

Innovations in Academic Radiology Programs

Balancing the Three Missions and the Impact on Academic Radiology

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The three missions of academic radiology compete with one another for time and funding. Revenue for the clinical mission often subsidizes education and research. Given the internal and external drivers/pressures on health care and, more particularly, on academic health centers, the current model is unsustainable. Trends seen in other industries are entering academic health care. The radiology department of the future will need to be more efficient with increasingly fewer resources while meeting its missions at higher levels of expectation.

Key Words: Academic radiology; healthcare reform; quality; waste.

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In this report, we examine the evolving ability of academic health centers (AHCs) to meet the demands of their multiple missions and project trends on academic radiology departments. Since the Flexner report (1), AHCs have faced many challenges. One element of this evolution has been the development of medical schools and their hospital partners into complex medical businesses (2). Initially, AHC clinical volumes were sized to meet basic educational and research needs. Clinical volumes exceeded the volumes needed solely to meet these needs. The increased revenues were used to fuel growth in academic enterprises, not just in clinical arenas. Although there was concern that increased clinical business would destroy the academic mission, clinical revenue has become the engine that today subsidizes much of the AHC academic mission. One study showed the clinical mission has provided >70% of faculty salary (3).

Despite representing only 6% of U.S. hospitals (4), AHCs provide a disproportionate share of complex care (Table 1). They provide 22% of services to Medicare beneficiaries and 28% of all Medicaid care. AHCs also provide 41% of all hospital-based charity care. Data analysis by the Association of American Medical Colleges (AAMC) and the Council of Teaching Hospitals and Health Systems (5) has demonstrated that a much higher level of complex care by Case Mix Index (CMI) is found in the AHCs.

AHCs also have a disproportionate economic impact due to the type of care provided and the cross-subsidization of the

education and research mission. An AAMC study showed AAMC-member medical schools and hospitals account for 1 of every 43 wage earners and had a combined economic impact of \$512 billion in 2008 (4). A recent analysis (6) suggests that the national investment in medical research has been a good return on investment. Approximately 40% of medical research in the United States is federally funded (7). Preliminary results demonstrate that \$1.00 of National Institutes of Health (NIH) funding initially generates \$1.70 of output of bioscience industry, but the long-term return may be as high as \$3.40. The life expectancy improvement since 1970 has a social value estimated at \$61 trillion. AHC have become big business, and radiology is a key component.

The 100 years after Roentgen's discovery of x-ray saw an explosion of imaging technology, which has become an essential part of patient care. On a recent survey, computed tomography (CT)/magnetic resonance imaging (MRI), balloon angiography, mammography, and ultrasound were in the top dozen of medical innovations ranked by physicians (8). Investments were made in radiology research, with radiology leaders taking active roles on the national stage. In 2000, President Clinton signed the National Institute of Biomedical Imaging and Bioengineering Establishment Act into law. Dr. Elias A. Zerhouni, former chair of radiology at Johns Hopkins, served as director of the NIH from May 2, 2002, to October 31, 2008. During this period of investment and technology growth, radiologists' salaries grew, with the specialty becoming one of the highest paid specialties (9). However, growth in health care resulted in health care becoming a \$2.2 trillion business, accounting for nearly 20% of the gross domestic product (GDP); this makes the current model unsustainable. As the national deficit and federal spending are reexamined over the coming years, this continued financial support is not ensured. Changes in funding for health care and, in particular, for AHCs could have unintentioned consequences on population health, employment, research, education, and access to complex medical care.

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TABLE 1. Percentage of Intensive Care Units (ICUs), Transplant Services, and Trauma/Burn Centers in Academic Health Centers

Center	Percent
Neonatal ICUs	40%
Surgical transplant services	50%
Pediatric ICUs	62%
All Level I trauma centers	61%
All burn care centers	75%

Data from (4).

CURRENT STATE

Health care reform was a response to longstanding unresolved issues (10) in the health care system in the United States, yet several issues remain unaddressed with further changes likely. Major socioeconomic shifts include an aging population, as well as newly insured populations through the Affordable Care Act. More than half of Americans suffer from one or more chronic diseases at a cost of more than \$1 trillion annually (11). Yet, the current U.S. health care system is badly fragmented with no coordination across the continuum of care, which limits the ability to deliver efficient, high-quality care and control ballooning expenses.

In an analysis of waste in health care, Don Berwick states:

In just 6 categories of waste—overtreatment, failures of care coordination, failures in execution of care processes, administrative complexity, pricing failures, and fraud and abuse—the sum of the lowest available estimates exceeds 20% of total health care expenditures (12, p. 1513).

A 2012 Institute of Medicine (13) report reached similar conclusions, estimating that \$750 billion of the \$2.2 trillion spent on health care in the United States was waste (Table 2).

Geographic variations in cost without corresponding improved outcomes reinforce health policy makers' belief that there are inefficiencies and waste in the system. Radiology is not immune to these systematic problems, as illustrated by geographic variation in imaging utilization (14) and economically motivated imaging (15). Patient choices also affect health care outcomes and costs. Researchers have shown that the annual direct costs of smoking are >\$298 billion (16). Lifestyle choices resulting in obesity and diabetes account for nearly 10% of the annual health care expenditure (17).

Further variability is seen in the nature of radiology practices. Current academic radiology practices range from the community-based radiology residency to the multispecialty academic medical practice (eg, Mayo Clinic, Cleveland Clinic) spanning several locations. The current academic practices have both advantages and disadvantages (Table 3). While there are advantages to a traditional academic structure model, there is further investigation into more multidisciplinary approaches, service lines, and accountable care organizations (ACOs). These new approaches theoretically could be cost effective and patient centric with improved quality. It

TABLE 2. Estimated Sources of Excess Costs in Health Care (2009)

Source of Excess Costs	Cost
Unnecessary services	\$210 Billion
Inefficiently delivered services	\$130 Billion
Excess administrative costs	\$190 Billion
Prices that are too high	\$105 Billion
Missed prevention opportunities	\$55 Billion
Fraud	\$75 Billion

Data from (3).

is unclear where radiology would fit in such a model—as participant or as the leader.

CHANGING REIMBURSEMENT MODELS

As the percentage of GDP consumed by health care has increased, employers and employees have paid more for health care. Between 2000 and 2009, there was a gap between the rate of growth of employee earnings and employee health care costs. The growth in workers' earnings was 37%. The employee health care cost rose 149% with the resulting gap of 112% net increase (18). During this time, CT utilization per 1000 beneficiaries doubled (19). Federal and state regulations will result in changes in the insurance market. Market consolidation has already resulted in larger multihospital and provider systems and fewer independent hospitals and physician groups. As insurance plans try to maintain margins with lower rate increases, medical providers will need to accept risk and manage costs and quality. In such an environment, hospital profit/margin erosions and limited access to capital would be expected unless new efficiencies can be rapidly identified and implemented.

Trends in reimbursement include linking payment to outcomes, procedure bundling, shared risk, and an emphasis on population health. Reimbursement linked to the continuum of care will require coordination between preadmission, admission, and postadmission care—hence, the rationale for penalties for hospital readmission rates regardless of where the etiology of the problem is. New models are likely to favor a larger-scale clinical operation resulting in integration of hospitals and physicians. While academic radiology departments have typically seen referrals from their academic enterprise, AHCs may no longer be the driver for radiology volumes. Changes in insurance plans may force AHCs to send radiology examinations to less expensive providers. This poses interesting questions for the role of the general and specialist radiologists. Recent data comparing the nonexpert with expert readers showed an increase in lesions detected in the refractory focal epilepsy workup, increasing from 39% to 91% (20). Such data will make it harder to justify general radiologists doing specialty work, although the definition of a specialty radiologist is unclear. Specialization within radiology also plays critical roles in education of residents and in research.

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