

Education Research: Neurology residency training in the new millennium



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ABSTRACT

Objective: To survey adult neurology program directors (ANPD) to identify their most pressing needs at a time of dramatic change in neurology resident education.

Methods: All US ANPD were surveyed in 2007 using an instrument adjusted from a 1999 survey instrument. The goal was to characterize current program content, the institution and evaluation of the core competencies, program director characteristics, program director support, the institution of work duty hour requirements, resident support, and the curriculum needs of program directors and programs.

Results: A response rate of 82.9% was obtained. There is a significant disconnect between administration time spent by ANPD and departmental/institutional support of this, with ANPD spending approximately 35% of a 50-hour week on administration with only 16.7% salary support. Rearrangement of rotations or services has been the most common mode for ANPD to deal with work duty hour requirements, with few programs employing mid level providers. Most ANPD do not feel work duty hour reform has improved resident education. More residents are entering fellowships following graduation than documented in the past. Curriculum deficiencies still exist for ANPD to meet all Neurology Program Requirements, especially for nontraditional neurology topics outside the conventional bounds of clinical neurology (e.g., practice management). Nearly one quarter of neurology residency programs do not have a meeting or book fund for every resident in the program.

Conclusions: Adult neurology program directors (ANPDs) face multiple important financial and organizational hurdles. At a time of increasing complexity in medical education, ANPDs need more institutional support. *Neurology*® 2009;72:e15-e20

GLOSSARY

AAN = American Academy of Neurology; **ACGME** = Accreditation Council for Graduate Medical Education; **ANPDs** = adult neurology program directors; **CNPD** = Consortium of Neurology Program Directors; **GES** = Graduate Education Subcommittee; **NPR** = Neurology Program Requirements; **NRC** = Neurology Review Committee; **PA** = program administrator.

Neurology residency training has experienced unprecedented change in the new millennium with the introduction of the Accreditation Council for Graduate Medical Education's (ACGME) Outcome Project and the institution of work hour requirements.^{1,2} In the first two phases of the Outcome Project (July 2001–June 2006), learning opportunities in the six core competencies were integrated into residents' didactic and clinical educational experiences and programs were required to improve evaluation of resident performance in all competency domains. In the third phase (July 2006–June 2011), programs are expected to provide evidence of data driven residency program improvements with resident performance data becoming the basis for program improvement and evidence for accreditation review. External measures such as clinical quality indicators, patient surveys, and graduate surveys are being used to verify performance. In this same time frame, the ACGME mandated Resident Work Duty Hour Requirements limiting the total number of hours per shift and per week, and setting the

Supplemental data at
www.neurology.org

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Table 1 Program director work duties

Duty	Mean hours per week	Median hours per week	Minimum hours per week	Maximum hours per week
Clinical duties (n = 98)	25.5	20.0	5	70
Teaching-residency (n = 95)	7.7	6.0	2	40
Administrative-residency (n = 98)	9.6	9.0	1	30
Education research (n = 46)	2.5	1.5	0	20
Teaching-other (n = 73)	3.8	2.0	0	20
Administrative-other (n = 70)	7.2	5.0	0	25
Research-other (n = 70)	7.4	5.0	0	50

n = number of respondents.

minimum hours between shifts and number of days off per week. These changes have dramatically altered neurology residency curricula and the role and administrative workload of program directors.

In light of these challenges, the Graduate Education Subcommittee (GES) and Consortium of Neurology Program Directors (CNPD) of the American Academy of Neurology (AAN) conducted a survey of adult neurology program directors (ANPD) to ascertain the state of neurology training. The goal was to characterize current program content, the evaluation of the core competencies, program director characteristics and support, the effects of work hour requirements, resident support, and the curriculum needs of programs. Results were compared to those from a prior survey completed in 1999.³ We wanted to identify the most pressing needs of ANPD in this changing educational environment.

METHODS The GES and CNPD designed a 46-question survey modified from a 1999 survey of ANPD to address the issues described above.³ Questions were determined over the course of several GES meetings and through e-mail communication. In January 2007, a draft was submitted to the AAN Member Demographics Subcommittee for review and to obtain suggestions for improvement. The final survey was sent to all ANPD with active status in the AAN as of February 21, 2007. Directors of child neurology programs and Canadian programs were excluded. Responses were confidential, although AAN staff could track nonrespondents. Staff sent four reminders to nonresponders and members of the CNPD and GES called nonresponders encouraging the return of the survey the week before data collection was closed (April 16, 2007). Data were analyzed by Oksana Drogan, AAN staff. Subset data analysis was performed by program type: state university, private university, or community program; by program size: small (1–9 residents), medium (10–16 residents), and large (≥ 17 residents); and by

level of support: those with funding from the department or institution for role of program director or other administrative work vs no funding for administration.

RESULTS The survey was sent to 123 ANPD. A total of 102 surveys were returned for a response rate of 82.9%.

Program characteristics. Forty-six percent of respondents were from state universities, 35% from private universities, 17% community programs with or without a university affiliation, and 2% military programs. A mean of 14.0 (range 3–41) residents trained at each program. The majority (67.0%) of programs had voluntary unpaid clinical faculty participating in resident teaching. Community programs were more likely to rely on a significant percentage of teaching from voluntary faculty (mean 56.1%) compared to state (mean 7.2%) or private university programs (mean 15.4%).

Program director demographics. The majority (81%) of ANPD were men. About half of all ANPD were in a “clinician-educator” track (54.7%). Of the remainder, this track was not available to 65% at their institution. The academic ranks of ANPD tended to be advanced with 32.7% professors, 44.9% associate professors, and only 21.4% assistant professors. ANPD served a mean of 6.7 years as program director and many had other administrative duties (11% preclinical neuroscience course director, 18% student clerkship director, 22% fellowship director, 27% department chair or section chief, and 12% vice-chair).

ANPD support. ANPD spent approximately 17.3 hours per week (35% of a 50-hour work week) on duties related to teaching and administration, while a mean of 16.7% of their salaries came from departmental or institutional funds earmarked for these activities (ables 1 and 2). Nearly 25% received no departmental or institutional support for residency work. The time required solely for administering the residency program increased proportional to program size. ANPD of small programs devoted on average 7.7 hours per week, compared to medium programs (9.0 hours) and large programs (12.5 hours). ANPD from community programs spent a greater amount of time per week providing clinical care (mean 36.6 hours) than ANPD of state (23.5 hours) or private universities (24.8 hours).

Eighty percent of all ANPD have attended a CNPD meeting, with 97% of ANPD from private universities and 70% of ANPD from state university or community programs attending. Nearly 36% of ANPD from small neurology programs have never attended a CNPD meeting. Many are encouraged by their chair to attend

Table 2 Salary sources for adult neurology program directors (n = 98)

Source	Mean %	Median %	Minimum %	Maximum %
Clinical income	51.7	50	0	100
Research grants	5.8	0	0	75
Education grants	0.9	0	0	25
Endowment	1.0	0	0	35
Departmental funding for program director	10.7	0	0	50
Departmental funding for other administrative work	4.2	0	0	75
Institutional funding for program director	6.0	0	0	50
Institutional funding for other administrative work	7.7	0	0	100

(75.3%), with 44.4% receiving financial support to attend both CNPD meetings each year, and 31.1% receiving no support to attend either meeting.

About half (53.9%) employed a full-time program administrator (PA), while 38.2% employed a part-time PA. Large programs were more likely to have a full-time PA (74%) compared to medium (43%) or small programs (46%). About a quarter of programs designated an assistant or associate program director (26.5%). A full or part-time secretary was available to 8.8% and 19.6% of programs. Few programs employed departmental information technologists or PhD educators (5.9% and 3.9%). Most ANPD (90.2%) favored sending PAs to professional development courses. Likewise, ANPD supported developing medical education workshops separate from the Annual AAN Clerkship and Residency Program Director's Conference: 74.7% favored attaching workshops to the AAN annual meeting, 32.3% favored workshops at the American Neurological Association annual meeting, and 31.3% would attend any time, including a completely unattached meeting.

Resident support. Seventy-eight percent of residency programs provided a book fund for every resident in the program, with an average annual amount of \$510.70 per resident. Nearly a quarter of residency programs provided no meeting expense funds for each trainee (24.0%). For programs that provide meeting expense funds for every resident, the average annual amount was \$897.20. Of those programs that provide meeting expense funds to every resident, 45.3% offered funds every year of training, 33.3% during 1 year of training, and 56.0% when residents presented abstracts at national meetings. Small and medium-sized programs were more likely to fund residents to attend meetings every year of training (small 53%, medium 49%, large 28%). The institution of the Medicare "Cap," which strictly limits funding of residency training

to a fixed number of positions, has limited the ability of 49.5% of ANPD to offer their residents external rotations.

Resident research. Ten percent of neurology residency programs include a research requirement for every resident with dedicated research rotations, while 53% required research but afforded trainees no specific rotation. Research rotations last 1–3 months with about half equally split between 1 and 2 months. Fifty percent of programs with a dedicated research rotation did not need to alter resident schedules to accommodate the rotation as they always required such training, while 30% reduced elective time, 10% reduced ward service, and 10% reduced other rotations.

Work duty hours. Programs most commonly rearranged services and rotations to accommodate work hour requirements. Table e-1 on the *Neurology*[®] Web site at www.neurology.org lists other adaptations instituted by ANPD. Fifteen percent of programs used mid-level providers to deal with work hour reform. Thirty-two percent of ANPD track duty hours with electronic or written time records on a continuous basis, while 41.0% track hours intermittently. Very few ANPD believe that implementation of duty hour limits has improved patient care (8.1%) or resident education (15%). The majority of ANPD believe the rules have improved resident quality of life (80%) but increased faculty work load (61.6%).

Graduate information. ANPD reported a mean of 76.9% of their program graduates from the prior 3 years entered fellowships, while 22.6% went directly into practice. Most (71.3%) entered ACGME approved clinical fellowships, while 24.5% entered non-ACGME approved clinical fellowships; 1.6% entered basic science fellowships, and 2.6% entered a mixed clinical and basic science program. More graduates from small programs entered practice (41.4%) than their counterparts in medium (18.4%) and large programs (11.6%).

Curriculum. The ACGME Neurology Program Requirements (NPR) outline the topics which must be covered during residency training. The ANPD were polled about the availability of specialists in 36 areas specifically listed in the program requirements, including whether faculty were available within or outside their department, and whether the educational experience was an internal rotation, external rotation, or didactic experience (table 3). Data demonstrate programs are more likely to lack faculty in highly specialized areas (neurointensive care, neurology of aging, neuro-oncology, neuro-otology, and

Table 3 Program content (n = 102)

	Faculty within department	Faculty outside department	No faculty available	Internal rotation	Outside rotation	Didactic lecture(s) or course
Neurosciences						
Neurophysiology	89.1	20.8	4.0	37.6	4.0	49.5
Neuropharmacology	40.6	51.5	13.9	3.0	2.0	49.5
Neuropathology	41.2	66.7	0	41.2	12.7	42.2
Neuroimmunology	68.7	19.2	15.2	16.2	3.0	45.5
Neurogenetics	52.0	40.0	16.0	7.0	6.0	46.0
Neuroepidemiology	36.0	38.0	28.0	3.0	3.0	42.0
Clinical topics						
Neuroradiology	40.2	73.5	2.0	48.0	3.9	42.2
Pediatric neurology	80.2	28.7	0	47.5	10.9	42.6
Neurointensive care	65.7	26.5	14.7	34.3	10.8	31.4
EEG-epilepsy	98.0	4.9	0	53.9	2.9	47.1
EMG-neuromuscular	98.0	4.9	0	53.9	2.9	47.1
Evoked potentials	99.0	2.0	0	36.3	2.0	40.2
Vascular neurology	98.0	3.9	1.0	47.1	1.0	50.0
Psychiatry	23.5	85.3	0	45.1	5.9	39.2
Neurosurgery	15.8	86.1	0	30.7	4.0	30.7
Neuroanatomy	60.8	50.0	5.9	5.9	2.0	53.9
Behavioral neurology	78.4	19.6	8.8	25.5	3.9	46.1
Movement disorders	88.2	6.9	6.9	34.3	8.8	47.1
Pain management	43.1	57.8	8.8	16.7	10.8	40.2
Neurology of aging	70.6	22.5	14.7	12.7	3.9	35.3
Headache	91.2	5.9	4.9	21.6	2.9	47.1
Neuro-oncology	50.0	37.0	17.0	25.0	8.0	44.0
Neuro-ophthalmology	45.5	59.4	5.0	32.7	7.9	44.6
Neuro-otology	21.8	66.3	13.9	10.9	5.0	38.6
Neurorehabilitation	35.0	65.0	4.0	21.0	17.0	35.0
Sleep disorders	65.7	40.2	4.9	29.4	6.9	49.0
Neuroinfectious disease	42.6	46.5	14.9	5.9	4.0	47.5
End-of-life/palliative care	44.1	56.9	8.8	4.9	2.9	52.0
Ethics	49.0	56.9	5.9	2.0	1.0	55.9
Practice management	48.5	33.7	19.8	2.0	0	45.5
Statistics/epidemiology	46.1	54.9	9.8	1.0	2.0	45.1
Medicolegal	22.5	47.1	29.4	1.0	0	39.2
Outcomes research	38.4	42.4	24.2	1.0	0	32.3
Recognition and management of abuse	17.8	59.4	22.8	1.0	1.0	34.7
Cost-effective care	42.0	37.0	24.0	1.0	0	36.0
Effects of sleep deprivation	50.0	35.3	13.7	2.0	0	48.0

Values are percentages. Percentages add up to greater than 100 because departments may have expertise both within and outside the department, and may have rotations and didactic experiences.

neuroinfectious disease). About 6–30% of programs have no faculty teaching nontraditional topics outside the conventional bounds of clinical neurology (e.g., ethics, practice management, end-of-life/palliative care, medicolegal issues, effects of sleep deprivation, and recognition and management of physical/sexual abuse).

When ANPD prioritized their preference for distance learning educational supplements for residency training, from the list of 36 educational components the top five priorities related to these topics were statistics/epidemiology, practice management, medicolegal issues, ethics, and neuropharmacology (in descending order).

Table 4 Length of rotations for a typical neurology resident (n = 92)

Rotation	Mean number of months (range)
Inpatient adult wards/consults	13.3 (8-20)
Outpatient clinics (include continuity clinic)	5.3 (0-10)
Pediatric neurology	3.1 (2-6)
Neuroradiology	1.0 (0-5)
Psychiatry	1.0 (0-3)
Neurosurgery	0.4 (0-2)
Neuropathology	1.3 (0-3)
EEG	1.5 (0-4)
EMG	1.9 (0-4)
Epilepsy unit (if separate from adult wards)	0.5 (0-3)
Research	0.3 (0-2)
Electives	4.3 (0-11)
Neurorehabilitation	0.4 (0-4)
Neurointensive care (if separate from adult wards)	0.6 (0-4)
Neuro-ophthalmology	0.3 (0-2)

Entries totaling more than 36 months were excluded from the analysis.

There continues to be a wide variety of rotation experiences offered in different programs, as seen in table 4. Twenty-five percent of program directors polled would increase the duration of neurology residency training by 1 year.

ANPD have incorporated multiple methods to evaluate the six core competencies (table e-2). Most programs use a global rating scale to evaluate all core competencies, a written examination to evaluate medical knowledge, and multisource/360 degree assessments of interpersonal and communication skills and professionalism.

DISCUSSION This survey provides important insight into the needs of ANPD and residency training programs in this unprecedented time of change in training. These results demonstrate a striking disconnect between ANPD administration and teaching time commitment in residency programs and the level of support for these activities. These findings are basically unchanged compared to the 1999 survey. Support includes not only ANPD salary and dedicated time, but support for a dedicated PA, and faculty development through subsidizing attendance at CNPD meetings. These results also demonstrate less than adequate support of residents in about a quarter of programs as evidenced by the absence of a book or travel fund. From this survey, small community-based programs are the most likely to lack sufficient

support. Program requirements of other nonsurgical specialties (dermatology, emergency medicine, family medicine, internal medicine, pediatrics, psychiatry, and diagnostic radiology) were reviewed; only neurology and dermatology fail to specifically require salary support or minimum protected time for program directors.⁴ Many ANPD also desire career development with more education-oriented workshops than are currently available at the AAN annual meeting.

ANPD accommodate work hour requirements with a variety of program changes. Compared to neurosurgery, mid-level providers have not filled the gap for neurology programs.⁵ This is not surprising given the differences in clinical income between the surgical and nonsurgical specialties. It is also likely that physician extenders are better suited to neurosurgery for the portion of their service which provides care to medically well patients admitted for elective procedures in which standardized clinical pathways can be employed. Institution of a night float system has not been common except in large neurology programs where nearly half have such systems. According to ANPD work hour reform has not improved resident education or patient care, and there is increasing stress on academic physicians to, in part, make up for time residents are not available. While these statements remain to be independently verified, they are basically unchanged from the opinions of a limited number of ANPD surveyed in 2004 immediately after institution of duty hour reform.⁶

Multiple areas of curricular deficiency in residency programs were identified. A trend continues toward increased outpatient clinic rotations compared to 1999, with a reduction in the months on neuropathology, EMG, EEG, and electives.³ Despite increased outpatient clinic time, the 2007 respondents reported a mean of 5.3 months in the outpatient clinic setting, whereas ACGME NPR mandate a minimum of 6 months. Respondents may have failed to include longitudinal clinic experiences, despite instructions to include all clinic experiences, or simply reported inaccurate data. Compared to 1999, slightly more programs have no faculty to teach traditional topics such as neuropharmacology and neuroimmunology.³ Nontraditional education components (ethics, end-of-life/palliative care, statistics and epidemiology, practice management) are also NPR but only 32–63% of programs provide a didactic experience in these areas. Despite these deficiencies, the authors are optimistic that innovation can help ANPD meet these needs. For example, the AAN offers a basic science curriculum for residents including neuropharmacology at the annual meeting. ANPD can already access the

AAN's case-based curriculum, "Ethical Dimensions of Neurologic Practice," currently being updated by the AAN Ethics, Law and Humanities Committee (personal communication, Tyler Reimschisel, MD). The AAN's Evidence Based Medicine Toolkit includes didactics on basic statistics and epidemiology and became available to ANPD in 2008. Web-based curricula covering traditional neurology topics (e.g., headache and epilepsy) have also been developed.^{7,8} The reliability and validity of these curricula and tools have not yet been determined. Validated educational tools and curricula in end-of-life/palliative care are also available to ANPD, and have been adopted successfully in some programs.^{9,10}

This survey has provided a set of priorities for the development of supplemental educational materials for residency use. Statistics/epidemiology was the first priority followed by practice management, medicolegal issues, and ethics. High priority should be placed on the development of a practice management and a medicolegal educational resource as it is unlikely these needs will be met at each individual program site. This may be accomplished through a Web-based tool or development of educational modules for local program use. It is interesting that ANPD recognize deficiencies in teaching nontraditional topics such as end-of-life/palliative care and recognizing the effects of sleep deprivation but these were not highly ranked as priorities for the development of supplemental educational materials for residency use.

We hope this survey becomes an instrument of change. The survey results have been shared with ANPD, the GES, and the ACGME Neurology Review Committee (NRC). One purpose of this survey was to provide important benchmarking information for ANPD. Despite fiscal challenges to residency programs, all wish to recruit the best possible candidates. This information may assist ANPD in highlighting their program's strengths and in advocating for curriculum change or resident support to enhance their program's attractiveness to applicants. The results of this survey highlight the need for revising the NPR to address important issues of salary and professional development support for ANPD, administrative support with a PA, and resident travel and book

fund support. Indeed, the GES and CNPD formally asked the NRC to require several of these items and the updated NPR will include new requirements for minimum ANPD salary support, support for ANPD attendance at one education meeting per year, and support for resident attendance at one national meeting during training.

The survey's limitations are clear. The information obtained cannot be externally verified. Furthermore, data from child neurology and fellowship program directors were not obtained. Their input into neurology education needs is also vital and should be addressed by future surveys.

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