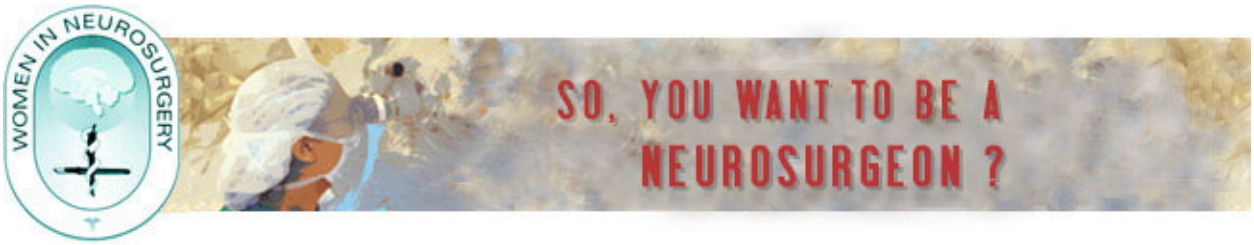


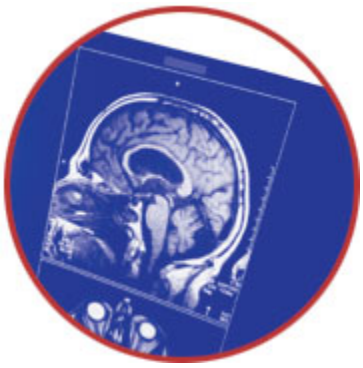
INTRODUCTION

I am pleased to introduce the 2nd edition of, "So You Want To Be A Neurosurgeon". Originally developed and written by Drs. Karin Muraszko and Deborah Benzil, this brochure remains a concise and relevant snapshot of the field of neurosurgery. The recent changes in both the application process as well as the course of training for neurosurgical residents are summarized in this 2nd edition. In addition, requirements for board certification and maintenance of certification are introduced.

While the healthcare system will continue to undergoing change in the future, the field of neurosurgery will always remain a vibrant demanding specialty, attracting the brightest and most dedicated students. On behalf of Women in Neurosurgery, I wish you the best of luck in whichever field you pursue.

D. Roxanne Todor, MD

neu·ro·sur·geon (noo´ rō sur jən) *n.* a **medical specialist** concerned with the diagnosis and treatment of patients with injury to, or diseases of, the brain, spine or peripheral nerves



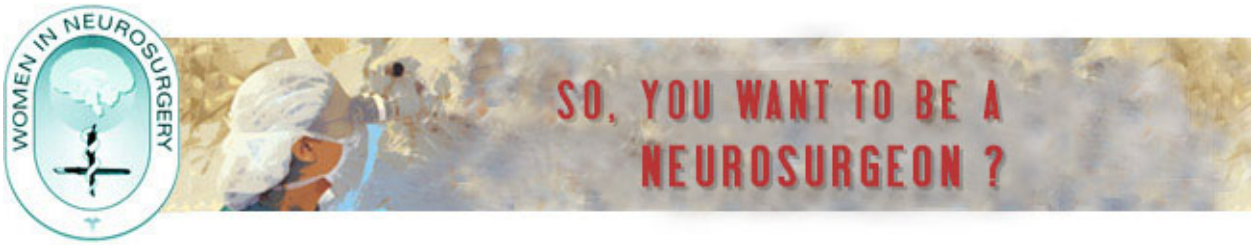
WHAT IS NEUROLOGICAL SURGERY?

Neurosurgery is the discipline in medicine that focuses on the diagnosis and treatment of the central, peripheral, and autonomic nervous system. Because of this emphasis, it is a discipline that focuses on a complete system rather than any specific region of the body. It is first and foremost a surgical discipline, and with rare exception, its practitioners are physicians who operate on the nervous system.

Because the nervous system encompasses all parts of the body, a neurosurgeon may operate on the brain, spine, or extremities in a given day or week. Neurosurgeons operate on patients of all ages, treating abnormalities that range from congenital anomalies of the newborn, to trauma, to tumors, to vascular anomalies or infections of the brain or spine, to abnormalities of the aging such as stroke or degenerative diseases of the spine. Like the neurologist, the neurosurgeon is an expert in the diagnosis of neurological disorders, capable of interpreting a variety of radiological studies such as CT scans, magnetic resonance images, and angiograms. Unlike the neurologist, the primary focus of the neurosurgeon is on surgical approaches to the treatment of their patients.

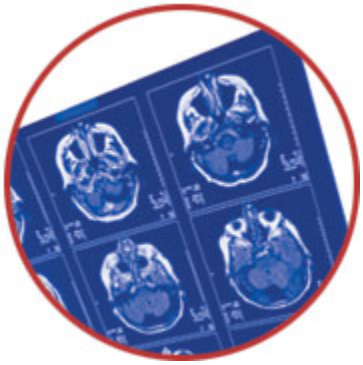
Neurosurgery is among the youngest of surgical disciplines, dating back to the early 1900s. The early greats in neurosurgery were well-trained general surgeons who specialized in the nervous system. Many were also creative scientists who used their expertise in neurophysiology to become expert clinicians. Because it is a young specialty, neurosurgery is rapidly evolving. An important tradition in neurosurgery is change and rapid dissemination of new ideas and techniques. Today neurosurgeons practice in a variety of locations from academic centers, to community hospitals, to major research facilities such as the NIH. After adequate training, a practitioner of the art of neurosurgery has many opportunities for a variety of career paths. Successful practitioners of this young specialty embrace change and recognize that during their careers they will continue to change and grow, incorporating new techniques and ideas in the treatment of their patients.

The community of neurosurgeons is relatively small. In the United States there are about 3,500 practicing



Board-certified neurosurgeons and only 99 approved training programs. Each year there are approximately 170 new training positions open and 160 residents who graduate. The total number of residents in the United States is about 790. Sub specialization has become a part of neurosurgery, and there are now post-residency graduate training positions or fellowships in pediatric neurosurgery, spine surgery, interventional neuroradiology, vascular surgery, neuro-oncology, pain, trauma, and functional and stereotactic neurosurgery.

Who Should Become a Neurosurgeon?



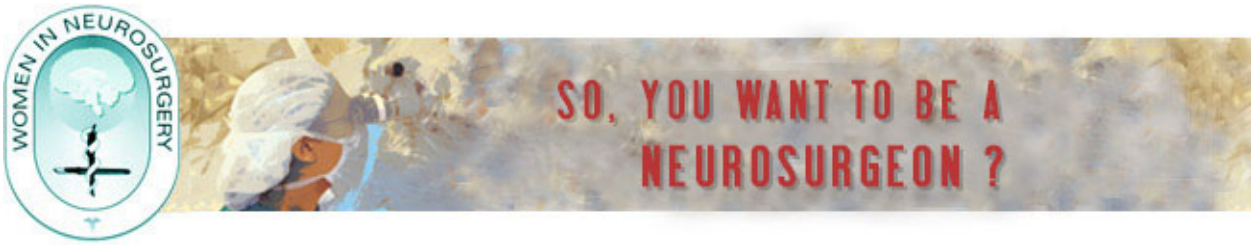
Like all specialties, neurosurgery strives to attract the best and the brightest candidates graduating from accredited medical schools. Men and women considering a career in neurosurgery should have the intellectual curiosity and ability to embrace and understand the detail and complexity of the nervous system. They must have the personal and physical stamina to meet the challenges of a demanding residency and surgical procedures that often extend for many hours. Because the number of residency positions is limited, most students granted acceptance to a neurosurgical training program are exemplary, and generally rank at or near the top of their class.

Neurosurgery appeals to those individuals who find the human brain fascinating and who enjoy the physical act of correcting abnormalities of the nervous system. Although the intellectual challenge of constant learning and change may draw an individual to neurosurgery, it must be coupled with a strong desire to be an interventionist, willing to make decisions and take responsibility for those decisions. No two operations are exactly the same, and much time is spent considering the various options before choosing an approach to a problem. Stress and the challenges of dealing with critically ill patients are every day occurrences for neurosurgeons. They must be able to cope not only with death but also with the very real and difficult decisions regarding the most vital functions of the brain and spinal cord such as the ability to think, speak, see, move, and feel. Neurosurgeons are asked to communicate complex concepts to patients and family members about quality of life and risks versus benefits of surgical procedures on the most delicate organ in the body.

How Do I Learn About Neurosurgery?

Who Can I Talk to About My Plans?

As with any profession, the best way to know about it is to talk to individuals who practice the art and science of neurosurgery. For students this can sometimes be intimidating. A neurosurgical career is a rigorous undertaking, and careful consideration should be given to one's motivation for choosing this specialty. Get to know neurosurgeons in active practice and spend time with them and with residents training in neurosurgery. There are many different styles of practice, and a wide variety of personalities can be found in neurosurgery. To be certain that this career is right for you; it is wise to immerse yourself in it for a period of time. Spend at least one month on a neurosurgery service. Go to the operating room as much as possible. Shadow a neurosurgeon to see what his or her life is like. Consider spending time in a neurosurgery laboratory to understand the complexity and beauty of neuroscience. If possible, spend some time at a neurosurgery program other than that at your own institution. Talk to neurosurgery residents about their experiences with the interview process and how they ranked programs. Ask questions. Be certain that you have a clear understanding of why you have chosen this field. A list of



programs is available on the eras website with links to their institution's home page - https://services.aamc.org/eras/erasstats/par/display8.cfm?NAV_ROW=PAR&SPEC_CD=160.

If you need additional advice or would like to talk to neurosurgeons at a variety of places, the following organizations have individuals you may contact*:

- American Association of Neurological Surgeons –- Young Neurosurgeons Committee
- The Congress of Neurological Surgeons –- Resident Committee
- Women in Neurosurgery –- Executive Committee
- Council of State Neurosurgical Societies –- Young Physicians Committee

You should avail yourself of as many sources of information as possible. Don't be afraid to seek information outside your home institution. This is your life, and you are about to make an important decision. The more informed you are, the better you will understand what neurosurgery is about and how to succeed in becoming a neurosurgeon.

* see addresses in Important Resources at the end of this brochure

BECOMING A NEUROSURGURGICAL RESIDENT

Overview

Although some students have a strong sense of subspecialty interest before medical school, it is typically near the end of the third year that most students begin to define their future career goals. A few individuals come to neurosurgery at a later point in their career, choosing to do an internship or work in a laboratory prior to applying to neurosurgical residency. The Neurological Surgery residency matching program will be changing from SF Match to the ERAS/NRMP system commencing with the 2008-2009 match year. While no longer part of the early match, applicants are encouraged to organize their application process in a timely fashion. This match takes place each March for positions that will start July of the same year.

All aspects of the application must be completed by that time, including reference letters, which must be submitted with the application. Completion of the application process is the responsibility of the applicant and not the ERAS or the individuals asked to write letters of recommendation.

Individual institutions may require material in addition to the ERAS application. Applicants are expected to contact all institutions to which they apply to learn of any additional requirements. Applicants must identify at least three individuals from whom they can obtain letters of recommendation. Such letters must be requested in the summer or early fall before the match to assure that they are available in a timely fashion to requesting institutions and the ERAS. Dean's letters should also

TIMETABLE:

During third-year Medical school:
Design a fourth year medical school curriculum to include at least one neurosurgery rotation.

Late Spring - Early Summer:
Look at individual program websites.

Early Summer-Early Fall:
Request letters of recommendation from at least three faculty members. Two letters should be from a neurosurgeon. Initiate ERAS.

August/September:
Have ERAS application completed
Complete any additional application requirements of specific institutions

October/November:
Programs will contact the applicant regarding interview dates

November:
Make certain dean's letters are received by various programs

Mid January/February:
Submission of rank order by applicants and by the various neurosurgical departments

Mid March:
Results of the match become available

be requested, but will not usually be available until November of the year before the match.

Interviews are by invitation only. In general, if an applicant has not been asked to interview at a particular institution, the applicant will not match there. The majority of interviews take place during October, November, and December of the year before the match. Several residency programs may have their interviews on the same day, and therefore applicants must decide which interview takes precedence.

The final match rank list must be submitted by the applicant and the various institutions by late February. Results of the match ranking are generally available by mid March.

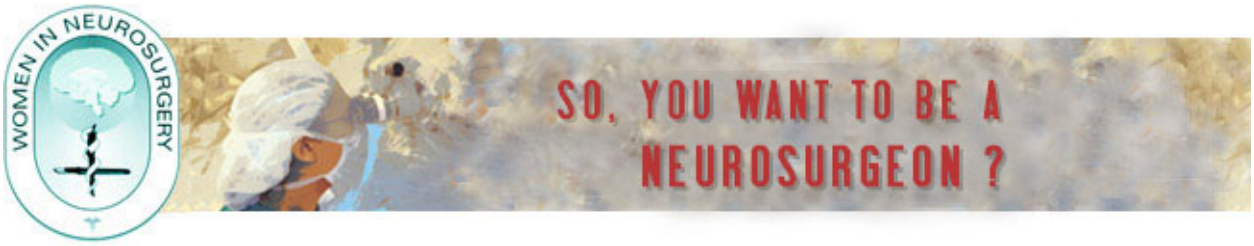
ELECTRONIC RESIDENCY APPLICATION SERVICE ERAS is a service that transmits applications, letters of recommendation (LoRs), Medical Student Performance Evaluations (MSPE aka Dean's Letter), medical school transcripts, USMLE transcripts, COMLEX transcripts, and other supporting credentials from you and your designated dean's office to program directors using the Internet. ERAS consists of MyERAS (the Web site where you create your application), the Dean's Office Workstation (DWS), the Program Director's Workstation (PDWS), and the ERAS PostOffice.

- **MyERAS Web site.** This is where you complete your application and personal statement, select programs to apply to, and assign documents to be received by those programs.
- **Dean's Office Workstation (DWS).** This is ERAS software used by staff at your designated dean's office. From this software they create an electronic token that you use to access MyERAS. They also use this system to scan and attach supporting documents to your application, such as photograph, medical school transcript, MSPE, and LoRs.
- **Program Director's Workstation (PDWS).** This is ERAS software used by program staff to receive, sort, review, evaluate, and rank applications.
- **ERAS PostOffice.** This is a central bank of computers that transfer the application materials from applicants and the designated dean's office to residency programs. You can monitor the activity of your files on the ERAS PostOffice via the Applicant Data Tracking System (ADTS).

The ERAS provides you with a straightforward way of summarizing your educational and research background. It provides you with sufficient space to describe any awards or accomplishments you may have as well as an area to describe your personal interests. Take time with your application. Sloppy or poorly organized applications reflect poorly on the applicant. Make certain that the personal statement has been proofread repeatedly for grammatical and typographical errors. This application will go to every program to which you apply.

The application process in neurosurgery asks you to provide a thoughtful assessment of your strengths and weaknesses. The personal statement is the one area on the application that allows you to show your individuality and to describe why you chose neurosurgery as a career. It is the one spot on the application that is entirely decided by the applicant. The most important thing a personal statement can do is explain to the reviewer why the applicant should be chosen as a future neurosurgeon. Personal statements that stray far from that purpose do not best serve the interests of the applicant.

PERSONAL STATEMENT The personal statement can be difficult to write. It may take several drafts to produce the final product. Take the time to do it well. It is important to your future. Ask others, especially advisors, to review it and make suggestions. It should reflect who you are and why you want to be a neurosurgeon. Remember that program directors will read hundreds of personal statements. Talking about personal aspects of your life helps put personality on your application.



Clearly written, grammatically correct, and carefully organized personal statements are essential.

It is important that the individuals who write your letters of recommendation know you reasonably well and are able to speak about you with some insight. Letters from “famous” individuals that do not speak of you in a personalized fashion are not as useful as those that are written by individuals who can speak with credibility about your assets. Finding such individuals means taking the time to talk to faculty members about your plans. Although letters from a variety of individuals are valuable, letters from neurosurgeons are particularly important as they can speak to your ability to practice neurosurgery.

LETTERS OF RECOMMENDATION At least three letters are necessary when applying for a neurosurgical residency. At least two of these letters should be from neurosurgeons who can speak about your strengths. This means that you should have some contact with the neurosurgery department at your institution or an outside institution to be able to identify such individuals. Additional letters can be helpful. Although the ERAS application will make use of only three letters of recommendation, additional letters may be obtained. Such additional letters will need to be sent to the institutions to which you are applying and should probably not exceed a total of six, unless there is a compelling need for additional clarification of your application.

INTERVIEW The interview process gives you a chance to see the institutions with which you wish to train and allows these institutions to assess you and your qualifications. You will not be invited for an interview at every program to which you apply. Offering an interview is the first step by which programs begin to narrow the pool of applicants. Because neurosurgical residency is a long process and institutions vary in their character and programs provided, it is important that you seriously assess each institution and your ability to fit in. The interview is your best chance to talk about yourself and to become an individual in the application process.

Programs emphasize different questions in the interview process. You can tell a great deal about a program by the emphasis it places on various questions. Even if you decide a program is not right for you, having seen the program will give you important information that you can use to assess other programs.

To succeed at an interview, you must remember that it is a two-way process. You should be honest in answering questions and should not be intimidated to ask questions that you want answered. Be direct and straightforward in your answers, but also be succinct. You want to have the chance to talk about several areas. You are likely to be asked about why you chose to go into neurosurgery and what you would like to do in neurosurgery. Although no one expects an applicant to have made a complete decision as to their ultimate goals, some consideration should have been given by the applicant to possible options. For example, what kind of practice setting do you think you would like -– private or academic? It is best not to second-guess the questioner as to the desired answer.

You should arrive well in advance of your interview, leaving yourself plenty of time to get to the interview and to find your way. Because many interviews can be all day, you should consider arriving the day before. This will require making arrangements for accommodations the night before and perhaps the evening after an interview. It is unwise to assume that transportation schedules are precise or that a room will always be available in a given town. A well-prepared applicant has considered the various obstacles that can arise and has made appropriate plans to ensure a successful arrival.

Try to get sufficient sleep the night before an interview. A refreshed mind can be your greatest asset. Remember that appearance counts. Your appearance will be the first thing appreciated about you and will leave a lasting impression. Make certain you have considered your attire before the interview. Many interview days have considerable amounts of walking associated with them. Wear comfortable business

shoes that allow you to walk distances in comfort.

Remember that there are no insignificant individuals at any institution. Many applicants have made serious errors by being curt or demanding of individuals such as secretaries or assistants. Neurosurgery requires a team approach, and you should approach the interview with the goal of showing everyone that you are a team player. This means dealing with everyone with respect.

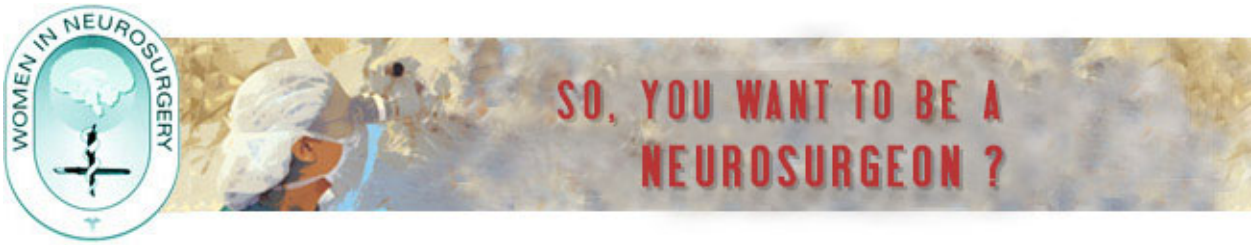
If you have the opportunity, review your notes on a given institution or visit their Web site before an interview. It often helps to have some insight about an institution before interviewing there. You may want to bring along copies of abstracts or papers that you have written to provide additional information. Keep in mind that in most instances the individuals with whom you are interviewing will know your application.

RANKING Both you and the programs to which you apply will develop a rank list that will be used by the Neurosurgical Matching Program to determine who will match with which program. Details of this matching process can be found on the Neurosurgical Matching Program web site. Some general considerations are important to remember. First, if you don't want to be in a particular program, don't rank that program. You could wind up at that program, and participation in the match program constitutes a contract that you will accept the position given to you. Second, don't assume that because you have been told "you will be ranked very highly here at X University," you will match at that institution even if you rank it number one on your list. Being ranked number five by X University does mean that they ranked you highly, but others may still be more highly ranked.

Programs are not permitted to discuss specific rank order with applicants and are specifically instructed not to pressure or have conversations with applicants outside of the normal channels of the interview process. You should not ask a program director how you will be ranked. You can, however, communicate to a program director that you have found a specific program particularly appealing and that you would like to train there. The best way to do this is generally through a letter or by returning for another visit. All programs are seeking individuals who want to train there and hope that the fit of the individual and the institution will be perfect.

Discussing your rank order with advisors and colleagues is important. Many students have ranked only the top rated programs and then found themselves without a residency position because of poor choices on the rank list. Be realistic about your qualifications and the likelihood that you will be ranked highly at a given institution. A balanced rank list gives you the best chance to match to a residency position and therefore have a chance to be a neurosurgeon.

PLAN FOR ALTERNATIVES Matching to a neurosurgery residency is very competitive. The possibility exists that you may not match. Although you may have your heart set on being a neurosurgeon, at least entertain what you would do should you not match. How might you change your application? What would you do in the year before you could apply again? Would you apply again? Would you do a year of research or continue with a year of internship? There are no "right" answers to these questions. Discuss these issues with your advisors and with program directors. Many applicants elect to apply for general surgical positions in addition to neurosurgery. Others may wish to spend a year doing neurology or research. What is most important is to have an alternative plan ready.



TRAINING FOR NEUROSURGERY

The American Board of Neurological Surgery (ABNS) determines the certification process by which a program may be accredited to train residents in neurosurgery. To become board certified, an individual must have graduated from an accredited medical school and have completed neurosurgical residency training in a program that is accredited by the Accreditation Council for Graduate Medical Education (ACGME).

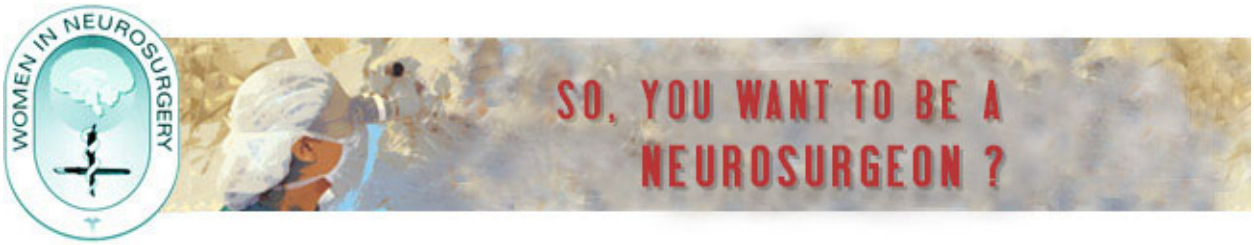
There is a prescribed formula of minimal requirements for neurosurgical residency and training. Twelve months must be spent acquiring basic or fundamental skills. This may include the required three month rotation in Neurology as well as rotations in General Surgery and Critical Care. In addition to this year, training in neurosurgery must include at least 60 months in the neurological sciences. Thirty-six months must be specifically devoted to clinical neurosurgery in an ACGME-accredited neurosurgery program, of which 12 months must be as senior or chief resident. As senior or chief resident, the trainee must have major or primary responsibility for patient management as well as administrative responsibilities. This level of responsibility varies among residency programs but is a crucial element of training. It prepares the individual to assume, in a graduated fashion, responsibility for patients and their complex neurosurgical problems. In addition to neurosurgical training, at least three months must be spent in clinical neurology, again in an ACGME-accredited neurology residency program. Six months of neurology training is recommended but not required. The remaining 21–24 months of training can be divided among neuropathology, neurology, neuroradiology, additional neurosurgery, and research. These additional months give programs a character and flavor that make them unique. In some institutions, these months are largely spent in the laboratory. In others, there may be an exchange program with other institutions. It is important to assess each program and learn how it structures these months.

All neurosurgery programs are under the auspices of the ACGME and as such are bound by their rules including the 80 hour work regulations. Training in neurosurgery is progressive, requiring graduated experience and increasing responsibility. The ABNS requires that at least 24 months of training in clinical neurosurgery be done at one institution. Training taken outside the parent institution will not be recognized unless approved by the trainee's program director. The program director plays an important role in the training of a neurosurgeon through regular evaluations and determinations of rotations.

Once residency training is complete, you should begin planning your timetable to complete primary Board Certification. It is important to remember that certification by the ABNS requires general knowledge of all aspects of neurosurgery, not only your particular field of specialization. In addition, the Board now issues time limited certificates that must be renewed every ten years through the maintenance of certification (MOC) process. Information about both processes is available at **www.abns.org**.

IN CONCLUSION

The dream of becoming a neurosurgeon, that can at times seem unobtainable, may be achieved with persistence and hard work. Every individual's path to becoming a neurosurgeon is unique, but they all start with the same first step. We hope the information in this brochure will guide you in your decision, and encourage you to take advantage of all the available resources listed below.



IMPORTANT RESOURCES

National Resident Matching Program (NRMP)
www.nrmp.org
2501 M Street, NW, Suite 1
Washington, DC 20037-1307
Phone: 202-828-0566

Electronic Residency Application Service (ERAS)
(American Association of Medical Colleges)
www.aamc.org/audienceeras
2450 N Street, NW
Washington, DC 20037-1126
Phone: 202-828-0400
E-mail: erashelp@aamc.org

American Council of Graduate Medical Education (ACGME)
www.acgme.org
Graduate Medical Education Directory -- available in most medical libraries and Dean's offices or from:
The American Medical Association
535 North Dearborn Street
Chicago, IL 60610

The American Board of Neurological Surgeons (ABNS)
www.abns.org
6550 Fannin Street, Suite 2139
Houston, TX 77030
Phone: 713-790-6015
E-mail: abns@tmhs.org

The Society of Neurological Surgeons (SNS)
www.societyns.org

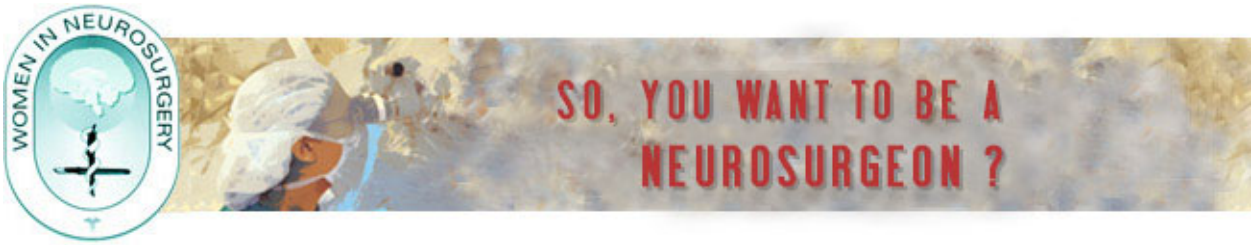
American Association of Neurological Surgeons (AANS)
www.aans.org
www.neurosurgerytoday.org
5550 Meadowbrook Drive
Rolling Meadows, IL 60008
Phone: 847-378-0500
Toll-free: 888-566-AANS (2267)

Congress of Neurological Surgeons (CNS)
www.neurosurgeon.org
10 North Martingale Road, Suite 190
Schaumburg, IL 60173
Phone: 847-240-2500
Toll-free: 877-517-1CNS (1267)

Council of State Neurosurgical Societies (CSNS)
Young Physicians Committee
http://www.csnsonline.org/committee/7.php

Women in Neurosurgery (WINS)
www.neurosurgerywins.org
5550 Meadowbrook Drive
Rolling Meadows, IL 60008
Phone: (847)378-0500

Young Neurosurgeons Committee (YNC)
www.aans.org/young_neurosurgeons



ACKNOWLEDGEMENT

Women in Neurosurgery appreciates the ongoing support for their efforts from the American Association of Neurological Surgeons and the Congress of Neurological Surgeons.

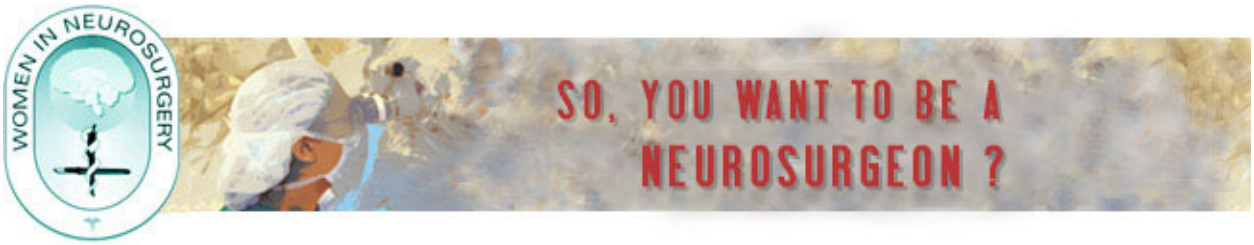
ON BEHALF OF THE AMERICAN ASSOCIATION OF NEUROLOGICAL SURGEONS (AANS), I am delighted to welcome you to stimulating world of 21st century neurosurgery. The AANS, the organization that speaks for North American neurosurgery, celebrated its 75th anniversary in 2006; while neurosurgery looks very different today than it did to those pioneering the profession in the early 1900's, there is no doubt that it continues to be just as intellectually challenging and personally satisfying.

There have been astounding advances in our understanding of that most sophisticated and complex of human systems – the nervous system. Neurosurgeons worldwide have worked to broaden our understanding of such challenging disorders as stroke, brain tumors, epilepsy, pain and trauma. We also have moved actively into the exciting arena of neurodegenerative disease, probing the cause and treatment of such devastating disorders as Parkinson's and Alzheimer's diseases. The evolution of sophisticated computer systems has allowed us to explore the depths of the brain with great precision to sample tissue, stimulate selected nuclei, and implant genetically engineered tissue or pharmacological agents. We have adapted the techniques of molecular biology to develop novel therapies for the treatment of brain tumors and stroke.

Focused efforts have provided a framework to enhance the lives of the increasing number of patients suffering from many different types of spinal disorders. Advances in the understanding of spinal biomechanics have allowed the application of sophisticated interventions to alleviate the suffering experienced from degenerative disease of the spinal column. Research is underway on the use of transplantation and other novel interventions to remedy the tragic consequences of spinal cord injury.

ON BEHALF OF THE CONGRESS OF NEUROLOGICAL SURGEONS (CNS), I hope you are inspired to pursue our beloved field of Neurological Surgery. What is so special about Neurological Surgery? It is a magnificent, but challenging field that covers a broad spectrum of disease and injury that affect the brain, spinal cord and peripheral nerves. The brain and spinal cord are the last frontiers in medicine. Although we understand more about the central nervous system every day, there is an unlimited amount of research and learning yet to do.

Our field needs, bright, talented and interested students who desire to discover, innovate and push our field forward. Ultimately, it is our patients who will benefit. The relationship between a Neurosurgeon and their patient is often an unforgettable one for the patient, and of unparalleled satisfaction for the Neurosurgeon. Today, Neurosurgeons have an opportunity to remove a brain tumor or epilepsy focus, stop a bleed in the brain, fix a child's congenital anomaly, restore neurological function or eliminate pain and suffering with newer and safer techniques. When necessary, we provide palliative and humane care for those who have incurable neurological disease. We treat stroke, cancer, spinal disorders, trauma and neurological disorders that were once only amenable to medical therapy. The Neurosurgeon has a daunting task, but is aided by novel neurosurgical techniques and exciting emerging technologies that will fascinate any student. We use minimally invasive approaches, interventional/intravascular techniques, computer imaging and molecular solutions that are evolving in an exponential fashion. This has created more excitement and more opportunity to treat patients safely than ever before. It is a career that offers the unique combination of scientific inquiry, surgical mentorship and patient advocacy. The psychomotor skills that are developed over time are a skill set that are honed by discipline and a more creative and



These truly are exciting times for neurosurgery.

This monograph, prepared by Women in Neurosurgery (WINS), has been adopted by organized neurosurgery to help introduce everyone to the exciting opportunities of a career in neurosurgery. I encourage you to read it carefully to learn of the possibilities for you in our specialty. We are a relatively small discipline in numbers but there is extraordinary potential in our field. Perhaps you will be stimulated to move with us into the exciting future of our specialty.

Donald O. Quest, MD
American Association of Neurological Surgeons

compassionate educational process than in the past. The Neurosurgeons of today are a talented and diverse group of people who treat adults and/or children, and have arrived at their field from a multitude of beginnings. It is open to any ethnic background or gender, and has benefited from the diversity of experiences that our newest trainees have brought to our field.

The future of medicine is bright because of the rapidity and efficacy of the latest innovative treatments and technologic advances. However, the incomparable personal satisfaction from laying hands on a patient and making them better by surgery remains an important attraction for those seeking a career in Neurological Surgery. We wish you luck with whatever career path you choose to travel.

Richard G. Ellenbogen, MD, FACS
Congress of Neurological Surgeons

SO, YOU WANT TO BE A NEUROSURGEON?

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