Neurosurgical Resident Training Program

Analysis of historical and modern approaches to teaching neurosurgery by professional communities and public authorities in the United States, the European Union, and the Russian Federation makes it possible to develop a modern training program regarding content and duration. High-tech and dynamically developing specialty has acquired several large sub-specializations over the past decades. Each direction requires long-term training and a special program. Training in neurosurgery in the modern world takes 5-7 years and involves the acquisition of clinical and scientific knowledge [1].

Training neurosurgical residents about intraoperative decision-making appears to be ad-hoc and dependent on both the institution and the availability and willingness of senior surgeons to make this a part of their pedagogy [2].

The quality and extent of a resident's neurosurgical training is difficult to quantify

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Training in medical education depends on the availability of standardized materials that can reliably mimic the human anatomy and physiology. One alternative to using cadavers or animal bodies is to employ phantoms or mimicking devices.

Three-Dimensional imaging and videos are a very useful tool in the neurosurgical training,

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In addition to the basic training required for a trade, occupation or profession, observers of the labor-market recognize as of 2008 the need to continue training beyond initial qualifications: to maintain, upgrade and update skills throughout working life. People within many professions and occupations may refer to this sort of training as professional development.

The virtual simulation surgery has initially exhibited its promising potentials in neurosurgery training.

Adequate training based on cadaveric dissection is essential to acquire a practical knowledge of surgical anatomy and microsurgical/endoscopic dissection techniques. Endoscopic procedures for the treatment of pathologies of the skull base are becoming increasingly common. The endoscopic training curve for tool handling and detailed knowledge of the topographic anatomy of the skull base requires intensive training on cadavers before approaching living patients, which is why cadaver laboratory experience should be mandatory for every resident and surgeon preparing to use microsurgical and endoscopic techniques.

Tschabitscher and Di Ieva describe the basic principles of the philosophy of anatomic dissection and the equipment necessary to set up an endoscopic cadaver laboratory [3].

Long working hours and sleep deprivation have been a facet of physician training in the US since the advent of the modern residency system. However, the scientific evidence linking fatigue with deficits in human performance, accidents and errors in industries from aeronautics to medicine, nuclear power, and transportation has mounted over the last 40 years. This evidence has also spawned regulations to help ensure public safety across safety-sensitive industries, with the notable exception of medicine. In late 2007, at the behest of the US Congress, the Institute of Medicine embarked on a year-long examination of the scientific evidence linking resident physician sleep deprivation with clinical performance deficits and medical errors. The Institute of Medicine's report, entitled “Resident duty hours: Enhancing sleep, supervision and safety”, published in January 2009, recommended new limits on resident physician work hours and workload, increased supervision, a heightened focus on resident physician safety, training in structured handovers and quality improvement, more rigorous external oversight of work hours and other aspects of residency training, and the identification of expanded funding sources necessary to implement the recommended reforms successfully and protect the public and resident physicians themselves from preventable harm. Given that resident physicians comprise almost a quarter of all physicians who work in hospitals, and that taxpayers, through Medicare and Medicaid, fund graduate medical education, the public has a deep investment in physician training. Patients expect to receive safe, high-quality care in the nation's teaching hospitals. Because it is their safety that is at issue, their voices should be central in policy decisions affecting patient safety. It is likewise important to integrate the perspectives of resident physicians, policy makers, and other constituencies in designing new policies. However, since its release, discussion of the Institute of Medicine report has been largely confined to the medical education community, led by the Accreditation Council for Graduate Medical Education (ACGME). To begin gathering these perspectives and developing a plan to implement safer work hours for resident physicians, a conference entitled “Enhancing sleep, supervision and safety: What will it take to implement the Institute of Medicine recommendations?” was held at Harvard Medical School on June 17-18, 2010. This White Paper is a product of a diverse group of 26 representative stakeholders bringing relevant new information and innovative practices to bear on a critical patient safety problem. Given that our conference included experts from across disciplines with diverse perspectives and interests, not every recommendation was endorsed by each invited conference participant. However, every recommendation made here was endorsed by the majority of the group, and many were endorsed unanimously. Conference members participated in the process, reviewed the final product, and provided input before publication. Participants provided their individual perspectives, which do not necessarily represent the formal views of any organization. In September 2010 the ACGME issued new rules to go into effect on July 1, 2011. Unfortunately, they stop considerably short of the Institute of Medicine's recommendations and those endorsed by this conference. In particular, the ACGME only applied the limitation of 16 hours to first-year resident physicans. Thus, it is clear that policymakers, hospital administrators, and residency program directors who wish to implement safer health care systems must go far beyond what the ACGME will require. We hope this White Paper will serve as a guide and provide encouragement for that effort.

RESIDENT PHYSICIAN WORKLOAD AND SUPERVISION:

By the end of training, a resident physician should be able to practice independently. Yet much of resident physicians' time is dominated by tasks with little educational value. The caseload can be so great that inadequate reflective time is left for learning based on clinical experiences. In addition, supervision is often vaguely defined and discontinuous. Medical malpractice data indicate that resident physicians are frequently named in lawsuits, most often for lack of supervision. The

recommendations are: The ACGME should adjust resident physicians workload requirements to optimize educational value. Resident physicians as well as faculty should be involved in work redesign that eliminates nonessential and noneducational activity from resident physician dutiesMechanisms should be developed for identifying in real-time when a resident physician's workload is excessive, and processes developed to activate additional providersTeamwork should be actively encouraged in delivery of patient care. Historically, much of medical training has focused on individual knowledge, skills, and responsibility. As health care delivery has become more complex, it will be essential to train resident and attending physicians in effective teamwork that emphasizes collective responsibility for patient care and recognizes the signs, both individual and systemic, of a schedule and working conditions that are too demanding to be safeHospitals should embrace the opportunities that resident physician training redesign offers. Hospitals should recognize and act on the potential benefits of work redesign, eg, increased efficiency, reduced costs, improved quality of care, and resident physician and attending job satisfactionAttending physicians should supervise all hospital admissions. Resident physicians should directly discuss all admissions with attending physicians. Attending physicians should be both cognizant of and have input into the care patients are to receive upon admission to the hospitalInhouse supervision should be required for all critical care services, including emergency rooms, intensive care units, and trauma services. Resident physicians should not be left unsupervised to care for critically ill patients. In settings in which the acuity is high, physicians who have completed residency should provide direct supervision for resident physicians. Supervising physicians should always be physically in the hospital for supervision of resident physicians who care for critically ill patientsThe ACGME should explicitly define “good” supervision by specialty and by year of training. Explicit requirements for intensity and level of training for supervision of specific clinical scenarios should be providedCenters for Medicare and Medicaid Services (CMS) should use graduate medical education funding to provide incentives to programs with proven, effective levels of supervision. Although this action would require federal legislation, reimbursement rules would help to ensure that hospitals pay attention to the importance of good supervision and require it from their training programs.

RESIDENT PHYSICIAN WORK HOURS:

Although the IOM “Sleep, supervision and safety” report provides a comprehensive review and discussion of all aspects of graduate medical education training, the report's focal point is its recommendations regarding the hours that resident physicians are currently required to work. A considerable body of scientific evidence, much of it cited by the Institute of Medicine report, describes deteriorating performance in fatigued humans, as well as specific studies on resident physician fatigue and preventable medical errors. The question before this conference was what work redesign and cultural changes are needed to reform work hours as recommended by the Institute of Medicine's evidence-based report? Extensive scientific data demonstrate that shifts exceeding 12-16 hours without sleep are unsafe. Several principles should be followed in efforts to reduce consecutive hours below this level and achieve safer work schedules. The recommendations are: Limit resident physician work hours to 12-16 hour maximum shiftsA minimum of 10 hours off duty should be scheduled between shiftsResident physician input into work redesign should be actively solicitedSchedules should be designed that adhere to principles of sleep and circadian science; this includes careful consideration of the effects of multiple consecutive night shifts, and provision of adequate time off after night work, as specified in the IOM reportResident physicians should not be scheduled up to the maximum permissible limits; emergencies frequently occur that require resident physicians to stay longer than their scheduled shifts, and this should be anticipated in scheduling resident physicians' work shiftsHospitals should anticipate the need for iterative improvement as new schedules are initiated; be prepared to learn from the initial phase-in, and change the plan as neededAs resident physician work hours are redesigned, attending physicians should also be considered; a potential consequence of resident physician work hour reduction and increased supervisory requirements may

be an increase in work for attending physicians; this should be carefully monitored, and adjustments to attending physician work schedules made as needed to prevent unsafe work hours or working conditions for this group“Home call” should be brought under the overall limits of working hours; work load and hours should be monitored in each residency program to ensure that resident physicians and fellows on home call are getting sufficient sleepMedicare funding for graduate medical education in each hospital should be linked with adherence to the Institute of Medicine limits on resident physician work hours.

Both Europe and the USA have a long tradition in biomedical education in neurosurgery [4].

It was William Stewart Halsted in the early twentieth century who introduced the format of a residency program to USA as a tool to improve clinical practice. As a surgeon teaching at Johns Hopkins Medical School in Baltimore, his aim was to guarantee a well-organized training period for young medical doctors to finally become qualified surgeons—and this model is still considered the standard for education in any medical specialization [5].

However, a vast range of different neurosurgical education programs have developed worldwide ever since [6] [7] [8].

Consequentially, the structure and quality of residency programs vary between different countries and teaching centers [9] [10].

In both professional societies as well as pertinent literature, there is clear evidence for a continued interest in optimizing neurosurgical residency [11]. [12].

Surgical Training in Spine

see Surgical Training in Spine.

The development of neurointerventional treatments of central nervous system disorders has resulted in the need for adequate training environments for novice interventionalists. Virtual simulators offer anatomical definition but lack adequate tactile feedback. Animal models, which provide more lifelike training, require an appropriate infrastructure base. The authors describe a training model for neurointerventional procedures using the human placenta (HP), which affords haptic training with significantly fewer resource requirements, and discuss its validation. METHODS Twelve HPs were prepared for simulated endovascular procedures. Training exercises performed by interventional neuroradiologists and novice fellows were placental angiography, stent placement, aneurysm coiling, and intravascular liquid embolic agent injection. RESULTS The endovascular training exercises proposed can be easily reproduced in the HP. Face, content, and construct validity were assessed by 6 neurointerventional radiologists and 6 novice fellows in interventional radiology. CONCLUSIONS The use of HP provides an inexpensive training model for the training of neurointerventionalists. Preliminary validation results show that this simulation model has face and content validity and has demonstrated construct validity for the interventions assessed in this study.

Simulation Center

Simulation Center.

Impact of COVID-19 on the Neurosurgical Resident Training Program

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