Postgraduate Medical Specialization Alternatives to Specialty Departments

Endovascular Surgery
Endovascular Neurosurgery

A. BERENSTEIN

The Hyman-Newman Institute of Neurology and Neurosurgery Beth-Israel NY, USA
Albert Einstein School of Medicine

For decades, postgraduate medical education has followed traditional specialty pathways or board certifications. However, technological advances in multiple disciplines have expanded many fields beyond the traditional departments and specialty boundaries. Simultaneously the body of knowledge of various disease processes has grown tremendously with increasing understanding of disorders at the molecular, genetic and cellular levels. Today, a variety of diseases require a "multidisciplinary" approach to management resulting in safer, less costly treatments with better outcomes. Postgraduate medical training however, has not followed these advancements. Therefore, at present to become competent in highly specialized fields of modern medicine, postgraduate training is usually extended by many years of multiple subspecialty fellowships, which has significant financial implications.

While the training of radiologists now includes many subspecialty areas, ranging from diagnostic imaging to minimally invasive interventions, radiologists continue to be certified and accredited the same way as their counterparts were when the field was a more limited diagnostic discipline. Some "special competency" certifications have slowly been introduced, which may be obtained only after the traditional board certification in radiology.

Surgical specialties are also rapidly expanding, with overlapping areas of interest among various surgical subspecialties, such as vascular surgery and neurosurgery. Simultaneously "non-surgical" subspecialties, such as interventional neuroradiology, interventional radiology and interventional cardiology have also grown tremendously, and share common areas of interest and expertise.

The arena of vascular diseases is an excellent example of how the way physicians are educated has not kept up with the multiple advances attained in technology nor in our rapidly expanding body of knowledge. This has resulted in lengthy, cost prohibitive training programs to properly educate physicians involved in the care of patients with cerebrovascular disease.

In the USA, in 1986, in conjunction with the Resident Review Committees (RRC) of Neurosurgery and Radiology, we attempted to bridge the specialty boundaries between neurosurgery and radiology. Despite multiple drafts on "Standards of Training", the only true achievement resulting from this long series of dialogues has been the name "endovascular surgical neuroradiology". This compromise satisfied the narrow perspectives of present certifying bodies; the surgeons wanted the term "surgery", and the radiologists the word "radiology" used in the name of this new field.

Over the intervening thirteen years, a multitude of specialists have utilized percutaneous transcatheter techniques for the management of a variety of cerebrovascular pathologies and have, in various degrees, further advanced the field of interventional neuroradiology. These specialists are from the fields of interventional cardiology, interventional radiology, neurology, vascular surgery, and neurosurgery. Despite their interest, none, with exemption of inter-

Table 1 **Endovascular Surgeon**

MEDICAL SCHOOL:

- 2 years - Basic / Clinical Sciences
- 1 year - Vascular Imaging / Clinical Competence
- 2 years - Endovascular
- 1 year - Organ specific Fellowship

Total 6 years

Table 2 **Endovascular Surgeon**

2 YEARS POST GRADUATE (PG) 1 & 2

Basic Science	*Clinical Science*
Vascular Anatomy	ICU
Vascular Physiology	CCU
Coagulation	SICU
Endothelium	NICU
Etc.	Etc.

Table 3 **Endovascular Surgeon**

PG 3: VASCULAR IMAGING
AND CLINICAL EXPERTISE

- Ultrasound
- Angiography
- MR Angiography
- Etc.
- Vascular Pathology
- Haematology
- Vascular clinic
- "Managing" of patients
- Etc.

ventional neuroradiology, has developed a curriculum for "endovascular (neuro) surgery". Interventional cardiology and interventional radiology have special qualification certification, but neither covers the neurological diseases and applications of endovascular procedures, either during training or as part of the certification examination.

We propose an alternative model of postgraduate medical education to the current method of training in highly subspecialty departments. The pilot program will entail a six year focused training program in "endovascular surgery". In addition, the model suggests a way to finance this training, and advance the field from the basic science level to clinical research and outcomes analysis.

The program will expose the trainee to all aspects of the vast body of knowledge of the vascular system, including its anatomy, physiology, pathology, natural history of the diseases, and various treatment options. The clinical curriculum would encompass both diagnostic imaging and surgical techniques. Lastly, the program will allow for the teaching of skills necessary to understand and cost effectively manage a service. At the sixth year the trainee can do a fellowship that is organ (neuro) oriented (table 1).

During the two first years, the training combines basic and clinical sciences focusing on the vascular system. The basic science curriculum would include vascular anatomy and physiology with special attention given to the understanding the endothelium, muscular layer, adventitia, and the cellular elements of blood and coagulation. Basic science studies would alternate with clinical rotations throughout the various intensive care units, where the trainee learns how to care for acutely ill patients (table 2).

The third year focuses on the various imaging modalities utilized in the diagnosis and treatment of patients with vascular disease. The resident learns the physics principles of the various imaging devices and techniques, as well as their indications, methods of interpretation and cost. The clinical rotations in year three will include radiology, vascular pathology, vascular clinic, as well as how to best "manage" various stages of care (table 3).

At this stage the trainee has the basic and clinical skills necessary to diagnose, understand and care for patients with vascular disease. The training now focuses on principles of endovascular surgery including catheter techniques, patient selection, and the endovascular management of cardiac, neurological and peripheral vascular diseases (table 4).

At the end of the fifth year, the physician is trained as a "general" endovascular surgeon. The sixth and final years allows for focusing on one area of interest (i.e. organ oriented), and to acquire additional training in one particular area, such as Endovascular Cardiac, Neuro, or Peripheral Surgery (table 5).

As with any branch in medicine, education

Table 4 **Endovascular Surgeon**

PG 4 & 5: 2 YEARS ENDOVASCULAR
Cardiac
Neurovascular
Peripheral

Table 5 **Endovascular Surgeon**

1 YEAR *FELLOWSHIP*
Organ Oriented
- Cardiac
- Neurological
- Peripheral

must be complemented and enhanced with research. Our model will incorporate research into the training program and will help finance the curriculum. Research will be done both in the basic and clinical sciences (table 6).

Cost Reduction

During the three first years the graduate will learn basic sciences in the laboratory, where s/he will participate in research. The laboratories are staffed by full time researcher in various fields (i.e. vascular anatomy, physiology, etc.). The laboratory has the potential of funding for research focused on vascular related work by government agencies, Universities, or work attractive to industry, or other foundations (table 7).

During the clinical rotations at the various intensive care units (ICU), the trainee acts as a resident with anappropriated level of compensation. At present, the rotations in intensive care models (12 h on by 24 h off or similar) permit such an arrangement.

Centers which subspecialize (i.e. endovascular) have the greatest potential to attract patients, which translates into greater expertise, better and more cost-effective outcomes. Larger patient recruitment, which in turn, leads to clinical trials and increased funding (table 8).

This model is a theoretical one, the main obstacles at present are represented by the present "boxes" of Postgraduate Medical Education (table 9).

Table 6

Research
From the Bench to the Bedside
- Biomedical Research
  - Endothelial Physiology
  - Tissue Response to Endovascular Devises
  - Bioengineering
  - Etc.
- Clinical Research
  - Patient Recruitment
  - Outcome analysis
  - Clinical Trials

Table 7

BIOMEDICAL RESEARCH
- Vascular Response to Endovascular Diseases
- Endothelial Physiology
- Bioengineering
- Etc.

Table 8

CLINICAL SCIENCES
- Outcome analysis
- Patient Recruitment
  Clinical Trials
  Lower M&M
  Shorter LOS
- Etc.

Table 9 **Challenges**

- Specialty Boards/ Certification
- Present "Boxes"
- Limited Resources
- Social Demands
- R&D
- Market Demands
- Funding

Medical Education