Developments and Innovations in Resident and Fellowship Education

Review Article

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Abstract *Background:* Medical trainee education has drastically changed over the past 30 years significantly since the inception of the Accreditation Council for Graduate Medical Education (ACGME) in 1981. With an emphasis on patient safety, regulations and oversight from the ACGME have drastically changed the way many programs function with respect to trainee responsibilities, duty hours, and resident supervision. *Questions/Purposes:* The purpose of this review is to summarize significant changes and innovations implemented by the ACGME and their proposed effects on trainee education. While there is an emphasis on musculoskeletal radiology fellowship training, the majority of the regulations and guidelines are applicable to all training programs. *Methods:* Articles, commentaries, and policies focusing on ACGME requirements were reviewed, with a focus on musculoskeletal radiology. *Results:* Changes in ACGME policies have resulted in significant structural modifications in how training programs are designed, specifically with respect to curriculum standardization, measuring outcomes of trainee performance, and integration of residents and fellows into hospital-based quality improvement and patient safety initiatives. *Conclusion:* With an eye to continued training program advancement and improvement, the goal of universal oversight and standardization in medical training remains to produce forward-thinking physicians with an emphasis on lifelong learning, patient care, and quality improvement.

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Introduction

Medical education traditionally has largely been based on an apprenticeship model, with the trainee observing and working one on one with clinical mentors in an intensive environment such that, in the past, they physically lived in the hospital (hence the term “resident”) [17]. Even after the time when trainees no longer actually maintained residence in the hospital, the culture of a 24/7 apprenticeship practice of medical training continued. This often led to extensively long shifts and work hours culminating in the tragic Libby Zion case (1984) in New York, where exhaustive work hours by the house staff were felt by many to have resulted in excessive fatigue and thus poor decision-making [4, 20]. As a result, the Bell commission was formed which ultimately led to the State of New York legislating that residents could not work more than 80 hours a week or more than 24 hours in one shift [20].

The Accreditation Council for Graduate Medical Education (ACGME) was established in 1981 through the action of sponsoring institutions, which included the American Medical Association (AMA), the Association of American Medical Colleges (AAMC), the American Hospital Association, the American Board of Medical Specialists, and the Council of Medical Specialty Societies [2, 17]. In 2003, the ACGME adopted the work hours restrictions as crafted by the State of New York and further stated that residents must not work greater than 80 hours per week, averaged over 4 weeks, and must have one day off in seven, free from all clinical and educational responsibilities. More recently, the Institute of Medicine suggested further restrictions of trainee work hours by decreasing the length of shifts, increasing the time off between shifts, and allowing for mandatory rest periods during long work periods [18, 20].

There has been a mixed response from both trainees and faculty with respect to these rules. Many of the more

traditional faculty (and in fact, some trainees) have been of the opinion that such restrictions negatively affect the trainees' medical education by limiting their experiences with clinical patient interactions and surgical procedures [21]. A survey distributed by the American Academy of Orthopaedic Surgeons to all American orthopedic residents and program directors found disparate responses to questions regarding the effects of the 2003 ACGME work hours restrictions: 71% of residents thought that limiting the work week to 80 hours was appropriate compared to 38% of program directors [21]. Of significance, however, in response to the stricter 2011 guidelines, 70% of residents and 79% of program directors thought the new regulations would result in increased number of patient care transitions which would have a negative effect on patient care [21].

On the other hand, others believe work hours restrictions result in a more thoughtful, well-rounded clinician, with better focus and therefore improved patient outcomes [16]. One recent study reviewed residency schedules with attention to work hours and examined trainee-reported quality of care and medical errors [8]. The authors found that residents on rotations that had at least 24 hours of overnight call had higher fatigue scores, with resultant adverse patient care as well as personal outcomes, but those that adhered to the 2003 ACGME work-hour requirements did not [8].

While patient care and quality improvement remain the ultimate objective, the ACGME has recently turned its focus to developing new metrics of documenting trainee progress and development including the Next Accreditation System (NAS) and the Clinical Learning Environment Review (CLER) as well as educational milestones. This review will present these major changes and challenges as they affect all training programs with an emphasis on radiology.

Methods

Standard documents available from the ACGME such as the ACGME Program Requirements for Graduate Medical Education in Musculoskeletal Radiology as well as information regarding the Next Accreditation System (NAS) and Clinical Learning Environment Review (CLER) were reviewed. In addition, a systematic web-based search was performed using the United States National Library of Medicine National Institutes of Health search engine (PubMed). The combination of the Boolean search terms "musculoskeletal" AND "fellowship" AND "education" was used as well as "ACGME" and "work hours." The literature was searched from the present retroactively until approximately 2000.

Results

Several meta-analyses were reviewed, most of which were based on an online questionnaire survey type format, with interrogation of program directors, current and past fellows, as well as practicing physicians. Major summary points largely with an emphasis on radiology point to a variety of challenges in fellowship and resident education including

the increasing demand for fellowship training and concern regarding the turnover rate of program directors (Table 1). In addition, articles summarizing recent changes in ACGME regulations, including the NAS, educational milestones, and the CLER program, as well as source documents from the ACGME are presented.

Discussion

Changes and developments in trainee education have resulted in universal improvements in oversight, supervision, and curriculum standardization, but many challenges remain [1, 14, 27, 28, 33]. Maintenance of rules and regulations from both the ACGME as well as hospital administration can be burdensome not only to program directors but also faculty, trainees, and support staff [30]. The dilemma of ACGME versus non-ACGME accreditation, the number of fellows to accept, and, for our specialty which does not have a formal match process, determining the timing of interviews, all remain significant challenges not only for the programs but for the resident applicants [5, 9, 19, 29, 32].

Formal oversight of programs with an emphasis on patient safety and quality improvement has evolved with the recent development of the Next Accreditation System (NAS), phased into implementation in July 2013 for seven specialties (diagnostic radiology, emergency medicine, internal medicine, pediatrics, neurological surgery, orthopedic surgery, urology) and which will be universally applied to all programs in July 2014 [24]. The NAS was, at its core, designed as an outcomes-based measure to allow continued accreditation based on a variety of components including program attrition, significant changes in program structure, scholarly activity and research, resident and faculty survey data, educational milestones data, and CLER visit reporting [23, 24].

The CLER program was designed partly in response to the Institute of Medicine's report on resident hours and patient safety and emphasizes the extent of which residents and fellows are integrated and involved in patient and hospital based quality improvement and safety programs [18, 20, 31]. The six arms of the CLER program decidedly underscore the program's emphasis on quality of patient care: transitions of care, patient safety, quality improvement, promoting appropriate resident and fellow supervision, duty hour oversight and fatigue management, and enhanced professionalism [31]. Of significance, the CLER site visits will involve all departments as well as hospital leadership, nursing, and other support staff, thus emphasizing the multidisciplinary nature of the interactions of both trainees and patients and their effects on patient care.

The educational environment of resident and fellow trainees will further transform under the NAS by concentrating on competency-based milestones, used to monitor trainee performance and progress over time. These outcomes-based objectives are based in the six core competencies (patient care, medical knowledge, practice-based learning and improvement, systems-based practice, professionalism, interpersonal skills and communication) and were composed

Table 1 Snapshot of views and opinions regarding recent educational changes and developments with an emphasis on radiology

Authors	Objective	Study design	Results/recommendations
Yablon et al. [33]	Needs assessment of musculoskeletal radiologists regarding their training experience and perceptions of a standardized fellowship curriculum	Survey sent to members of the Society of Skeletal Radiology querying their practice patterns and fellowship program design	Lowest rated components of fellowship training included lack of curriculum (57%), lack of structured learning (48%) and lack of mentoring (24%). A more structured educational design with a standardized curriculum, clear expectations, and performance assessment recommended.
Nicholson et al. [25]	In response to the ABR changes to the board examination, residents were queried about the potential restructuring of the fourth year curriculum	An online survey was sent to residents at the authors' institution ($N=36$)	Response rate, 61%. Fifty percent of residents wanted to spend 6 months in one area. The majority (73%) intended to use the fourth year to do rotations other than their planned fellowship.
Mulcahy et al. [22]	To examine whether or not radiologists anticipated changes in radiology fellowships in response to the new ABR certification timeline	Online survey to program directors, radiologists affiliated with fellowship programs, and recent fellow graduates.	Most program directors and radiologists affiliated with fellowship programs anticipated no significant changes; however, recent fellow graduates expected to see increases in the number of applicants to fellowship programs, positions filled internally, positions filled by senior residents ("miniFellows") and the importance of doing a fellowship.
Webber et al. [30]	To review perceptions and trends with respect to training program leadership turnover, responsibilities and residency requirements	Web-based survey sent via email to program directors of diagnostic radiology residency programs	Has taken longer and required more pages to complete the Program Information Form (PIF) than previously. Turnover among program directors is a "current/impending" problem and the majority of respondents felt that time spent on documentation detracted from teaching, learning and taking care of patients.
Baker et al. [6]	To survey radiology chairpersons' views about the value of education with respect to department success and to report their direct involvement in the educational process	Hard copy questionnaire mailed to all American members of the Society of Chairmen in Academic Radiology (SCARD) querying their opinions on relative value of education among other metrics of department success	Response rate, 63.9%. Resident training fourth most frequently cited metric of department success (86%). Department size had an inverse effect on resident education (100 to 64% as programs increased in size). Fellowship training increased (18 to 45%). Over 50% personally involved in resident training; less than 1/3 participated in medical student or fellow training.

with the intent that by the end of their training, residents and fellows will have achieved educational goals and proficiencies that will result in lifelong learning with an emphasis on patient safety and high quality patient care [24].

Unique to radiology, recent changes in the way the ACGME formally evaluates programs and trainees are compounded by modifications in when trainees can sit for the radiology board certification exam as well as in the structure of the resident fourth year (PGY-5) [23, 32]. The American Board of Radiology (ABR) recently modified the timing of the board certification exam to 15 months after the end of the fourth year (previously residents could sit for the exam at the end of the fourth year). This was done in part to pattern the timing of certifying examinations in other specialties. With this change comes a restructuring of the Radiology fourth year, which now will include a series of "mini Fellowships" whereby the trainee spends anywhere from 1 to 9 months in one subspecialty [15, 25]. Programs now have the added challenge of balancing the educational

environment among four "levels" of trainees, having to ensure an appropriate learning environment for all: medical students, residents, "miniFellows" and fellows [7]. Further, the change in the timing of the ABR certifying exam has been predicted to result in even more residents pursuing fellowships after residency, thus augmenting this challenge of balancing trainee education [3, 12, 22].

Maintaining an appropriate educational learning environment for resident and fellow trainees can be demanding for faculty when taken in the balance of individual and department progress and success [11]. A recent report highlighted the opinions of Radiology department chairpersons' regarding the weighted importance of resident and fellow education among other departmental success metrics via a survey questionnaire sent to all American members of the Society of Chairmen in Academic Radiology (SCARD) [6]. Sixty-four percent of chairpersons responded and were asked to weigh the relative importance of various components of department growth such as clinical research, faculty

development, and education. Resident training was on average ranked as the fourth most frequently cited measure of a department's success (86%) [6]. Of note, an inverse relationship was found between the size of the department and the importance placed on resident training (100% for small programs decreasing to 64% as programs increased in size); however, the relative importance of fellow education increased (18 to 45%) [6].

The balance between providing an environment conducive to teaching and education with that of clinical care and research continues to be challenging among all medical specialties. The relationship between academic pursuits and clinical productivity remains demanding as an increase in one often results in a decline in the other with the ultimate result, by many, being a significant loss of interest in teaching [13]. By having strong departmental leadership and support; however, the interest and zeal for education can be cultivated: in an editorial in *Radiology*, one of our specialty's preeminent journals, Cohen and Gunderman wrote "if the department chair is not enthusiastic about education, research, and service, then it is unrealistic to suppose that faculty and residents will be [10]."

In the report by Baker et al., the authors found that overall, more than 70% of program chairs directly participated in resident education; however, with increasing program size, the amount of time spent by the chairman teaching fellows significantly decreased: in medium sized programs, more than 60% of chairman responding to the survey reported that they did not directly teach fellows, and this number decreased to 55% for larger programs [6]. Support of teaching faculty by department chairmen as demonstrated by their dedicated involvement in day to day clinical work with an enthusiastic emphasis on trainee education, provides a "grass roots" foundation and encourages all faculty to participate in education and value its impact on the future of medicine.

Fellow education has significantly changed and evolved over the years, certainly since the inception of the musculoskeletal radiology fellowship program at this institution in 1969, and it is doubtful that one will find universally positive or negative responses to all of these innovations [26]. In sum, however, at the heart of these changes is the goal of producing competent well-rounded physicians with an emphasis on lifelong learning and high quality patient care and it is with these objectives in mind that we look to the future of educating the next generation of physicians.

Disclosures

Conflict of Interest: Carolyn M. Sofka MD has declared that she has no conflict of interest.

Human/Animal Rights: This article does not contain any studies with human or animal subjects performed by the any of the authors.

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Required Author Forms Disclosure forms provided by the authors are available with the online version of this article.

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