EDUCATION

Assessment of the educational experience in the Neurosurgery Residency Program of the University of Puerto Rico Medical Sciences Campus

RICARDO H. BRAU, MD; IRINA MURRAY, BS; ESTEFANÍA QUIRUZ, BS; FRANCISCO GELPI, BS; FERNANDO CABRERA, BS; CAROL RIVERA, BS; LUIS HADDOCK, BS

Objective: **In 2003, the American Council of Graduate Medical Education (ACGME) made significant changes in the medical postgraduate training policies, especially the 80 Duty Hours per Week Regulation. The Neurological Surgery Department at Mayo Clinic performed a national survey regarding the perceptions of program directors and residents on how compliance with the ACGME requirements has changed neurosurgery training. Using a similar methodology, we analyzed the University of Puerto Rico's Medical Sciences Campus, Neurological Surgery Division's resident and faculty staff perceptions with regard the way its training is currently performed.**

Methods: **Anonymous questionnaires were distributed among the neurosurgery division's resident and faculty staff at the University of Puerto Rico Medical Sciences Campus. Performance on the American Neurological Surgery Board (ANSB) written examinations was obtained from residents' records. The quantity and types of surgeries performed by residents was retrieved from neurosurgery section computer files. The relevant data was entered into a database and descriptive analysis and frequency distributions were performed.**

Results: **Surveys showed some concerns from both residents and attending physicians on the topics of inpatient and outpatient facilities, research activities, duty hours and the number of residents currently in the program. An upward trend in the residents' ANSB written examination performance was observed over the years. The residents' yearly number and diversity of surgical procedures were adequate.**

Conclusions: **Considering the results from the surveys, the performance of residents in the Board examination, and their surgical experience, it is concluded that the general perception of the educational experience in neurosurgery is satisfactory but improvements could be made.**

Key words: Educational experience, Neurological surgery residency, University of Puerto Rico

Is there something wrong with the way postgraduate medical education is being carried out? Is modern training in neurological surgery adequate? Does it produce competent neurosurgeons? Could this training be improved? With these questions in mind, the senior author and 6 students embarked on a mission to analyze the postgraduate neurological surgery experience at the School of Medicine in the University of Puerto Rico.

Modern resident training in surgery was first established in the late 1800s by William S. Halsted at Johns Hopkins University. "Students were expected to immerse themselves in the practicalities of patient care, including preoperative diagnosis, direct participation in surgical procedures and management of postoperative problems."[1] Since then, the neurological surgery residency programs have made a number of changes which have improved the way neurosurgeons are trained. However, this does not hinder further progress, particularly in the way neurosurgical residency programs instruct and educate future neurosurgeons. The Accreditation Council for Graduate Medical Education (ACGME) establishes the criteria for postgraduate medical education in most of the medical specialties and subspecialties. ACGME evaluates the residency training programs periodically and provides accreditation to those programs that comply with their criteria and regulations. Postgraduate education in neurological surgery is a subspecialty that is directly supervised by ACGME. Several researchers have carried out recent studies in order to assess the perceptions of neurosurgery residents and program directors regarding the training of residents and possible ways of improving

University of Puerto Rico, Medical Sciences Campus, Neurosurgery Division, University of Puerto Rico Medical Sciences Campus.
President CLA Radiosurgery Inc.

Address correspondence to: Ricardo Brau, MD, Department of Surgery, Section of Neurosurgery Surgery, University of Puerto Rico Medical Sciences Campus, PO Box 365067 San Juan PR 00936-5067, Email: rbrau@rcm.upr.edu

neurosurgery. Studies on how the compliance with ACGME requirements has affected neurosurgery, especially in the continuity of patient care, have also been carried out.[2]

William A. Friedman, Professor and Chairman of Neurosurgery at the University of Florida, at Gainesville, Florida, in an article about *Resident Duty Hours* wrote: "neurosurgical training is the most challenging and lengthy training in medicine."[3] The production of an adequate number of competent neurosurgeons that meet the needs of our population is imperative. "Improvements in education are crucial to the delivery of better medical care."[4] These ideas served as a framework for this study. The goal was to assess the perception and the educational experience in the current neurosurgery residency program of the University of Puerto Rico's Medical Sciences Campus by way of surveying residents and attending physicians, examining residents' performance in Board examinations, as well as the amount and diversity of their surgical experience. The intention was to determine whether the residency program provides the resident with the necessary educational resources and training experiences that are needed in order to become a competent neurosurgeon and to determine which areas of the neurological surgery residency program need improvement.

Methods

1. Surveys. A survey containing 83 questions regarding the current neurosurgery program was conducted among residents and attending physicians. The survey's 83 questions were subdivided into the following topics: scheduled teaching rounds, inpatient facilities, outpatient facilities, research activities, clinical components, surgical training, training in the neurosciences, library facilities and resources, duration of training, residents' duty hours, number of residents, evaluation of residents, evaluation of faculty members, the quality of attending physicians and Board Examination performance. The topic of scheduled teaching rounds was addressed in 5 questions; the topic of inpatient facilities was addressed in 8 questions, while the topic of outpatient facilities was addressed in 4 questions. The topic on research activities was addressed in 9 questions, the clinical components in 10 questions, and surgical training in 2 questions. The subject on residents' training in the neurosciences was dealt with in 7 questions, library facilities in 5 questions, duration of training in 6 questions, and duty hours in 10 questions. The survey also contained 2 questions concerning the residents and the attending physicians each, 8 questions concerning the evaluation of residents and faculty members, 2 questions concerning the Neurosurgery Board Examination Performance, and 3 questions specifically concerning the Neurosurgery Residency Program. The questions from the survey were articulated following the ACGME program requirements for residency education in neurological surgery and were revised by Dr. Carmen Albizu from the Public Health Department of the University of Puerto Rico Medical Sciences Campus, in order to ensure that the survey yielded precise and unbiased responses.

The survey results showed that 94% of the Neurosurgery Surgery division staff (11 attending physicians and 6 residents) answered the anonymous written survey questionnaires. "Yes", "No" and "No Answer" responses were entered into a computer database for a descriptive statistical study. Questions showing a 50% or less satisfaction rate among those surveyed aided to determine which areas of the program need improvement. Five attending physicians and one resident offered written comments on their survey. Survey questionnaires for residents and attending physicians are located in Appendix A.

2. Surgeries Performed by Residents. In order to assess the residents' surgical educational experience, the neurosurgery division files tabulating surgical data from January 2002 to June 2005 were retrieved. These data were arranged according to fiscal years and the quantity and variety of the procedures was established through a frequency distribution analysis. Surgical experience was based on the diversity of individual procedures and quantity of total procedures within each major surgical category during the fiscal years 2002-2003, 2003-3004 and 2004-2005. The major surgical categories classified according to ACGME's criteria were: craniotomy other than trauma, head trauma, trans-sphenoid procedures, occlusive vascular surgery, spinal surgery, peripheral nerve, stereotaxic surgery, cerebro-spinal fluid shunting procedures, brain trauma, brain tumor, craniofacial reconstruction, craniosynostosis, shunt procedures, and miscellaneous. Particular procedures within each category are tabulated in Appendix B.

3. Neurosurgery Board Examination Performance. According to the *Program Requirement for Residency Education in Neurological Surgery* as established by ACGME, "one measure of the quality of a program is the participation in and performance of its graduates on the examinations of the American Board of Neurological Surgery."[5] Therefore, the residents' performance in the Board examinations that were available from 1986, 1987, 1995, 1997, 1998 and from 2003 to 2005 were organized in a database in order to identify any possible score trends through the years.

Results

1. Surveys.

Ninety two (92%) of the attending physicians (11 out of 12) and 100% of the residents (6 out of 6) answered the survey.

a) Scheduled Teaching Rounds

The neurosurgery scheduled teaching rounds for residents include all the educational activities at the patient's bedside. These scheduled teaching rounds are carried out early in the morning by all residents and attending staff in order to review any new cases that may have been admitted to the University's District Hospital and the University's Pediatric Hospital during the previous 24 hours, and changes in the medical and neurological conditions of the inpatients. These educational activities are essential for the educational experience of the residents, especially in the handling of preoperative and postoperative conditions and complications including critical care management. According to the surveys, the attending physicians (45%) were satisfied with the way the scheduled teaching rounds are being carried out in the current neurosurgical residency program. On the other hand, 83% of the residents were not satisfied with the way the scheduled teaching rounds are being carried out.

b) Inpatient Facilities

Inpatient facilities are those that contain patients who have been hospitalized. The fifth and sixth floors of the

Table 1. Yearly Distribution of Surgical Procedures Performed by the Neurosurgery Department

category	fiscal years 2002-2003	2003-2004	2004-2005	category	fiscal years 2002-2003	2003-2004	2004-2005
1A	12	7	8	5T	38	41	43
1B	50	77	58	5U	5	2	4
1C	2	6		5V		7	13
1D		1	1	5W	18	7	
1E	27	36	23	6A	1	3	2
1F	9	14	19	6B	10	1	1
1G	82	96	109	6C	3	5	
1H	10	17	15	6D			
2A				6E	2	1	1
2B	2	5	5	6F			1
2C	32	22	30	6G	1		1
2D	11	12	11	7A			
2E	33	30	35	7B			
2F	18	18	24	7C			
2G	39	104	195	7D	3	13	18
2H	119	60	11	7E		2	3
3A	21	22	21	7G			
3B		2	2	8A	68	73	110
4A		1		8B	12	13	20
4B	1	2	5	9A	35	56	30
4C		3	1	10A			
5A	4	3	8	10B			
5B	6	2	1	10C			
5C	33	20	25	10G			
5D	13	10	12	11	33	35	33
5E	4	2	2	12	30	28	24
5F			2	13	12	6	5
5G	4	3	2	14	6	13	10
5H	59	61	52	15	1		
5I				16	162	165	174
5J	2			17	19	24	18
5K	2	3	2	18	15	13	2
5L	3	4	5	19	33	4	5
5M				20	6	37	57
5N		1	1	21	7	5	3
5O	2	4	4	22			
5P	12	23	11	23		1	
5R		4	2	24	16	12	
5S	2	4	8				

*Refer to Appendix B to view description of categories.

phase III University District Hospital are assigned to neurosurgery. The sixth floor is the neurosurgical section's eighteen bed exclusively neurosurgical intensive care unit, however due to nursing staff limitations only 15 are operational. The fifth floor is its eighteen bed intermediate neurosurgical unit. For those patients who are not critically ill, and who need diagnostic studies, the program has beds available within the Trauma Hospital's facilities. Also some neurosurgical trauma patients are admitted directly to the Trauma Hospital. Also the Neurosurgery Spine Service and the Neurosurgery Endovascular Service admit patients to the Trauma Hospital facilities. At the University Pediatric Hospital, a floor is assigned to surgical patients including the neurosurgical pediatric patients. Pediatric postoperative cases, when necessary, are admitted to the pediatric intensive care unit. All neurosurgical patients of less than two years of age are admitted to the general pediatric wards and the nursery where they are under the primary care of the pediatricians. Neurosurgeons work as consultants in these situations. At the Veterans Administration Hospital, a floor is available for neurosurgery, neurology, and physical therapy patients. The VA surgical intensive care unit is available for neurosurgical patients requiring critical care. Results from the surveys show that both attending physicians and residents agree 100% that inpatient facilities are available and geographically identifiable. However, 100% of residents and 82% of attending physicians reported that these inpatient facilities do not have enough beds to cover the patient population. Fifty-five percent (55%) of the attending physicians and 67% of the residents also said they do not have proper equipment to ensure quality education. Overall residents (83%) and attending physicians (73%) were not satisfied with the inpatient facilities available.

c) Outpatient Facilities

Outpatient facilities are those that cater to patients that are not hospitalized. Each attending neurosurgeon has an outpatient clinic on the fifth floor of the School of Medicine. The Chief Resident also conducts a clinic on the fifth floor. Survey results showed that 67% of the residents and 73% of the attending physicians were not satisfied with the outpatient facilities available in the program.

d) Research Activities

All residents are encouraged to do clinical research throughout their residency. The Experimental Research Laboratory is located on the tenth floor of the School of Medicine in which there are six surgical research laboratories available for animal research. A Clinical Facility for Research is located at the University District Hospital, where follow-ups of patients entered in clinical trials can be performed. The facility provides for medical offices, examining rooms, nurses, data entry computers, and statistical analysis. The residents have been advised that the faculty will support any worthwhile research project that they wish to engage in.

Since several years ago arrangements were made with the Neurobiology Institute in San Juan and the Department of Physiology (Neurophysiology) at the Central Caribbean School of Medicine, Bayamón, Puerto Rico, to send one resident a year to do basic research for several months on projects involving the nervous system. After the completion of the project, the resident participates in the preparation of a paper for publication.

Regarding research activities, the survey showed 67% of the residents and 55% of the attending physicians agree that there is no adequate space for research. One hundred percents (100%) of the residents reported that there are no support personnel for research. Seventy-three percent (73%) of the attending physicians reported the same observation while 9% of them did not answer. Seventy-three percent (73%) of the attending physicians also reported that there is no guidance or technical support for residents involved in research. Generally speaking, 64% of the attending physicians and the 83% of the residents were not satisfied with the research activities provided by the neurosurgical residency program.

e) Clinical Components

The clinical components of the program include: participation in the treatment of a wide variety of neurosurgical diseases; availability of surgical and critical care for adult and pediatric patients; a well organized rotation schedule for residents; an adequate quantity of surgical procedures per resident and, among other things, a fair distribution of surgical experiences.

The residents seemed to be satisfied with the clinical components of the program as the majority agreed that these components meet the standards of the ACGME and are being carried out satisfactorily. However, the attending physicians were not as satisfied as 55% of them reported that surgical cases are not appropriately distributed among cranial, extra cranial, spinal, and peripheral nerve procedures. Results also demonstrated that 73% of these attending physicians believe the program does not offer the residents the opportunity for them to evaluate patients referred for elective surgery in an outpatient environment. Despite of these complaints, 73% of the attending physicians said they were satisfied with the clinical components of the program.

f) Surgical Training

The necessity of excellent surgical training is imperative especially in one of the few institutions actually offering neurosurgical care to the residents of the island of Puerto Rico. According to the survey results, 73% of the attending

physicians and 83% of the residents said that they were satisfied with the surgical training given in the current neurological surgery residency program.

g) Residents' Training in the Neurosciences

We believe that the ongoing education of residents is necessary for the improvement of the current neurosurgical residency program and the attainment of quality patient care. According to the surveys, 55% of attending physicians and 67% of the residents said they were satisfied with the training in the neurosciences.

h) Library Resources and Services

The availability of a library and its educational resources to the residents is necessary for the acquisition of information updates in the field of neurological surgery and other related subjects. Currently there are two libraries with neurosurgical resources. The general library of the School of Medicine and the Neurosurgery Division Library located at the 9th floor of the Medical Sciences Building. Surveys showed that 82% of the attending physicians and 67% of the residents were satisfied with the library, its accessibility and its resources.

i) Duration of Training

The duration of the neurosurgery residency training in the University of Puerto Rico's Medical Sciences Campus lasted five years until July 2003. An additional 12 months of training were added and the program's curriculum was modified in order to accommodate the 80 duty hours per week regulation instituted since July 2003. The modifications to the curriculum were implemented in order to compensate for the loss of resident-patient contact hours produced by this regulation. According to survey results, 64% of the attending physicians and 83% of the residents said they were satisfied with the duration of neurosurgery training.

j) Duty Hours

The neurosurgery residents' duty hours are weekdays from 7 AM to 5 PM. Residents are off duty during weekends and holidays unless required to be on call roster. Nonetheless it is not unusual for residents to suffer from stress and fatigue during their duty hours. Surveys showed 82% of attending physicians agreed that they have seen residents suffer from fatigue and stress during duty hours. 67% of the residents said they have felt fatigued and 83% said they have felt stress during duty hours. And although 67% of the residents said that they were satisfied with their duty hours, 100% of them agree the 80 hours per week reform will improve the way their training program is carried out. On the other hand, only 27% of the attending physicians thought the 80 hours per week reform for residents will improve the way the current residency program is carried out. Also, 55% of these attending physicians reported that they were not satisfied with the residents' duty hours. In July 2005, the night schedule was modified. Currently there is a resident on call every night from 7 PM to 7 AM, from Monday through Thursday. During Fridays, Weekend days and Holidays, another resident is on call every twelve hours, from 7 AM to 7 PM and a different resident from 7 PM to 7 AM. In this way, a resident never works more than 12 hours straight. The 80 Duty Hours per Week Regulation is fully complied with this arrangement. This new schedule has been very popular with the resident's staff.

k) Residents

The number of residents enrolled in the neurosurgery resident's program is determined by the Residency Review Committee (RRC) and implemented by ACGME. According to the RRC, a program may be authorized to enroll more than one resident per year where there is demonstrated excellence in providing educational experience for the residents. When the RRC determines the number of residents allowed for a particular program, it examines the following: the presence of a faculty of national stature in neurological surgery, quality of the educational program, quality of clinical care, number and distribution of cases, quality of clinical and basic research, quality of residents trained by the program, number of residents starting and finishing the program, number of the graduates who take the written and oral examinations of the American Board of Neurological Surgery, and the number of graduates passing these written and oral examinations. The RRC also inspects the facilities available in the program. Regarding residents, survey results showed that both attending physicians (73%) and residents (67%) thought that the enrollment of one resident per year to the neurosurgery program is not enough. Eighty-two percent (82%) of the attending physicians and 83% of the residents also thought the number of residents currently in the program is not sufficient to deal with the increasing workload.

l) Evaluation of Residents and Faculty Members

The attending staff evaluates all the residents twice a year (May, December). Such evaluations are made available to the residents for their review and are discussed with the program director. The residents are advised regarding any deficiencies in their performance and are recommended ways to improve. The residents are urged to discuss their problems with the director and to offer suggestions in ways to change or improve the service. The residents also evaluate all the faculty members two times a year (May, December). The director discusses with the faculty members their performance on an individual basis. According to the surveys, both residents and attending physicians agree that evaluations of residents and faculty members are provided for by the program and are carried out frequently enough. They also agree the evaluation process is fair.

m) Attending Physicians

The role of the attending physician is not only to educate the residents on every aspect of neurosurgery, but also to serve as mentors and professional role models. "Mentoring is probably the best way to inspire appropriate behavior in young physicians."[6] The attending physicians' role and availability is crucial in the training of residents. According to survey results, 100% of the residents and attending physicians believe the number of attending physicians available for training is sufficient. Also, 100% of the residents and 82% of the attending physicians thought most attending physicians in the neurosurgery residency program guide residents in some way or another through their training.

n) Attitudes regarding the topic of performance on the examination of neurological surgery boards

Residents of the neurological surgery resident's program take the American Board of Neurological Surgery (ABNS) for credit usually one year before the graduation year. Prior to this year, the residents take the examination as a means to evaluate themselves academically. The performance of residents on the American Board of Neurological Surgery is a good indicator of the program's success in the education and training of the residents, and was thus used in this study. According to the surveys, 83% of residents and 100% of the attending physicians agreed that the program prepares residents for their Board examination. Likewise, 67% of the residents and 100% of the attending physicians reported that the Boards performance is a good scale for neurosurgery residency program success.

ñ) General opinions regarding the neurological surgery residency program

In order to know whether residents and attending physicians were satisfied with the current neurological surgery residency program, a number of questions pertaining to this topic were included in the survey. The degree of satisfaction or discontent in residents and attending physicians could serve as an indicator of the extent of improvement the program would have to undertake in the following years. Survey results showed 82% of the attending physicians and 83% of the residents were satisfied with the current neurosurgery residency program. Also, 64% of the attending physicians and 100% of the residents said the program's recent changes and transformations will improve the way neurosurgery is carried out. However, all of the residents and attending physicians who completed the survey said that the program still needs improvement.

2. Surgeries Performed by Residents

ACGME establishes that: "there should be a minimum of 500 major neurosurgery surgery procedures per year per finishing resident." According to the collected program data on yearly volume of surgical procedures, residents received over twice the minimum required amount of surgical experience. For the single graduating resident in the program per year, there were 1144, 1256, and 1283 procedures carried out in 2002-2003, 2003-2004, and 2004-2005 respectively. Please refer to Figure 1. In addition, the number of operations is distributed across a wide variety of surgical procedures. Please refer to Figure 2. Of all the procedures performed by the residents and their corresponding attending physicians, during 2002-2003,

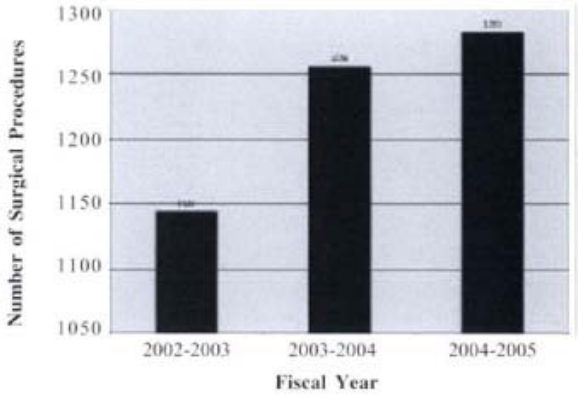

Figure 1. Volume of Surgeries Performed by the Neurosurgery Department

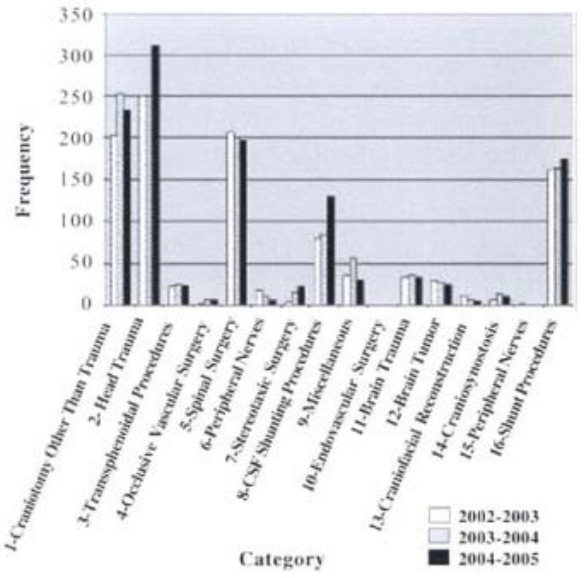

Figure 2. Frequency Distributions by Major Neurosurgical Classifications (2002-2005)

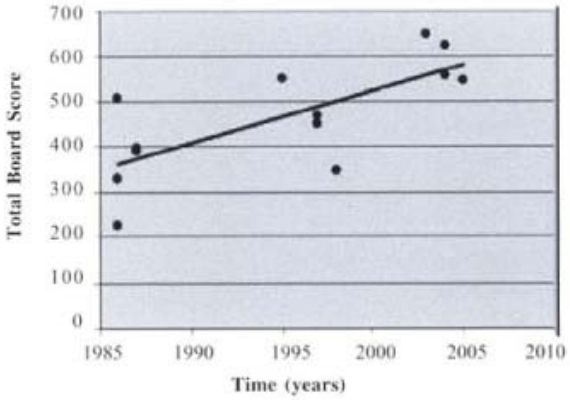

Figure 3. Total Neurological Surgery Board Examination Performance Since 1986

the most common were those involving Head Trauma, specifically those involving cases of Acute and Chronic Subdural Hematomas. During 2003-2004, procedures involving Craniotomy Other Than Trauma were most frequent, particularly the 96 cases of Primary Tumors. From 2004-2005, procedures relating to Head Trauma was again the most common, with 195 Acute and Chronic Subdural Hematomas.

3. Performance in the American Board of Neurological Surgery

According to the Neurosurgery Division's records, there has been a consistently upward trend in residents' performance on the Neurosurgery Surgery Board Examination (Figure 3). From the available scores, the highest observed score in the history of Puerto Rico's Neurological Surgery Resident's program was obtained in the year 2003, been the 7th highest score nationwide.

Discussion

Ninety two percent (92%) of the attending physicians and all the residents (100%) completed our surveys. We believe that the fact that we were able to asses the perceptions of the majority of the members of the neurological surgery residency program gave the study a certain degree of validity. All the questions in the survey were written in order to determine if the current neurological surgery residency program in the University of Puerto Rico's Medical Sciences Campus not only meets the minimum standard requirements as established by the ACGME, but also if it meets the residents' and the attending physicians' expectations. The questions were designed to be clear and precise so as to eliminate biased or inaccurate responses. The fact that the survey questions had only three options ("Yes", "No" and "No Answer") limited the respondent's capacity to answer.

According to the results, most of the attending physicians and resident staff were not satisfied with the way scheduled teaching rounds were being carried out although the majority of the residents were not. The respondents' comments on this topic did not contain any type of recommendations as to how this aspect of the residency program can be improved.

Regarding inpatient facilities, respondents agreed these facilities are available and geographically identifiable. However, there were concerns about a lack of sufficient beds to cover the actual patient population and the amount of equipment needed to ensure the quality education of residents. These aspects of the neurological surgery program are difficult to improve without economical support from the Puerto Rican government.

Concerns regarding outpatient facilities and research activities were also noted in the survey. Most respondents agreed research activities are lacking in the program as well as support personnel, guidance, and technical support for the former. The problem with active research is a major concern for most of the postgraduate training programs at the UPR School of Medicine. The neurosurgery division has created a faculty position in order to promote research and relieve this problem. The research director position will be filled by the summer of 2006.

The majority of the attending physicians said cases are not appropriately distributed among cranial, extra cranial, spinal, and peripheral nerve procedures, perhaps because very few peripheral nerves cases are performed. The attending physicians also believe residents should have the opportunity to evaluate patients referred for elective surgery in an outpatient environment. In regards to this matter, it is important to say that the program director has recently made mandatory the attendance by all the residents to the Chief Resident's outpatient clinics.

The majority of the respondents were satisfied with the surgical and neurosciences' training given in the neurological surgery residency program. The majority of respondents were also satisfied with the library and its resources. They were also satisfied with the residents' duration of training.

The fact that most attending physicians and residents undeniably agree that stress and fatigue is a way of life in neurosurgery shows how important it is to find a way to avoid the working conditions which provoke these during duty hours. "The unexpected death of Libby Zion, at New York Hospital in 1984, led to a series of investigations that recently resulted in profound changes in resident duty hours."[7] Since July 1, 2003 no resident is supposed to work more than 80 hours per week. It would be reasonable

to find residents agreeing to these seemingly favorable changes in duty hours. Accordingly, our surveys show most residents are satisfied with their duty hours and believe the 80 hours per week reform will improve the way their training program is carried out. On the contrary, most attending physicians are not satisfied with the residents' duty hours and agree in that the 80 hours per week reform will not improve the way neurosurgery training is carried out. Although the reasons for these opinions were not directly expressed by the faculty staff, it could be speculated that because most attending physicians were trained in an environment were the duty hours were not a major issue, they feel as though the new policy could affect the continuity of patient care and the quality of neurosurgery training. They believe this policy could potentially make it seem as though commitment and continuous patient care are not essential aspects of neurosurgery and medicine for that matter. Furthermore, it is worrisome that the residents' training could become fragmented and disjointed. Regarding the cut in duty hours and the training of residents in the field of neurosurgery, several philosophical questions have to be answered:

- How is the resident's sense of professionalism going to be affected after completion of training, if it fails to demand responsibility towards patients and continuity of care?
- Do we expect that a fully trained neurosurgeon should not work more than 80 hours a week?
- Are they going to follow through and give comprehensive care to their patients or is their care going to be fragmented and disjointed?
- Can the "standard of care" be achieved in a split fashion?

Certainly the quantity of duty hours necessary for an optimal post-graduate education form part of a very controversial issue at this time in the field of neurosurgery. Fatigue and stress could be attributed to many things. Studies on surgical education in the United States show that: "residents have accumulated more and more administrative chores, many which make little sense in an environment that is so rich in information systems."[8] If the work was well distributed among nurses, orderlies, secretaries and other no-medical staff members, then residents would only have to concentrate on their work and would probably be less stressed and fatigued during duty hours. Recently, several non-resident house physicians (licensed physicians) were hired by the hospitals and ASEM to assist with these duties related to the patient care.

Regardless of whether or not the attending physicians and the residents believe more residents should be enrolled each year because of the increasing workload, this aspect of the program cannot be changed unless it is permitted by the Residency Review Committee. However, since July of the year 2005 the Neurological Surgery Program established an International Neurological Surgery Training Program which is not sanctioned by the ACGME. It is therefore, believed that the number of residents in will increase in the future. Currently the Neurosurgery Division is applying to the Neurological Surgery Residency Review Committee and ACGME for an increase of the resident complement.

According to the survey results, the evaluation of both residents and attending physicians are provided by the program frequently enough. Both attending and residents agreed this evaluation process was fair.

Regarding the role of the attending, survey results indicated most respondents are satisfied with the number of attending physicians available for training and the majority of the respondents agreed most attending guide residents in some aspect of their training.

The majority of respondents to the survey agreed in that the current neurological surgery program prepares residents for their American Neurological Surgery Board Examination. They also agreed in that the performance on these Boards should be used as a scale for neurosurgery program accomplishment. Further analysis of the residents' Board Examination performance was consistent with an upward trend since 1986. This trend could reflect the neurological surgery residency program's success in the training of their residents.

The majorities of the respondents are satisfied with the current neurological surgery residency program and believe that the program's recent changes and transformations will improve the way neurosurgery is carried out. However, all respondents agreed and stressed that improvements to the program are still necessary.

The number and diversity of surgical procedures seems satisfactory according to the data relating to surgeries performed by residents, although detailed examination of the data revealed that there is not enough epilepsy and movement disorder surgery cases. On August 2005, a new pediatric neurosurgeon was added to the RCM Neurosurgery Division's Faculty Staff. According to the neurosurgery program director, Dr. Ricardo Brau, this pediatric neurosurgeon has performed epilepsy surgery during his past fellowship training and is willing to develop an epilepsy surgery service.

Other arrangements have been made in order to provide care for the increasing number of epilepsy cases. For example, arrangements have been done with the San Juan City Hospital Neurology Service to evaluate patients with epilepsy, and some of these cases have been referred for surgery to major medical centers in the continental USA.

Also in the area of surgery for movement disorders, especially Parkinson Disease, a neurosurgery faculty staff member has joined efforts with the Neurology Service to evaluate and coordinate surgery for these patients. In 2004 two cases with Parkinson's disease received Deep Brain Stimulators Pacemaker placements in this institution.

Furthermore, there have been a lopsided number of cases of trephination for subdural hematomas. This fact probably accounts for the high incidence of this condition in patients managed at the Puerto Rico Medical Center.

Comments of Respondents

Only 1 out of the 6 residents and 5 of the 11 attending physicians surveyed provided further written comments on their questionnaire. Regarding scheduled teaching rounds, the only responding resident indicated that adjustments could be made to the scheduled teaching rounds. On the subject of inpatient facilities, he/she stated that there are insufficient support personnel (nurses, escorts, secretaries, etc.). This was also supported by various attending physicians who also declared that the attendance and quality of the scheduled teaching rounds can also be improved. Regarding inpatients facilities, physicians commented that more nursing staff and more beds are crucial. The clinical setting was also described as being quite adequate. In addition to the standard survey questions, these comments provided information about which areas of the program need improvement.

Conclusion

The objective of this study was to assess the current state of the neurological surgery residency program in an effort to identify possible ways to improve it. After doing so, it was determined that a vast majority of the Neurological Surgery Section's faculty staff and residents were satisfied with the current neurosurgery residency program. The residents' overall Neurological Surgery Board Performance and their surgical experience demonstrate the residency program's success. Nonetheless, many concerns regarding inpatient and outpatient facilities, research activities, and the number of residents currently in the program indicate further improvements must be made. Unfortunately, none of the residents or attending physicians offered any recommendations regarding these aspects of the program on their comments.

Two aspects of the residency program attracted more concern than the others and thus will be discussed accordingly, in an effort to increase awareness of these particular situations. The surveys demonstrated that the neurological surgery division's staff was discouraged by the lack of research opportunities and facilities given to residents. The residency program in the University of Puerto Rico devotes only 3-6 months to research. Other neurological surgery residency programs in the United States, such as University of Virginia Medical School provide 2 years of research for residents during their 4th and 5th years of training.[9] Because "research has been considered an integral part of every recent neurosurgeon's training and because only a few of them continue research actively, we encourage the residents and attending physicians to promote and engage in further research activities".[10]

The other topic that raised significant concern was the seemingly low number of neurosurgery residents currently in the program. According to the surveys, the attending physicians and residents agree in that the number of residents currently in the neurological surgery residency program is not enough to handle the increasing workload. The American Association of Neurological Surgery Bulletin written by Dr. James R. Dean states that currently there is only one neurosurgeon for every 65,000 citizens in the United States, which is not enough for the present demand.[1111] Bean J.R., Numbers and Needs: Maintaining Balance in the Neurosurgical Workforce; AANS Bulletin, 2003; 12:4; p. 6.

Currently, there are 25 registered neurosurgeons in the island. Out of those 25 neurosurgeons, 4 of them do not perform open surgery due to their age or health conditions. That leaves 21 neurosurgeons for 4 million people, a ratio of 190,000 per every neurosurgeon, contrasting with the previous quoted ratio for the USA of 65,000 people per every neurosurgeon. This ratio broaden further when we take into consideration that Puerto Rico provides the neurosurgical care for many of the American citizens of the USA Virgin Islands, the people of the British Virgin Islands and other surrounding islands of other nationalities. Puerto Rico is obviously in need of competent neurosurgeons. For this reason, it is recommended an increase in resident enrollment per year.

Assessment of the perceptions of residents and attending physicians was one way of achieving an insight on how neurosurgery is being carried out in the University of Puerto Rico Medical Sciences Campus.

Resumen

En 2003, el Consejo Americano de Educación Médica Graduada (ACGME) realizó cambios significativos en las doctrinas y filosofías de los programas de entrenamiento médico post-graduados, en especial, la Regulación de las 80 horas de trabajo por semana. El Departamento de Cirugía Neurológica de la Clínica Mayo realizó un sondeo

a nivel nacional con respecto a las opiniones de los directores y de los residentes de neurocirugía sobre como el cumplimiento con los requisitos de ACGME, ha cambiado el entrenamiento de la neurocirugía. Usando una metodología similar, se investigó las opiniones de la facultad y de los residentes del Programa de Neurocirugía del Recinto de Ciencias Médicas de la Universidad de Puerto Rico. Se inquirió con respecto al currículo existente y sobre el modo en que el entrenamiento se realiza actualmente.

Cuestionarios anónimos fueron distribuidos entre la facultad y los residentes de la División de Neurocirugía. Se obtuvo los resultados de las puntuaciones de los residentes en el examen escrito del "American Board of Neurological Surgery". La cantidad y los tipos de cirugías realizadas por los residentes fueron obtenidas de los ficheros informáticos de la Sección de la Neurocirugía. Los datos fueron incorporados en una base de datos, se practicó un análisis descriptivo y de frecuencias de los resultados.

Los resultados demostraron preocupaciones por ambos, los residentes y la facultad, sobre la calidad de las facilidades hospitalarias y para los pacientes ambulatorios; de las actividades de investigación; del número de las horas del trabajo semanal; y del número de residentes matriculados actualmente en el programa. Se notó una tendencia ascendente a través de los años en las puntuaciones de los residentes en el examen escrito del "American Board of Neurological Surgery". Se concluyó que el número y la diversidad de los procedimientos quirúrgicos practicados por los residentes eran adecuados.

En vista de los resultados de las puntuaciones de los residentes en el examen escrito del "American Board of Neurological Surgery", y la experiencia quirúrgica a la cual se exponen, se concluyó que la experiencia educativa en neurocirugía es satisfactoria pero mejoras pueden ser llevadas a cabo.

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