I spent a year doing full-time clinical and basic science research with multiple faculty in the Department of Neurosurgery at the University of Minnesota. Over this time, I worked with three research groups. I began working with the first--a deep brain stimulation (DBS) clinical research team led by Dr. Aviva Abosch--as a first-year medical student, and I studied the relationship between DBS electrode impedance, time since electrode implantation, and anatomic location of electrode contacts. I worked with Dr. Daniel Guillaume, a pediatric neurosurgeon, to examine associations between hydrocephalus, myelomeningocele, and newborn hearing screening failure. My basic science research took place in the lab of Dr. Ann Parr, where I studied the role of T cell immunity in a rat model of spinal cord injury (SCI), as well as oligodendrocyte precursor cell transplantation as a potential therapy for SCI. In addition, I collaborated with Dr. Walter Low (Neurosurgery) and Dr. Shalom Michaeli (Center for Magnetic Resonance Research) to assess myelination in a mouse model of type I mucopolysaccharidosis (MPS I) using a novel MRI technique.

Throughout the year, I also had a variety of other experiences in neurosurgery, including attending weekly resident conferences, traveling to a neurosurgery workshop for medical students, and presenting my research at local and national conferences.
Describe how the project supported your progress towards the MD degree and/or your future career path in medicine:

In my application for the Flex MD program, I gave four reasons for taking a year to do full-time neurosurgery research: (1) to gain experience in neurosurgery, (2) to gain experience in clinical research, (3) to continue to work with my neurosurgical mentor, and (4) to prepare myself for residency by securing publication authorship, relationships with faculty members, and competency in neurosurgical topics. I believe I have met all of these goals, and in doing so I have set myself up well for my future career.

My interest in this research year was driven in part by my hope to continue working with my mentor, and while her departure from the university altered the course of the year, she continues to be my mentor and a valuable resource. As a result of her departure, I worked with several faculty members in the neurosurgery department, allowing me to establish relationships with all of them and gain greater knowledge about the neurosurgical subspecialties. I sought out one of these faculty members because of the clinical nature of his research, thereby expanding my experience with clinical studies. I ended up with several conference presentations and first-author publications to my name. In short, I am coming out of this research year with a greater interest in neurosurgery, several reasons for neurosurgical programs to be interested in me, and a variety of skills and knowledge that will be invaluable to me as an aspiring academic neurosurgeon.

List competencies/academic requirements achieved. Check all that apply and provide method (see attached sheet for competency definitions):

<table>
<thead>
<tr>
<th>Competencies/academic requirements</th>
<th>Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Medical Knowledge</td>
<td>Literature review, weekly neurosurgery conferences; neurosurgical workshop</td>
</tr>
<tr>
<td>□ Clinical Skills and Patient Care</td>
<td>Two-day Neurosurgery 101 workshop at St. Louis University</td>
</tr>
<tr>
<td>□ Scientific and Clinical Inquiry</td>
<td>Literature review; clinical and basic science research</td>
</tr>
<tr>
<td>□ Professionalism</td>
<td>Appropriate professional conduct, ethical research practices</td>
</tr>
<tr>
<td>□ Interpersonal and Communication Skills</td>
<td>Conferences; scientific publications; interaction with multidisciplinary researchers</td>
</tr>
<tr>
<td>□ Systems of Health Care</td>
<td>Conferences; scientific publications; interaction with multidisciplinary researchers</td>
</tr>
<tr>
<td>□ Continuous Improvement of Care Through Reflective Practice</td>
<td>Independent, self-directed research projects</td>
</tr>
</tbody>
</table>
Did this experience produce a scholarly outcome?  ✔ Yes  □ No

If yes, check all that apply and provide details:

**Outcome type**  

- [ ] Research paper
- [X] Journal article
- [ ] Poster presentation
- [X] Presentation at a meeting
- [ ] Reflective writing
- [ ] Audio or video project
- [ ] Art project
- [ ] Other:

**Details**

- JOURNAL ARTICLES
  - Satzer D, Maurer E, Lanctin D, Guan W, Abosch A. Anatomic correlates of DBS electrode impedance. J Neurol Neurosurg Psychiatry. Accepted.

- CONFERENCE POSTERS

**Information for future students who may undertake a similar project or one related:**

Though basic science research opportunities are usually easier to come by, even for medical students, clinical research is possible, especially for those who are interested and committed. Likewise, publication first-authorship is a reasonably goal, especially if you find a mentor who is genuinely interested in your success.

I dealt with several challenges this year, from the interpersonal (e.g. working with uncooperative collaborators, mentor leaving the university) to the academic (e.g. unsuccessful experiments, poor-quality data, not enough patients in study groups). To those pursuing a research-based Flex MD: there will be many obstacles, but they can be overcome with persistence.