Part I: Overview of Child Neurology and Developmental Disabilities

Description of Specialty, Common condition, types of patients
Child neurology has high rates of job satisfaction (according to the 2005 brief “Child Neurology: Workforce and Practice Characteristics” by Polsky and colleagues), with good reason: we think it brings together the best parts of pediatrics with the best parts of neurology. Child neurologists get to work with children across the age spectrum, thinking about everything from fetal development to the transition to adulthood, and doing everything we can to maximize the developmental potential of each child in the face of neurological illness, whether through medical treatments or through optimizing developmental and educational supports and services. We forge close and long-lasting relationships with families, many of whom see us as their medical home. We get to interact directly with the organ that makes humans human, our brain and nervous system, looking at it through the lens of development: how we learn to walk and talk, and the complexity of what happens when things go awry in a developing brain. Whether treating common disorders like epilepsy, headache, ADHD, and autism or rare diseases with genetic and metabolic underpinnings, we pride ourselves on combining a rigorous history and physical examination with insights from EEG, neuroimaging, and other testing, all adapted to the unique features of children of varying ages. We love the intellectual challenge of localizing an examination finding to an anatomical area within the nervous system, figuring out what process might affect that area, and creating plans for further workup and treatment based on clinical reasoning and knowledge of the broad array of neurologic diseases that may affect children. Clinician-scientists in child neurology are working at the cutting edge of understanding and applying neuroscience, genetics, drug development, advanced electrophysiology and imaging techniques, and more as the field’s knowledge base and treatment arsenal rapidly expand while leaving plenty of questions in need of further study. There has never been a better time to become a child neurologist.

Neurodevelopmental Disabilities (NDD) is a new, unique subspecialty developed in 2007, evolving from the Developmental Disabilities program which began in 1967. The neurodevelopmental disabilities residency incorporates training experiences in developmental pediatrics, child neurology and related fields such as genetics, metabolism and psychiatry. It is designed to provide residents with a broad range of clinical experiences and a scientific foundation in the diagnosis and treatment of...
neurodevelopmental disorders including cerebral palsy, intellectual disabilities, autism spectrum disorders and learning disorders. Neurodevelopmental disabilities is understood from a lifespan model and thus residency training includes both pediatric and adult training. Neurodevelopmental disabilities gives fellowship level expertise in the areas of behavioral and developmental assessments and treatments.

**Career trajectories: academics, clinical, research, teaching, etc.**
Child neurology may sound like a narrow field, but this specialty is home to a broad array of clinicians across many subspecialties, as well as a vibrant community of researchers, educators, and more. Most but not all child neurologists in the U.S. are affiliated with academic medical centers and combine their clinical practice with teaching and/or research. Research pathways in child neurology include basic, translational, and clinical research, often inspired directly by the patients we care for. Advocacy on behalf of children with complex health care needs is also important to our field, as is combating the global burden of pediatric neurologic disorders.

Due to NDD’s multidisciplinary approach, neurodevelopmental disabilities trainees have a limitless, wide-spectrum and vast career option with a NDD education. Factoring in the constant growing need for physicians to be trained in this field, this program’s impact is substantial. Neurodevelopmental disabilities offers greater emphasis on working with a therapeutic team, understanding community resources, advocacy and team leadership. The breadth of training allows NDD physicians to work in academic centers with clinical, teaching and research opportunities as well as in private practice where developmental skills are highly sought after.

**Practice Models**
Child neurology and neurodevelopmental disabilities are predominantly outpatient specialties, involving patient care in a hospital or medical center clinic or as part of a group practice. Some child neurologists additionally see inpatients, whether on a primary child neurology service or in consultation to other parts of the hospital including the emergency room, medical/surgical intensive care units, and neonatal intensive care units. Some perform and read EEGs, participate in epilepsy surgical planning, and perform diagnostic and therapeutic lumbar punctures. Neurodevelopmental disabilities physicians can be a part of several divisions depending on areas of interests including child neurology, developmental and behavioral pediatrics, a separate NDD division, or government organizations.

**Residency: Length, typical curriculum**
Child neurology is a core specialty as defined by the ACGME. The total residency training is five years, after which trainees are eligible to sit for the board examinations in Pediatrics and in Neurology with a Special Qualification in Child Neurology. The first two years are general pediatrics residency, often combined at the same institution as the neurology training. Child neurology residency is three years (36 months). Of these, 12 months are spent on adult inpatient and outpatient rotations such as general inpatient neurology, stroke, consults, electrophysiology (EEG/EMG), neurosurgery, and rehabilitation. The remaining 24 months are pediatric rotations including inpatient primary, consult, and ICU consult neurology services; outpatient subspecialties; and electives and selectives including psychiatry,
neuropathology, neuroradiology, teaching, international away electives, and research. The structure and timing of these months varies somewhat program to program, and they may take place at one or more hospitals. **The NDD curriculum varies per program. Some residents choose to do research, but others spend a significant number of months in developmental and behavioral pediatrics as well. This is a recurring theme in NDD as a whole--it is still a new field, and it is handled fairly different at each of the 8 programs at which it is currently offered. It's up to the applicant to figure out their priorities and see if the programs can meet those needs.**

Similarly, neurodevelopmental disabilities is also a core specialty with a total six years of residency training; two being general pediatrics residency and four in neurodevelopmental disabilities in only a handful of training centers (in 2019, 8 programs). Successful completion allows trainees eligibility to sit for board examinations in Pediatrics, Neurology with Special Qualifications in Child Neurology, and Neurodevelopmental Disabilities. Training includes 12 months of adult neurology, 18 months of child neurology and neurodevelopmental disabilities and 18 months of elective time, which may include developmental or behavioral pediatrics, clinical or basic science research. Experiences include child and adolescent psychiatry, neurosurgery, and neurorehabilitation. Residents also gain significant clinical experience with behavioral neurology, neurogenetics and metabolism, neuromuscular disorders, neuro-oncology, and neuro-ophthalmology. NDD training offers more protected research time in order to develop academic leaders in this field.

**Fellowships offered after residency**
A variety of ACGME-accredited and non-accredited fellowships are pursued by child neurology and neurodevelopmental disabilities graduates, including pediatric epilepsy/neurophysiology, neuromuscular, sleep, neurocritical care, neuroimmunology, neuro-oncology, movement disorders, headache, behavioral neurology, and stroke and cerebrovascular disorders. Fellowships are 1-2 years and may include dedicated research time.

**Part II: Life as a Child Neurologist**

Note that because NDD is such a new field, the following data apply mostly to child neurology.

**Demographics**
The demographics of child neurology are changing; in one 2015 study, 63% of practicing child neurologists were men but only 36% of child neurology residents were men. Racial and ethnic diversity are also increasing, with 82% of practicing child neurologists and 73% of child neurology residents identifying as Caucasian.

**Earnings Potential**
Compensation varies across regions and subspecialties, and between academics and private practice. In a 2017 survey, the average annual compensation for child neurologists was $220,000 compared to
$263,758 for general adult neurologists. Demand for child neurologists is high, with some workforce surveys estimating the supply of child neurologists is 20% below the national need.

**Lifestyle**

Call and other aspects of lifestyle vary by subspecialty and practice setting, but in general as a predominantly outpatient specialty the efforts of child neurologists are confined to typical business hours. Child neurologists may answer patient calls from home on a shared rotation schedule with their colleagues.

**Academic Medicine**

Most but not all child neurologists are affiliated with an academic medical center or teach in some capacity. The proportion is increasing over time.

**Part III: Applying in Child Neurology or Neurodevelopmental Disabilities**

There are three types of positions in Child Neurology or Neurodevelopmental Disabilities:

1) **Categorical** – the applicant applies as a senior medical student and matches to both their pediatrics (PGY1-2) and their child neurology (PGY3-5) or neurodevelopmental disabilities (PGY3-6) as linked programs in the same match; these slots with both programs at the same institution or affiliated institutions are becoming increasingly more common.

2) **Advanced** – the applicant applies as a senior medical student separately to pediatrics (PGY1-2) and child neurology (PGY3-5) or neurodevelopmental disabilities (PGY3-6); these slots are becoming increasingly less common.

3) **Reserve** – the applicant applies as a fully trained, board-eligible pediatrician (out of PGY3 or later) to a child neurology program or neurodevelopmental disabilities only.

**How Competitive is Child Neurology?**

Child neurology is a small field, with a small number of spots but also a small number of applicants. In 2018 there were 68 residency programs offering 134 Categorical positions. There were 192 applicants, including 113 U.S. senior medical students, and 129 matched to a position while 5 programs went unfilled. In 2018 there were 22 residency programs offering 26 Reserve positions. There were 14 applicants, and 12 matched to a position while 13 programs went unfilled. For the 168 total positions offered (including categorical, advanced, and reserve positions), there were 166 applicants; this makes for 0.99 applicants per available position, which is lower than many other specialties including pediatrics (1.07 applicants per available position) and neurology (1.25 applicants per available position). The competitiveness of individual programs within child neurology varies, and there is no one description of a competitive applicant.
Planning the post-clerkship and senior years
Interested students should reach out to the child neurology specialty advisor as well as local program directors to express their interest and explore next steps. Students may wish to block or have lighter rotations during November, December, and early January of the final year as many programs have their interviews during that time.

Clinical Rotations
Students interested in child neurology are strongly encouraged to take advantage of opportunities to experience child neurology at affiliated hospitals. Students in the PCE at BWH, at BIDMC, and at MGH should discuss with neurology and pediatric clerkship directors opportunities to rotate in child neurology inpatient or outpatient experiences as part of their neurology or pediatrics clerkships.

Sub-Internships
After the clerkship year, students should complete a child neurology or NDD elective locally to fully immerse themselves in child neurology and meet their future colleagues in the field. Doing this earlier in your post-clerkship years will give you the chance to get to know the child neurology faculty and, if interested, become involved with research or other projects well before the application season begins in the fall of your final year. HMS also offers a few rotations featuring work with individuals with disabilities.

Away electives
Some students who are interested in training in another part of the country may wish to do away rotations there to get to know other institutions, but this is by no means a requirement. There is no need to complete an “audition rotations”. While a stellar performance may impress some faculty at the away institution, anything less may actually diminish you as a candidate. A recent student commented: “Away electives really aren’t necessary unless you’re super interested in a particular program—the only people I knew who did away electives attended medical schools not affiliated with a child neurology program.”

Other Recommended Electives
Electives are a great chance to have fun exploring things you won’t necessarily get to do in the future, so don’t feel like everything has to be building up to your child neurology career. That being said, many students enjoy electives in related fields like genetics, radiology, ophthalmology, and so on. Many students are increasingly interested in global health so doing meaningful projects in international away rotations is a great opportunity for them. Similarly, many students are interested in research and engage in projects with child neurology or related faculty. In either case, depth of commitment and sustained effort is generally more important to selection committees than “just checking off boxes.”

Research
While research is not a requirement for successfully matching in child neurology, many students will have completed research whether in child neurology, neurology, pediatrics, related basic science fields, or other areas. Particularly for MD-PhD and similar applicants, quality of research output will be
carefully considered. Other applicants may have done research or scholarly work in public health, advocacy, global health, or education. Students are strongly encouraged regardless of the topic of their scholarship to participate in scholarly dissemination of knowledge through publication, poster and abstract presentation at national meetings, and so on.

**National Meetings**
Many annual meetings attract large numbers of child neurologists and offer great opportunities to share your research, learn more about the field, meet program leaders, and network with future colleagues – in a small field like ours, you can wind up knowing just about everybody! Many organizations also have dedicated meeting tracks and programming for students as well as free or discounted memberships and meeting registration, and even awards for medical student research or writing. Consider attending the American Academy of Neurology (AAN), the Child Neurology Society (CNS), the American Neurological Association (ANA), and the American Epilepsy Society (AES) among others.

**Other degrees**
As described above, research is a major part of many child neurologists’ careers: the proportion of child neurology residents who are MD-PhDs is among the highest of any specialty (10.5% in 2018). Future child neurologists may also pursue (whether during or after medical school) degrees in public health, public policy, business administration, or education depending on their career goals.

**Part IV: Assessing your Competitiveness**

**What Criteria do Programs Consider?**

1. **Grades and your DSA**
Child neurology programs are particularly interested in clinical grades on your pediatrics and neurology clerkships, pediatrics sub-I, and child neurology elective if applicable.

2. **USMLE Board Scores**
In 2018, the mean USMLE Step 1 score was 233 and mean USMLE Step 2 score was 246 but these vary widely among successful applicants. There is no widely used “cut off” or minimum for USMLE scores though scores are taken into consideration as one piece of evidence of mastery of the fundamentals of biomedical science.

3. **Research Experience**
Many applicants have research experiences, on average reporting 3.3 experiences for matched US senior applicants in 2018 (compared to 3.0 for those who did not match). As above, depth and quality of research are generally more important than a larger number of experiences with limited output or lower quality.
4. Publications
In 2018, matched US seniors reported an average of 6.3 abstracts, publications, or presentations. Publications are more impactful than abstracts, particularly if a number of years have elapsed since the abstract or presentation. Presentations at international or national meetings are more impactful than those presented locally such as within a medical school.

5. Extracurricular Activities
In 2018, matched US seniors reported an average of 6.9 volunteering experiences, similar to the overall average for matched seniors across specialties. Again, depth of involvement is the most important aspect of extracurricular activities, including leadership roles and/or long-term commitment. Many students applying to child neurology are inspired to do so by experiences caring for children or adults with neurologic disorders, whether family members or those they have met through extracurricular experiences during or prior to medical school, and reflecting on these experiences in the personal statement can give the selection committee insight into the applicant’s motivation, maturity, and empathy for people with neurologic disorders or other life-impacting illness.

Getting an Interview: Attributes Residency PD’s Consider in Granting Interviews:

There is no one applicant profile child neurology selection committees look for in selecting applicants for interview. Successful applicants have a combination of clinical achievement, grades and scores, research or other scholarship, and a clear understanding of and interest in child neurology ideally with related experience(s). These same factors are key in ranking applicants as are the interpersonal qualities which become apparent during an interview.

Letters of recommendation
Because child neurology is a small and tight-knit field, there is nothing better for selection committee members than receiving a glowing letter of recommendation from a close colleague or friend, or someone who is well known in the field and has worked with many medical students over the years. That being said, it is obvious when someone is not very familiar with an applicant and has just been asked to write a letter because of their rank or prominence. The best letters will speak in superlatives supported with specific evidence or examples of the applicant’s fund of knowledge, clinical reasoning, professionalism, maturity, depth of commitment to the field, and ability to engage with children and families. Each program has its own requirements for number of letters; generally, three letters of recommendation are required. Some require at least one letter from a child neurologist, but some are more flexible. You should check with the program administrator at the programs you are interested in—they are usually accessible by e-mail and happy to answer questions about the application. If you have extensive research or extracurricular experience, consider having your mentor write one of your letters to speak to your dedication, scholarship, productivity, and the context and impact of your work. A recent student reported having 2 pediatrics letters, 1 child neurology letter, and 1 letter from a long-term research PI.
**How many programs should you apply to?**
The optimal number of programs will depend on your competitiveness as an applicant, the selectivity of the programs you wish to apply to, and any other considerations such as being committed to a certain region or coordinating with a partner whether in the couples match or outside of medicine. As for all specialties, you should attend as many interviews as possible, both to increase your chances of being ranked to match at a program and to understand the important differences between institutions and get a better sense of what you are looking for. Rank as many programs as you would be interested in training in...and no more. In general, HMS applicants to child neurology have done quite well in matching to programs they ranked highly.

Keep in mind programs differ in their application requirements--some categorical programs require separate applications to pediatrics; some do not and provide the information to the pediatrics program directly, but you may also need to apply to pediatrics programs if you are applying for Categorical or Advanced positions. With the exception of the few advanced positions, you will be applying to one pediatrics program for each child neurology program you are interested in. The information may be on a program’s website, but if not, you should check with the program administrator at each program to be sure. A recent graduate stated, “Roughly half the programs I applied to specified this on their website; the other half did not and I needed to email the program coordinator to make sure I was doing it right.”

**Common questions you may be asked – specialty specific:**
Applicants should not be surprised if they get asked during the interview what specific area of child neurology they are especially interested in or what fellowship they might want to do. This can be daunting – isn’t child neurology specific enough at this point? Don’t worry, no one is committed for life to what they say they are interested in during their interview. Mainly, interviewers want to know if applicants have a good understanding of the scope and possibilities of the field and have enough experience in child neurology to know it is the right field for them. So, applicants should feel free to talk about areas of potential interest, and how that interest developed. Similarly applicants may be asked if they intend to pursue research or what they want to do with their career. Applicants should use these questions as opportunities to demonstrate their enthusiasm, their experience, and their vision for their training and career. They may wish to practice with friends or advisers answers to these questions to convey their passion and link past experiences to future goals.

Applicants can also be expected to ask to talk about a patient experience they found particularly interesting or impactful, and to discuss experiences in which they demonstrated leadership skills, teamwork, conflict resolution, problem-solving, or working effectively with a child or family as these are all important competencies for child neurologists. Selection committees also want to get to know applicants as people, so don’t be surprised if the conversation turns to good books, favorite restaurants, or unique hobbies. If an applicant was invited for an interview, they are qualified in terms of numbers and other “on paper” metrics; the interview is the chance to make sure the applicant is right for the program, and the program is right for the applicant. There are significant differences among child neurology programs in terms of size, volume, structure of inpatient and outpatient experiences, research and elective opportunities, patient population, and the career paths of graduates so the
Communication with Programs: NRMP Code of Conduct for Applicants and Programs:
Child neurology programs abide by the NRMP Code of Conduct and should never ask an applicant how they are ranking the program. A program may inform an applicant he or she is ranked highly or ranked to match, without soliciting the same commitment from the applicant. Applicants may consider informing their top-ranked program it is their first choice, as some programs take this into consideration in their own rank order list. Applicants may also wish to express to a program an interest in or commitment to the region, especially if it is not obvious from their application (i.e. not where they grew up or went to school), including if they are couples matching with a partner who is also interested in the region and getting promising interviews. Keep in mind child neurology is a small and interconnected field and the people at the programs one applies to, regardless of match results, will become future colleagues; honesty is always the best policy.

Advocating for Interviews
Programs should be clear with applicants whether they have received an interview invitation or will not be receiving an invitation. These decisions may be difficult to appeal. If there is a very compelling reason for appealing, an extenuating circumstance, or a new piece of information (for example, a publication or award) which greatly strengthens the application, applicants might consider discussing with their advisors whether to pursue this further. Similarly if new information becomes available after an applicant has been interviewed, this can be forwarded to the selection committee.