostic and treatment modalities and being incorporated into a larger number of existing treatment approaches.

- 2. The digitization and computer-assisted modeling of images.** Digitization in concert with computational modeling technologies is creating new and improved imaging capabilities. Images can now be manipulated in a three-dimensional level of detail and at an increasing image contrast that dramatically aids detection and diagnosis. Additionally, advances in digitization enable the expanded application of telemedicine and remote readings.

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- 3. Advanced technologies have transformed imaging into a diversified, highly interventional treatment discipline, resulting in new applications.** Advanced imaging technologies are creating new clinical processes and procedures in real time. Image-assisted surgery, implantation of drug delivery systems, and guided radio frequency ablation, are just a few examples of the way in which state-of-the-art imaging techniques are changing the face of medicine. A by-product of this growth is that imaging technology has expanded well beyond the traditional radiology department; MRI, CT and PET scanners are now commonly found in advanced ORs and special procedure rooms.

Greater consumer access to a wider array of ambulatory care settings is increasing demand. Over the course of the ten-year period from 1993 to 2003, the search for added revenue together with the lowering cost of technology and the ready availability of capital, fueled more than a doubling of freestanding U.S. imaging centers from 2,188 to 4,793.<sup>4</sup>

This trend was also heavily influenced by preferred reimbursements to private outpatient centers. While the growth of such centers has contributed significantly to imaging's higher utilization, a close eye must be paid to proposed changes in outpatient payments that may foster a shift of procedures back to hospital settings.

## Imaging Resource Challenges

As imaging's growth brings enhanced care and greater revenue, substantial capital requirements and widespread manpower shortages at all levels threaten to limit its growth.

- 1. Capital demand for new imaging technologies will continue to rise rapidly.** The increased need for capital to support imaging's growth will continue to compete with other hospital capital needs. Capital spending on radiology equipment is projected to grow 7.6% per year over the next several years, reaching \$10 billion (excluding space and related costs) by 2008.<sup>5</sup> Imaging's capital costs are propelled both by increased unit sales to ever increasing imaging venues and by the rapid commercialization cycle of imaging technology that enables equipment manufacturers to continually advance their products. For example, today's state-of-the-art 64-slice CT will soon be replaced by a 128-slice CT in many advanced centers. Additionally, imaging services are being embedded in other capital investments. An expensive example of this is the evolution of imaging technology being included in the operating suite. The use of imaging in procedures, and other technological advances, is changing the concept of OR design to that of a fully integrated "interventional service area."

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- 2. Specialist physicians and technologists will be in short supply for years.** As advanced imaging demand grows, the need for highly skilled and appropriately trained personnel grows in tandem. The projected shortage in Radiologists alone is stunning. While imaging procedures are growing at 6% annually, the supply of new Radiologists is growing at merely 1.5% per year.<sup>6</sup> Projections suggest that the current gap of 5,000 practicing Radiologists will grow

to 10,000 by 2015 and 15,000 by 2020.<sup>7</sup> Interventional sub-specialists needed for many of the most effective new techniques are even scarcer. For example, a major Midwestern city recently had only two fully qualified Neuro-Radiologists to perform the newest and most advanced neurovascular procedures.

Equally problematic is the shortage of Radiologic Technologists. Current estimates suggest that there are 30,000 Radiologic Technologist vacancies nationwide.<sup>8</sup> Hospitals are reporting that these vacancies are contributing to an assortment of problems including overcrowded EDs, increased ED diversions, declining patient satisfaction<sup>9</sup> and increased length of stay.

## Strategic Implications for Providers

For hospital providers, success in this increasingly complex future will require an incisive strategy for imaging services. It means successfully wielding a full array of clinical and management skills and resources—around service line planning, physician relations, human resources, capital acquisition, practice management, and information systems—in order to piece together the complex mix of specialties, technologies and resources necessary to harness imaging's enormous potential. We believe there are four key strategic implications of this market development for hospital providers:

- 1. Service line organization – the need for flexibility and collaboration.** New imaging technologies are altering the way clinical medicine is practiced and expanding the skills and specialties of traditional Radiologists to the point where historic hospital service line organizations are increasingly challenged in their ability to effectively align, facilitate, and coordinate the necessary portfolio of resources to meet clinical care needs and volume growth requirements. The evolving nature of radiology into an interventional discipline drives the need for closer collaboration among imaging specialists, clinical specialists and surgeons who often will be working physically together in real time. However, this need for closer collaboration is impeded by growing competition among these same specialists who seek to own/practice the new interventional technologies.

While the balance between competition and collaboration will vary depending on the clinical area and local physician supply and demand, it will also evolve in relation to the local hospital's vision and structure for physician relationships and the collaborative agreements reached among those who offer the services. Therefore, while specialists may vie to develop and control these new services, excellence in care will most often be achieved through greater collaboration among clinical specialties than has existed historically. The AAMC asserts, "Promising avenues of basic research and clinical applications require links among and beyond disciplines... and future progress depends on the continual fostering of interdisciplinary collaborations."<sup>10</sup>

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Hospitals and their medical staffs will be challenged to develop new service structures to provide care in an effective and efficient manner. Some organizations are moving toward establishing departments around such areas as "minimally invasive services." This "department" incorporates Radiologists, Surgeons and various medical specialists; the implication is that the traditional departmental structure cannot adapt to meet their needs. Others foresee modifying the economic and operating models of their current departments, from introducing advanced lease models, to the creation of virtual "institutes." For example, a stroke center established at a Midwestern hospital consists of Neurosurgeons, Interventional Neuro-Radiologists, and Neuro-Intensivists who collaborate to manage hemorrhagic strokes and aneurysms, all billed through a single entity. Others will rely on traditional specialist-to-specialist referral relationships but will also support the active definition of new interventional sub-specialties comprised of physicians from varying disciplines.

In planning for the future, flexibility is a core component—the ability to adapt rapidly to the implications of changing technology. Hospital managers and physicians will also need to develop the ability to foster collaboration (among specialties and between physicians and hospitals) while working to balance collaboration and competition. Future models must anticipate and incorporate major changes in medical practice, including:

- The mix of specialties required and the means to attract and retain the scarce physician and allied health manpower trained in the new skills;
- The departmental, economic, and organizational structures under which the specialties will work;
- Revenue sharing models that encourage collaboration, regardless of departmental relationships; and,
- The venues in which care will be provided, the technology needed, and a flexible configuration of the space.

**2. Capital planning – considering new future states.**

As hospital capital needs grow, capital expenditure decisions must be even more tightly tied to the organization's strategic vision of its future and the services it will provide. The imaging revolution adds new dimensions to potential future states that hospital managers and physicians must consider when planning capital expenditures. Assessing decisions against consistent strategic, operational, and financial criteria will be imperative. Figure 1 illustrates these criteria against which capital decision making can occur.

**3. Physician/hospital relationships – capitalizing on opportunities.**

The need to provide these new services in the context of constrained physician and capital supply requires heightened creativity in the formation of physician/hospital relationships.

First, as diverse specialties work together in multidisciplinary teams on one hand and vie to control the new interventional services on the other—hospitals and hospital support will be the battleground upon which this activity occurs.

**Figure 1. Criteria for Capital Planning**

Strategic Considerations
The extent to which the investment advances the organization's core clinical services
The impact on the organization's relationships with its physicians
The impact of the investment on the competition
The implications associated with prospective reimbursement trends
Operational Considerations
The departments/specialists that will operate the equipment—e.g., Radiology, Cardiology, combined services, etc.
The availability of the manpower required to support the investment
The venue for the equipment including on site, off site, in clinics, offices, OR suites and special procedure rooms
The economic model for professional and technical revenue and expense—and its nature—collaborative or competitive
Financial Considerations
The most appropriate, and ultimately effective, capital formation strategy
The required associated ROI
Capital implications for make vs. buy
Capital implications for collaboration vs. independent funding and provision
Opportunity cost implications

Second, Radiologists and other specialty groups are increasingly exercising their leverage in the imaging market as they both negotiate favorable support arrangements from the hospitals they serve while simultaneously moving imaging volume from these institutions to ambulatory settings where they exert even greater control. Finally, recruiting and retaining Radiologists and very scarce interventional subspecialists are rapidly becoming key management competencies for hospitals.

The challenge in each of these cases is to provide a rewarding, enriching and lucrative environment for physicians that supports mutual growth. Hospitals can position themselves effectively to provide the collaborative environment necessary to succeed in the imaging revolution given their relatively greater access to capital and their access to, and influence over, a diverse portfolio of specialties necessary to deliver the full range of clinical care.

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Over the years, great effort has been put into developing the concepts and mechanisms that support successful physician/hospital relationships. Relationships that are strategically and economically meaningful typically are based on two principles: shared investment (in terms of time, effort, and/or financial) by all the players in a common set of resources; and, economic alignment around a business model that enables "all boats to rise." Regardless of the specific mechanisms developed to structure collaboration (e.g., joint ventures, contracted services), certain organizational characteristics are essential. Figure 2 outlines these fundamental characteristics.

**4. Technologist manpower planning.** As demand grows and the supply of caregivers shrinks, manpower planning strategies are critical to

attracting and retaining Radiologic Technologists. Key to such strategies will be the ability to create a practice environment that competitively differentiates an institution from its peers. Five elements are necessary to creating such a setting:

- Push the setting upstream and align with Allied Health school programs, bringing students to the hospital for education and mentoring while offering incentives including signing bonuses, tuition reimbursement and loan forgiveness.
- Design competitive staffing models, including part-time work, flexible staffing models and incentives for less desirable hours.
- Establish career tracks for Technologists.
- Develop a desirable work environment to attract and retain staff; including involving staff in planning and decision-making; implementing performance measures and incentive systems; providing professional development/education programs and appropriate staff amenities.
- Create incentives for professional success.

**Figure 2. Collaborative Organizational Structure: Essential Characteristics**

Common economic definitions
An economic mechanism that aligns activity, reward and investment
Shared incentives and measures
A mutually supported governance/management/decision-making structure and process
An operating platform that supports efficiency and efficacy
Established operations management processes
A robust prospective capital plan with associated capital formation strategies
Access to extensive and ongoing training for all staff

## Conclusion: First Mover or Fast Follower

Imaging advances are fundamentally improving care and changing how medicine is practiced. It is often true that when disruptive technologies present themselves in times of scarcity, great advantage can accrue to select first movers who have planned in advance. It is also true that for others, being a "fast-follower" when under the right circumstances can be the more cost-effective and market-smart move. The key to optimal planning is to determine how imaging will fit into the continuum of patient care today and tomorrow—at your institution, across your medical staff, and in your market.

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