



INTRODUCTION

We are pleased to present the 3rd 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. Recent changes in the journey to neurosurgery, from application through residency, board certification, and maintenance of certification, are summarized in the 3rd edition.

No matter what changes our healthcare system undergoes, the field of neurosurgery will always remain a vibrant demanding specialty, attracting the brightest, most passionate, and most hard-working students. Organized neurosurgery recognizes the need to continue to bring the brightest minds to neurosurgery and as part of that mission is fully dedicated to diversity, equity, and inclusion. On behalf of Women in Neurosurgery, we are thrilled that you have chosen the field that we love and wish you all the best as you embark on your careers.

Holly S. Gilmer, M.D., and Theresa D. Williamson, M.D.

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 the complete neurological 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, **spinal column, spinal cord, and/or nerves** 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, angiograms, ultrasounds, and perfusion scans**. 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. **An important tradition in neurosurgery is change and rapid dissemination of new ideas and techniques. 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

WHY DO YOU WANT TO BE A NEUROSURGEON?

Neurosurgery is a rapidly evolving field that incorporates technologic advances and neuroanatomy to treat disease in the central and peripheral nervous systems. Neurosurgery offers the opportunity to care for sick children and adults in an elective, emergency, and intensive care practice.



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. **Applicants of any gender or background considering a career in neurosurgery should have the 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. **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 an outside neurosurgery program, in addition to the program 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://systems.aamc.org/eras/erasstats/par/index.cfm>.

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

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 (85% of medical students graduating from US medical schools who apply into neurosurgery will match)



BECOMING A NEUROSURGICAL 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 changed 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 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.

Some programs offer interviews during a sub-internship and we suggest asking the residents and program leadership if taking an interview during this time period is appropriate. Of note, interviews post-2020 have shifted to a virtual format. Applicants still have the opportunity to visit with faculty and residents and should prepare just the same but may need to do extra homework to learn about the program without seeing it in person. It is critical to be honest at interviews to find a good match. The ACGME strictly monitors all residency programs to ensure they will provide you with adequate education, the key is to find a program that fits you as an individual so that you can have a productive training experience.

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 Post Office.** 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 Post Office 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. **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. Rank your preferred programs highest, but consider ranking every program where you interview. The Neurosurgery match is extremely competitive, and it is better to train in a program that was not one of your top 3 choices than not to match at all.**

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 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

5550 Meadowbrook Drive
Rolling Meadows, IL 60008
Phone: 847-378-0500
Toll-free: 888-566-AANS (2267)

Congress of Neurological Surgeons (CNS)

www.cns.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



On behalf of the American Association of Neurological Surgeons (AANS), it is an honor and a pleasure to welcome you to our world of Neurosurgery. We have a “big tent.”

Our specialty enjoys a wide and diverse subset of specialization. Our physicians are as diverse as the pathologies that we treat.

Neurosurgery has evolved since my earliest exposure as a first year medical student in 1978. Our specialty, like our society, continues its aspiration toward a more diverse, inclusive community. We have sections developed for Medical Students, Young Neurosurgeons, Women in Neurosurgery, and Black Neurosurgeons. Our Diversity Task Force/ Committee remains fully committed to ensuring that anyone with the prerequisite skills, perseverance, and work ethic can attain their vocational goals.

Likewise, our specialty affords several areas of sub-specialization: including Pediatric, Vascular, Spine, Functional and Pain, Peripheral Nerve, Trauma, Tumor and Intensive Care.

Our surgeons may focus on microsurgery, endovascular, open cranial work for trauma, tumor and vascular diseases, Minimally Invasive Spine, spinal deformities, Functional diseases like Parkinson’s, depression, and Alzheimer’s.

We remain at the cutting edge of robotics, gene therapy, immunotherapy, navigation and stereotaxis, with great exposure to the basic sciences if the candidate wishes.

This is a fun and exhilarating field! It requires discipline, focus and commitment. But the rewards are phenomenal.

We have the privilege to help other human beings during times of stress. It is immensely rewarding.

I am honored to be a neurosurgeon. My career has been blessed with intimate relationships with patients and families. Please take a look, you may be surprised at what our specialty offers.

We would like to acknowledge the pioneering work of Drs. Karin Muraszko and Deborah Benzil who led Women in Neurosurgery (WINS) to initiate this wonderful undertaking.

The WINS Section continues to lead, to inspire, to grow our wonderful field.

Regis W. Haid Jr. MD FAANS
President, American Association of Neurological Surgeons



There has never been a more exciting time to consider Neurological surgery as a career.

From advances in genetics, robotics, and brain mapping to image guidance and endovascular techniques, the field of neurological surgery continues to push the envelope in terms of potential cures for our patients. Yet at the same time, it remains a specialty which contains a vast realm of opportunities for students depending on their individual interests. Are you considering spine surgery but are not sure if there may be other areas of the nervous system that interest you? Perhaps you have a passion for curing neurological cancers but at the same time are considering both pediatric and adult patients to be a part of your future practice? Is stroke prevention a passion of yours, but are unsure if open microsurgery or endovascular techniques (or both) will suit your talents? Then you should consider a career in neurosurgery.

As President of the Congress of Neurological Surgeons, I can assure you that no other subspecialty of medicine can offer a superior opportunity to make meaningful differences in the lives of our patients. The CNS, as the largest neurosurgical organization in the world, is committed to supporting your career choice throughout residency and beyond with unique educational opportunities both online and in-person. We also recognize the need for increased diversity in the field and are committed through our Diversity, Equity, and Inclusion Committee to make an impact in this arena by ensuring that those of any background or level of experience have an equal opportunity to succeed in the field.

Neurosurgery is a challenging profession. It takes a toll both physically and emotionally on those who make the choice to pursue it. But as the Director of a Neurological Institute in which almost 30% of our faculty and residents are women I can tell you that it can certainly be part of a rewarding and fulfilling career choice while at the same time allowing for work-life balance. Many thanks to WINS for its role in inspiring the next generation of female neurosurgeons, and I and the CNS look forward to continuing with them on this journey.

Nicholas C. Bambikidis, M.D.
President, Congress of Neurological Surgeons