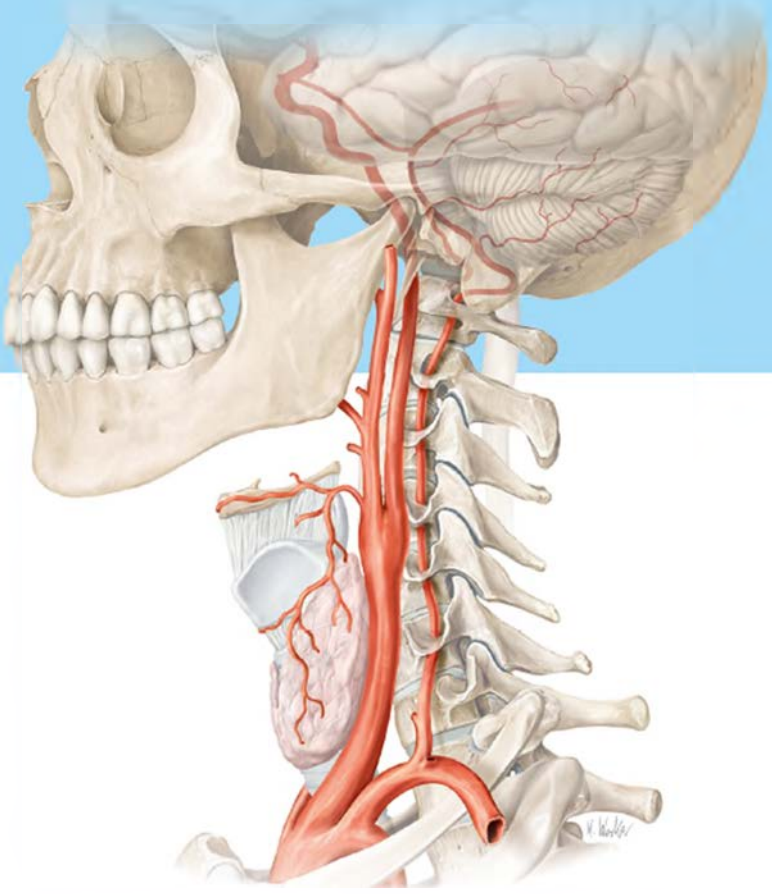
Neurosurgery Fundamentals

Nitin Agarwal



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Neurosurgery Fundamentals

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To my family for the unconditional support.
To my fellow residents for helping me carry the message.
To my mentors for educating me in the art of neurosurgery.
To my patients for teaching me on a daily basis.

Contents

Foreword

When Nitin Agarwal asked me to write this foreword, I was happy to learn that he put together his experiences, reflections, and advice in this *Neurosurgery Fundamentals*. The process of collecting important bits of knowledge and insight is so critical and I am happy to see a young writer already making his contributions. I know from my own writings that brevity is essential to be relevant for medical students and residents, and this handbook distills the basics of history, neurological examination, anatomy, radiology, and the operating room. This handbook also summarizes key concepts in trauma, vascular, tumor, spine, functional, and pediatric neurosurgery, which are the clinical problems most likely to be encountered in patients in the early stages of the aspiring neurosurgeon's career or when on call in the middle of the night. The accompanying figures and illustrations are well done and complement the text. I particularly enjoyed the roadmaps to academic careers and the advice from masters. Getting leaders in our specialty to share their insights on succeeding in neurosurgery is invaluable and rarely done, and this book captures the advice of key leaders. I congratulate the editors and authors of this handbook. I expect that it will soon become a classic for aspiring neurosurgeons who want to get off on the right foot, and that we will be seeing this handbook in the coat pockets of many neurosurgical subinterns and residents on the wards.

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Preface

Neurological surgery is a complex and highly selective specialty. As such, excellent texts are available to educate medical students, advanced practice providers, and residents engaged in the field. Given the magnitude of neurosurgical information to absorb, many of the existing references may be overwhelming. *Neurosurgery Fundamentals* offers a portable reference for neurosurgical providers in training to quickly digest the essentials of neurosurgical care. Its content enables quick preparation for medical student sub-internships or neurosurgical residency. Chapters include questions to aid retention of knowledge. The text also features a roadmap for matching into residency as well as advice from prominent academic neurosurgeons. Lastly, this handbook features a comprehensive collection of resources including textbooks, electronic resources, conferences, grants and awards, select peer-reviewed journals, organized neurosurgical membership, and board review references. High yield resources are highlighted to help in reader identification. Overall, this text is a unique and succinct guide for any aspiring neurosurgical provider.

Nitin Agarwal, MD

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I would like to say thanks to all my colleagues who contributed to this handbook to augment the training of future neurosurgical providers. I am very grateful to all the Thieme editors, especially Timothy Y. Hiscock, Gaurav Prabhuzantye, and Sarah E. Landis, for guiding me through this opportunity to enhance medical student, advanced practice provider, and resident education in Neurological Surgery.

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1 Roadmap to a Career in Neurosurgery

Ahmed Kashkoush, David T Fernandes Cabral, Robert M Friedlander

1.1 Introduction

Neurological surgery is the field of medicine dedicated to surgical treatment of nervous system pathology within the brain, spine, and in the periphery. The American Board of Neurological Surgery (ABNS) is responsible for selecting the training requirements for Neurosurgery residents.[1] Neurosurgery residency is 7 years (84 months) in duration, which consists of 54 months of core clinical neurosurgery and 30 months of electives. The aim of this chapter is to lay down a framework for preparing for the neurosurgery residency application.

1.2 Applications

1.2.1 Match Data

For the 2017–2018 academic year, there were 110 Neurosurgery residency programs accredited by the Accreditation Council for Graduate Medical Education (ACGME).[2] Generally, Neurosurgery programs accept 1 to 3 incoming residents every year, with the larger programs accepting 4 residents per year. Neurological surgery was among the most competitive specialties in the 2018 Match. According to the National Resident Matching Program (NRMP), there were a total of 310 applicants who preferred the specialty for 225 positions (1.38 applicants/positions).[3] Note: All NRMP statistics in this chapter are calculated for applicants that preferred Neurological Surgery (n = 310) and not those that ranked Neurological Surgery programs (n = 325).[3,4] The match rate for U.S. allopathic seniors into Neurosurgery was 86%; for comparison, the match rate for all specialties combined was approximately 94%. For 43 total international medical graduate (IMG) applicants in 2018, the match rate was 23%.[5]

Given the limited spots open for incoming residents, it is important to prepare early in medical school for the application process in order to have the best chance for success.

In a survey of 28 out of 104 residency directors (27% response rate) for Neurological Surgery conducted in March 2018, responders were asked to cite factors in interviewing and ranking applicants. Of all factors, most program directors cited the following as important factors for selecting applicants to interview[6]:

- Letters of recommendation (100%).
- United States Medical Licensing Examination (USMLE) Step 1/Comprehensive Osteopathic Medic al Licensing Examination (COMLEX) Level 1 scores (100%).
- Performing a neurosurgery rotation in that department (88%).
- Alpha Omega Alpha membership (88%).
- Evidence of professionalism and ethics (84%).

When asked about important factors in ranking applicants, residency directors most frequently cited[6]:

- Interactions with faculty during interview and visit (96%).
- Interpersonal skills (88%).
- Interactions with house staff (88%).
- Letters of recommendation (84%).
- USMLE/COMLEX Step 1 Score (84%).

Results from the NRMP suggest that academic achievements are most important in selecting applicants to interview, but personality and interactions with others are most influential in ranking applicants. It is important to note that the relative importance of each of these factors vary with program.

1.2.2 Qualifications

USMLE Step 1 scores are important screening factors to assess ot one's candidacy for neurosurgical residency programs. As noted earlier, 100% of residency directors utilize Step 1 scores to select applicants for an interview.[6] For those who matched in Neurosurgery as their preferred specialty, the mean Step 1 score for 2018 was 245 among 188 matched United States (US) allopathic seniors according to 2018 NRMP data (▶ Table 1.1).[3] For those 28 US seniors who preferred Neurosurgery but did not match in the specialty, the mean score was 234. Utilizing probabilities calculated with 2016–2018 data, the likelihood of matching in Neurosurgery as their preferred specialty with a score of 250 or higher is approximately 85 to 95%. For scores within the ranges of 220 to 230, 230 to 240, and 240 to 250, the probabilities of matching are approximately 50 to 60%, 70 to 80%, and 80 to 85%, respectively (▶ Fig. 1.1). For IMGs, the mean scores for matched and unmatched applicants are similar to those of US allopathic seniors.[5] However, a notable difference is that even with an extremely high score (> 260), the probability of matching in Neurosurgery as a preferred specialty for IMGs is still about 45% according to 2016–2018 NRMP data (▶ Fig. 1.2). As such,

Table 1.1 Summary statistics on United States allopathic seniors that preferred neurological surgery*

Measure	Matched (n = 188)	Unmatched (n = 28)
Mean number of contiguous ranks	16.4	8.5
Mean number of distinct specialties ranked	1	1.3
Mean USMLE Step 1 score	245	234
Mean USMLE Step 2 score	249	238
Mean number of research experiences	5.2	4.4
Mean number of abstracts, presentations, and publications	18.4	8.9
Mean number of work experiences	3.2	2.5
Mean number of volunteer experiences	7	6.9
Percentage who are AOA members	31.9	21.4
Percentage who graduated from one of the 40 US medical schools with the highest NIH funding**	43.6	10.7
Percentage who have PhD degree	13.6	3.8
Percentage who have another graduate degree	20	28

*Used with permissions from NRMP.[3]
**Top 40 US medical schools with the highest NIH funding is from the NIH website.
Abbreviations: AOA, Alpha Omega Alpha; NIH, National Institutes of Health; US, United States; USMLE, United States Medical Licensing Examination.