Financing Research and Education: Current Challenges and Future Solutions—A Summary of the 2009 Intersociety Conference

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Academic radiology departments perform the majority of the educational and research functions that support and grow our specialty; however, these missions are financed heavily from the clinical revenue generated by academic radiologists. This financial dependence on an uncertain revenue stream places our academic missions at considerable risk and strains the solvency of our academic base. Distributing the costs of education and research across the primary beneficiaries of the education and research product would lessen the burden on our academic departments and create a more stable financial base for the future.

Key Words: Academic radiology, finance, radiology education, radiology research

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Established by the ACR in 1979, the Intersociety Conference is intended to promote collegiality within radiology, foster and encourage communication among national radiology societies, and make recommendations on areas of concern. The subject of each meeting is selected by its executive committee. The 57 professional radiology societies that participate in this conference include both diagnostic and interventional radiology, radiation oncology, and radiologic physics.

The Intersociety Conference met from July 31 to August 2, 2009, in Banff, Alberta. As in prior years, the conference consisted of a series of plenary talks and breakout sessions in which each of 3 groups deliberated on specific aspects of financing research and education in radiology and reported their results to the conference attendees. Seventy-six members and executive directors participated in the conference. In addition, there were invited representatives from industry, private practice radiology, and leadership from an academic medical center.

RADIOLOGY'S EDUCATION AND RESEARCH ENTERPRISE

The advances in imaging that have occurred in the past 40 years have altered markedly the practice of medicine and positioned radiology as one of the most critical and highly reimbursed medical specialties. Without the development of ultrasound, CT, MRI, single photon-emission CT, PET, hybrid imaging devices, and interventional radiology, the practice of radiology would have lost its luster many years ago. These technologies and their myriad clinical applications were developed through intensive research and brought to clinical practice via a well-developed educational enterprise. Although industry has played a major role in the development of these technologies, the substantial and critical role of academic departments in this process cannot be denied. Indeed, without our academic education and research enterprise, many of these technologies and their clinical applications might not have come to fruition. The future of radiology depends on the continuation of strong academic education and research programs; however, significant changes in revenue streams, politics, bureaucracy, workload, and the nature of our research are forcing changes in our academic departments that challenge the viability of these programs.

Residency Education

Our residencies used to function as apprenticeships wherein residents performed progressively independent roles as their skills and knowledge increased. Their salaries were paid either by the teaching hospitals or from departments' clinical revenues, and the number of residency positions was limited by the available revenue. In 1965, Congress recognized a need to support graduate

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medical education (GME) and included in the newly enacted Medicare bill a provision to reimburse teaching hospitals for their GME activities [1]. The Medicare GME program along with the other funding sources for resident education (Medicaid, the US Department of Defense, and the US Department of Veterans Affairs) stimulated a substantial increase in the number of residency training positions around the country. In fact, the program was too successful and grew too costly, prompting Congress to place a cap on the number of Medicare-funded GME positions through a provision in the Balanced Budget Act of 1997. As of 2007, Medicare GME funding totaled $8.4 billion. These funds support both direct medical education (DME) expenses (resident stipends, supervising faculty salaries and benefits, and the administrative costs of running GME programs) and indirect educational expenses incurred by teaching hospitals due to increased case complexity, longer stays, and the increased case management time inherent in an educational environment. Although one might expect the majority of these funds to go to DME expenses, the opposite is true, with $5.7 billion of the $8.4 billion going to indirect educational expenses [1]. Of the DME expenditures, the large majority goes to resident stipends. The small residual that is allocated for faculty salaries and administration is a fraction of the global costs of resident education. At most academic centers, the amount of DME funds for these expenses is only slightly more than the salary of an educational administrator. In reality, faculty time spent training residents is not funded by the Medicare GME allocation. The primary revenue stream supporting these efforts is the clinical revenue stream generated by the faculty members.

Non-ACGME-approved fellowships are not funded by Medicare GME dollars. These programs, which include fellowships in musculoskeletal, breast, chest, abdominal, body, MRI, and cardiac imaging, although occasionally funded by hospitals, are more typically funded from academic departments' clinical revenues. Given that most institutional GME programs will not permit non-ACGME fellows to work independently of faculty members in their areas of training, these fellowships represent a significant financial obligation for academic departments without substantial return on the investment.

Medical Student Education

Radiology's participation in medical student education varies between medical schools in the United States. Although some funding for faculty members' time and effort exists at a number of schools, it is typically insufficient to cover the true costs related to the effort. Avoidance is a common consequence of the inadequate funding. Although it makes financial sense for radiology departments to forgo participation in medical student educational programs, it is clearly detrimental to medical student training. If radiologists are not involved in medical student education, who will teach students basic image interpretation, appropriate indications for imaging tests, and the efficacy of interventional procedures? There are other, less obvious negative consequences of not participating in medical student education, such as diminished visibility and standing of radiologists in medical schools, lost opportunity to promote our specialty, and diminished student recruitment opportunities.

Continuing Medical Education

Continuing medical education (CME) is essential for ongoing professional development. In most states, CME is a requirement for relicensing, and it is an integral component of the ABR's [2] Maintenance of Certification program. Providing 30,000 practicing radiologists with the CME they need requires a substantial enterprise. Continuing medical education is available from multiple sources, including commercial programs, industry-sponsored programs, national and regional societal programs, in written form, and online. The majority of the CME content in these programs is produced by academic radiologists, and most of the activity is funded by the academic departments of the participating faculty members. Although there is some funding provided by some of the venues, it rarely covers the full cost of the effort and time involved. In the case of the national societies, the full cost of CME-contributing faculty members is borne by the academic departments. These costs include faculty members' time to develop CME educational material, time away from their departments to present the material, and all travel expenses. The recent significant reduction in industry-sponsored CME activity (because of conflict-of-interest policies) has exacerbated the situation [3]. This, combined with decreasing professional reimbursement, increasing clinical workload, and a poor payer mix, is challenging the sustainability of the existing CME construct.

Research

In the recent past, the bulk of the research in our specialty consisted of clinical observational studies and technology development and application. The clinical studies were often case reports or retrospective studies that lacked scientific rigor. Although the studies served to advance the field, they did not garner the respect of our clinical colleagues who were involved in basic science and clinical trials research [4]. Much of the technological development was performed in partnership with industry. Imaging equipment manufacturers would provide free or low-cost equipment and engineering support to facilitate the refinement of technologies and development of clinical applications. However, this relationship has been challenged recently with the development of conflict-of-in-

terest policies, wherein a strict "quid pro quo" is enforced [5,6]. It is no longer possible for departments to obtain unrelated or disproportionate support from industry for their own research programs; all support from industry requires an in-kind effort from the recipient department.

Although both retrospective and prospective observational clinical studies continue, there has been a significant push to execute rigorous, hypothesis-driven basic science and multicenter clinical trials that are funded by the National Institutes of Health (NIH). Before 1995, radiology departments had very little NIH funding; however, through the efforts of the Academy of Radiology Research and the formation of the National Institute of Biomedical Imaging and Bioengineering, the number of funded imaging studies with principal investigators in radiology departments has increased dramatically. Today, the NIH is the major source of research funding for radiology departments with substantial research programs. Currently, 69 radiology departments have NIH funding; however, 8 departments have 51% of the funding. The differences in the levels of NIH funding among departments are substantial, with the top department having approximately $42 million in grants, compared with just $10,000 for the department with the least amount of funding. Although the growth in NIH funding in radiology departments is impressive, our overall share of the NIH pie remains relatively meager at $350 million per year, or just 1% of the NIH budget [7].

Funding from the NIH is a mixed blessing for radiology departments. Although the funds are a source of pride and help support research, they are often insufficient to cover the actual costs of research projects [8]. The existence of an NIH salary cap that is significantly less than an assistant professor's salary means that radiology departments must subsidize radiologists involved in NIH-funded research. Additional subsidies for NIH-funded research include faculty members' time spent performing pilot studies and writing NIH grant applications; the costs associated with pilot projects; administrative costs before, during, and after a grant; and bridge funding between grants. Depending on the size of research programs in radiology departments, these costs can quickly escalate to become a substantial percentage of an operating budget.

Other sources of research funding include foundations such as the Radiological Society of North America (RSNA) Research and Education (R&E) Foundation, professional research organizations such as ACRIN, professional societies, and departments and institutions. The RSNA R&E Foundation is the largest radiologic foundation, with approximately $33 million in assets. Annually, the foundation awards approximately $2 million in grants, and since its inception, it has awarded 760 grants totaling $30 million [9]. The annual cumulative funds for grants from all radiology endowments total approximately $3 million. ACRIN, a National Cancer Institute–funded medical imaging research network, has provided a total of $100 million in research funding to more than 100 institutions. Fifteen institutions have received more than $5 million each [10]. These numbers are impressive, but they pale in comparison with some of our competition, such as the American Heart Association, which alone provides $130 million in grants annually [11].

Departmental and institutional support for research and education has increased over the years. These funds come from two primary sources—endowments and clinical revenue. Endowments are typically used to fund "endowed chairs," the interest from which is used to pay for the academic time or academic activities of the member of the faculty who "sits" in the chair. Unfortunately, these chairs are rare because they require between $1.5 million and $2 million to form the corpus. Clinical revenue is being used to subsidize an ever-increasing portion of the academic activity within radiology departments as well as within medical schools themselves [12,13]. On average, 20% to 30% of clinical revenue is diverted to help cover academic costs. A department's contribution to institutional academic initiatives is typically not voluntary but assessed as a predistribution president's or dean's tax on clinical revenue, which typically is set at 5% to 10% of clinical revenue. Within radiology departments, the use of clinical revenue to support research can be quite contentious. Nonetheless, within departments with successful research programs, 5% to 10% of clinical revenue is used to support the academic mission [7].

BENEFICIARIES OF RADIOLOGY'S EDUCATION AND RESEARCH ENTERPRISE

The participants in the 2009 Intersociety Conference identified 7 key stakeholders, listed in Table 1, who benefit from radiology's education and research enterprise. They are academic and private practice radiologists, radiologic societies, teaching hospitals, industry, insurance companies, and patients. The participants discussed how each of these stakeholders benefits from radiologic edu-

Table 1. Seven key stakeholders

Academic radiologists
Private practice radiologists
Radiologic societies
Teaching hospitals
Industry
Insurance companies
Patients

cation and research and why and how each should help support the enterprise.

Academic and Private Practice Radiologists

Academic radiologists are the major producers of radiology's education and research products. They derive unique benefits from the programs they generate, including personal satisfaction, academic promotion, and national or international reputations. To a great extent, academic radiologists invest in themselves by diverting their clinical revenue to support research and educational efforts. They are also major contributors to radiologic foundations. Of the physician contributions to the RSNA R&E Foundation, more than 90% are from academic radiologists (V. P. Jackson, MD, member, Board of Trustees, RSNA R&E Foundation, personal communication). As previously stated, they typically cover the majority of the costs incurred while presenting scientific or educational materials at our national societies. Thus, clearly, academic radiologists are heavily vested in radiology's educational and research enterprise.

On the other hand, private practice radiologists are major consumers of the educational and research enterprise. Their global need for CME is staggering: 20,000 private practice radiologists requiring 15 Category 1 CME hours per year totals 300,000 hours of CME annually, or 822 hours a day, 365 days a year. Likewise, the impact of research on private practice radiology is enormous, and a cursory analysis of the financial return of the use of CT and MRI in a radiology practice would provide ample proof of direct benefit.

However, the amount of financial support provided by private practice radiologists to the education and research enterprise is negligible. Although there are a number of radiology groups around the country that are to be commended for contributing to radiology foundations, the majority do not [9]. The lack of investment by private practice radiologists in radiology education and research has been widely recognized [13-15]. William T. Thorwarth Jr, MD, [14] proposed that radiologists contribute 1% of their income to education and research; however, in subsequent conversations with Dr Thorwarth, he has admitted that few radiologists have responded positively to the proposal. Similarly, the ACR's Academic Private Practice Alliance Committee, which has focused on building a symbiotic relationship between academic and private practice radiologists and stimulating the latter group to invest in education and research, has had little success (T. B. Fletcher, personal communication). Nonetheless, it was the unanimous consensus of the Intersociety Conference participants that private practice radiologists have an obligation to invest in radiology's education and research enterprise. The investment can be distilled down to time or money, which are essentially synonymous. Time consists of volunteering to teach or perform clinical work for academic departments pro bono. Financial contributions can be made to national foundations (such as the RSNA R&E Foundation or ACRIN) or directly to academic radiology departments. Funds contributed to departments can be used to establish endowed chairs, create educational endowments, or fund fellowship positions.

Radiologic Societies

The 57 societies of radiology play an important role in supporting and delivering scientific and educational material to radiologists. Typically, societal membership fees and registration fees for programs are quite low. These low fees are a substantial benefit to the radiologists, technologists, and members of industry attending meetings, but they fall far short of covering the true cost of the meetings. Although programs themselves may break even with regard to organizational and operational expenses, the cost of the academic radiologists providing program content is not covered by the meetings; typically, it is borne by the presenters or their academic departments. These costs are substantial. A rough estimate of the cost incurred by the 1,198 faculty members who presented the 4,592 courses and exhibits at the RSNA's annual meeting last year [16] is $5,470,600 (8 hours of preparatory time per course at $100 per hour, plus $1,500 in travel expenses per faculty member). This number alone is sizable, but it is only a fraction of the total expenses paid by the academic community to present at the 57 different radiologic societies each year. The participants at the Intersociety Conference expressed a belief that these costs should be reimbursed to the academic community and that the funds needed to do so should be obtained through increases in societal membership and course fees. The participants stated that the consumers of the academic product should pay the actual costs of the effort rather having it subsidized by the academic community. It was proposed also that radiology journals increase subscription rates and pay authors for their contributions. However, societal representatives expressed concern that an increase in fees or subscription rates would have a negative impact on membership and attendance at the meetings and journal subscriptions.

Another proposal for generating support for the academic education and research enterprise consists of establishing an academic tax on the maintenance-of-certification process. The ABR could assess a tax on all radiologists required to participate in its Maintenance of Certification program and distribute the funds to national foundations and radiology departments of participants' choosing. Alternatively, the expense of the academic enterprise could be decreased by consolidating the 57 radiologic societies into a more efficient structure with

fewer annual meetings. To facilitate the participation of private practice radiologists in the societies, the collection of dues and contributions to foundations and departments could be coordinated through the creation of a United Way type annual fund drive. A single booklet containing entries for all radiology societies could be distributed once a year. This coordinated effort would remove the need for each society to execute independent fund drives and simplify participation for the private practice radiologists.

Teaching Hospitals

Teaching hospitals benefit from the radiology education and research enterprise in a number of substantive ways. The most obvious way is the financial margin that imaging generates for hospitals. At most major medical centers, imaging is 1 of the top 3 sources of marginal income. The radiology educational programs at academic medical centers provide a low-cost workforce that helps deliver contemporaneous clinical service, as well as create a pipeline for the recruitment of future members of the clinical faculties of facilities. Training positions funded through Medicare GME provide a substantial alternate revenue stream through the indirect medical educational payments to hospitals [1]. Last, an active research program feeds the clinical enterprise with new technology and clinical applications. These developments create a cutting-edge environment in diagnostic and interventional services that provides hospitals with both local and national clinical cachet that helps draw patients to the facilities.

The quid pro quo from hospitals to academic radiology departments should consist of shared revenue. It is nearly impossible for an academic radiology department to generate sufficient revenue from the clinical enterprise alone to support the academic missions, pay institutional overhead, and provide competitive salaries to faculty members. In most academic radiology departments, balanced budgets can be achieved only by capturing a portion of the technical revenue stream generated from the imaging operation [13]. This revenue can come from direct ownership in imaging centers or sharing in hospitals' technical revenues. Either way it is essential that teaching hospitals enable this flow of funds.

Industry

Industry has enjoyed a long symbiotic relationship with academic radiology departments that has yielded a significant percentage of radiology's educational and research product. This includes research partnerships wherein industry provides equipment and scientific personnel support, and academic departments provide faculty and scanner time and educational support in the form of sponsored speakers, funded research fellowships such as the GE-AUR Radiology Research Academic Fellowship, and unrestricted educational grants [6]. However, there is a perspective that the relationship is lopsided relative to the benefit derived by each group. The majority of the substantial publicity that the vendors enjoy from scientific and educational presentations, as well as from publications generated by faculty members, is unsupported by industry. Furthermore, industry support of educational programs is meager relative to the total costs of our educational programs (the GE-AUR Radiology Research Academic Fellowship and other sponsored programs not withstanding). Additional support can be justified on the basis of a positive return on the investment in terms of research and adoption of their technology, as well as the training of future users through CME and residency and fellowship programs. Future support should consist of a reduced price structure for clinical equipment for academic departments vs private practice, on-site research resources to include equipment and research scientists, joint grant applications, risk and profit sharing technology development agreements, support of multicenter trials, residency and fellowship support, and GME support.

Insurance Companies

Although Medicare, Medicaid, and the Department of Veterans Affairs provide direct and indirect support for GME, private insurance companies (payers) do not provide overt support for either education or research. Although payers claim substantial support for academic medical centers through higher negotiated medical reimbursement rates (estimated at more than $7 billion annually), the absence of specific negotiated support precludes accurate accounting [1]. Consequently, neither side recognizes an obvious benefit from the support. The participants in the Intersociety Conference identified the following benefits to payers through the support of radiology's education and research enterprise: (1) improvement in the technical quality of imaging through refinement and advances in imaging equipment and imaging technique, (2) standardization of the quality of imaging through the certification of imaging centers, (3) training of radiologists to improve care, (4) development of appropriateness criteria to decrease the inappropriate utilization of imaging studies, and (5) development of alternative minimally invasive image-guided therapeutic techniques that provide equal or improved outcomes at less expense than conventional medical care. Given the positive impact that each of these benefits can have on payers' bottom lines, their support of radiology's education and research enterprise seems appropriate. Although the participants believed that payers should provide direct support to academic radiology departments, they proposed a few novel opportunities, including support for the creation of an NIH-level program or institute focused on the quality of health care, support for com-

parative effectiveness research, the adoption of a policy for coverage during evidence development (ie, agreeing to cover a new service provided the mechanisms are in place to assess the effectiveness of the service), and support of outcome registries.

Patients

Radiology struggles in its effort to obtain patient and public support of our education and research enterprise. This is rooted in the invisible nature of our practice. Few patients meet their radiologists, and many believe that their primary physicians read their imaging studies. Radiology's lack of a public "voice" keeps us isolated from the primary beneficiaries of the health care we provide. This isolation prevents us from participating in the generous philanthropic and political support that other specialties in medicine receive [17]. An effective relationship with our patients would increase their understanding of the impact of imaging on the early detection and diagnosis of disease, as well as the advantages of minimally invasive image-guided procedures such as the possibility of diminished morbidity and improved quality of life. A proactive public relations educational effort could return substantial benefits to our education and research enterprise. Such a program would have to initiate a cultural change in radiology that connects us to our patients in our daily practice, develops a strong focused voice for radiology irrespective of our subspecialties, and embraces patient advocacy groups.

CONCLUSION

The radiology education and research enterprise is a highly beneficial but costly operation. The increasing reliance on the clinical revenue of academic radiology departments to float a large portion of this enterprise places the future of the specialty at risk. There is an opportunity to diversify the financial base of the enterprise by engaging the direct beneficiaries of the academic product and having them invest in their future as well as ours. Although obtaining their support will pose a significant challenge, the alternative of accepting the status quo will likely lead to a slow decay of our specialty.

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