

## Abstract

Epilepsy surgery is a safe and efficacious treatment for refractory epilepsy. However, many patients suffer with refractory epilepsy for years before surgery referral.

Through retrospective chart review, I determined the overall efficiency of epilepsy surgery workup at Michigan Medicine.

Over time patients who were diagnosed with medically refractory epilepsy have experienced shorter delays between a refractory diagnosis being made to when they are first taken to the operating room. However, there are certain steps in the epilepsy surgery workup pathway that can be made more efficient.

Future studies can develop countermeasures to reduce the time needed to undergo surgery workup, leading to improved quality of life and decreased disease burden for refractory epilepsy patients.

## Introduction

Antiseizure medications fail to control seizures effectively in almost 40% of patients with epilepsy, leaving a significant number of patients who continue to suffer from medication-refractory epilepsy<sup>1</sup>. Epilepsy surgery is known to be a safe and efficacious treatment for refractory epilepsy<sup>2,3,4</sup>. Less than 1% of patients, however, are actually referred for surgery, and many of those patients are referred after suffering with epilepsy for several years<sup>5,6</sup>. This can lead to worsened quality of life, psychological disease, and even death<sup>7,8</sup>.

Michigan Medicine has a pediatric epilepsy surgery program; however, data has never been collected and analyzed to determine if the surgery workup pathway for patients with refractory epilepsy can be made more efficient.

## Methods and Materials

I carried out retrospective chart review, collecting and analyzing data from the charts of all patients who ultimately underwent epilepsy surgery at Michigan Medicine. I determined how long each step of the surgery workup pathway took to be completed for each patient.

After collecting this data, I then determined which steps in the epilepsy surgery workup pathway caused the most significant delays

Finally, also through retrospective chart review, I determined whether the epilepsy surgery workup pathway as a whole became more efficient over time at Michigan Medicine.

## Results

Over time patients who were diagnosed with medically refractory epilepsy at Michigan Medicine have experienced shorter delays between a refractory diagnosis being made to when they are first taken to the operating room (Figure 1).

My results have also shown that certain steps in the epilepsy surgery workup pathway are responsible for the most significant delays in the overall workup process. The two steps that caused the most significant delays in epilepsy surgery workup were: (1) refractory epilepsy patients being referred for surgical evaluation and (2) completing neuropsychology testing after it was ordered (Figure 2).

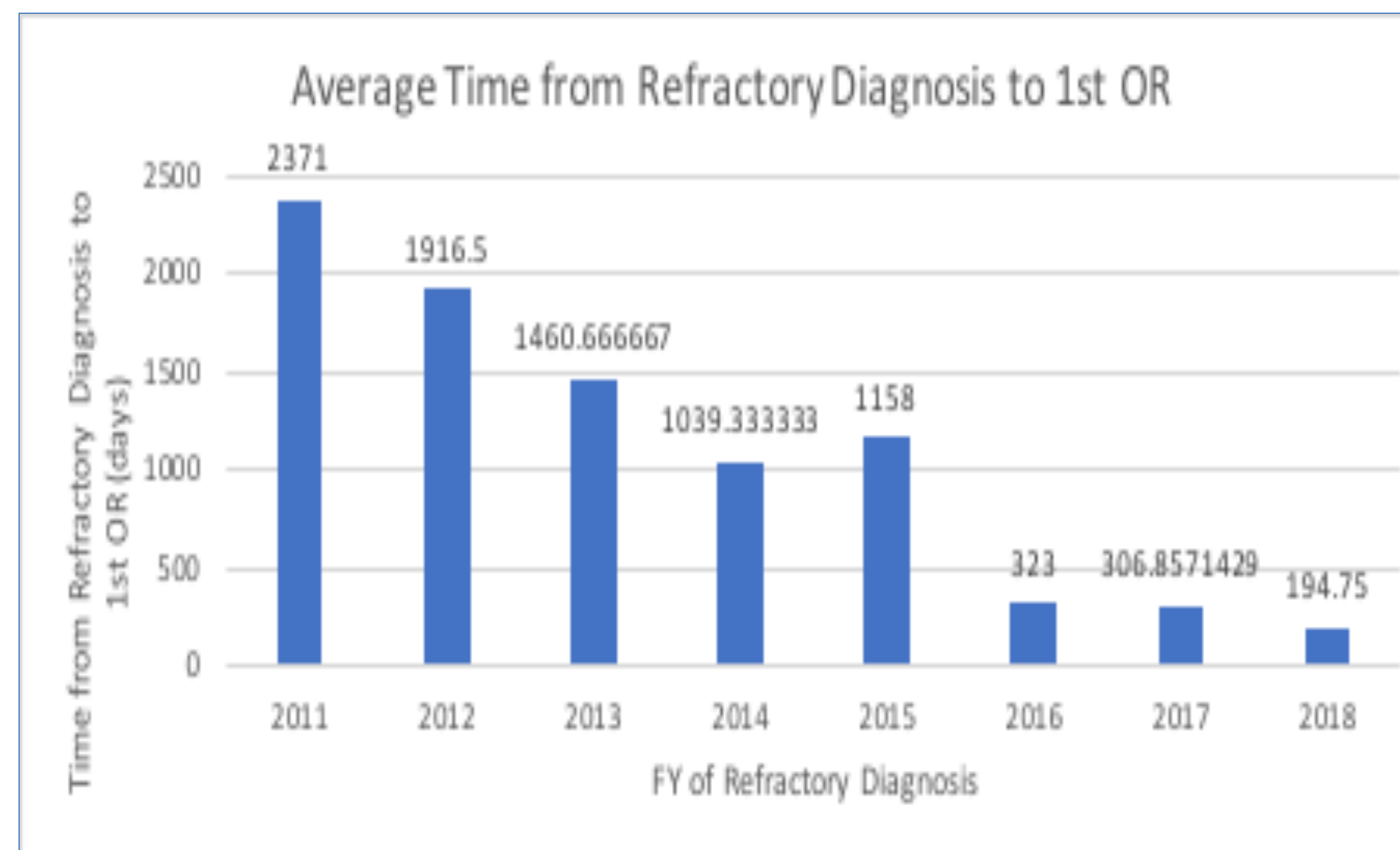
## Discussion

My results have revealed some encouraging data. Over time, the epilepsy surgery workup pathway at Michigan Medicine has become more efficient (Figure 1).

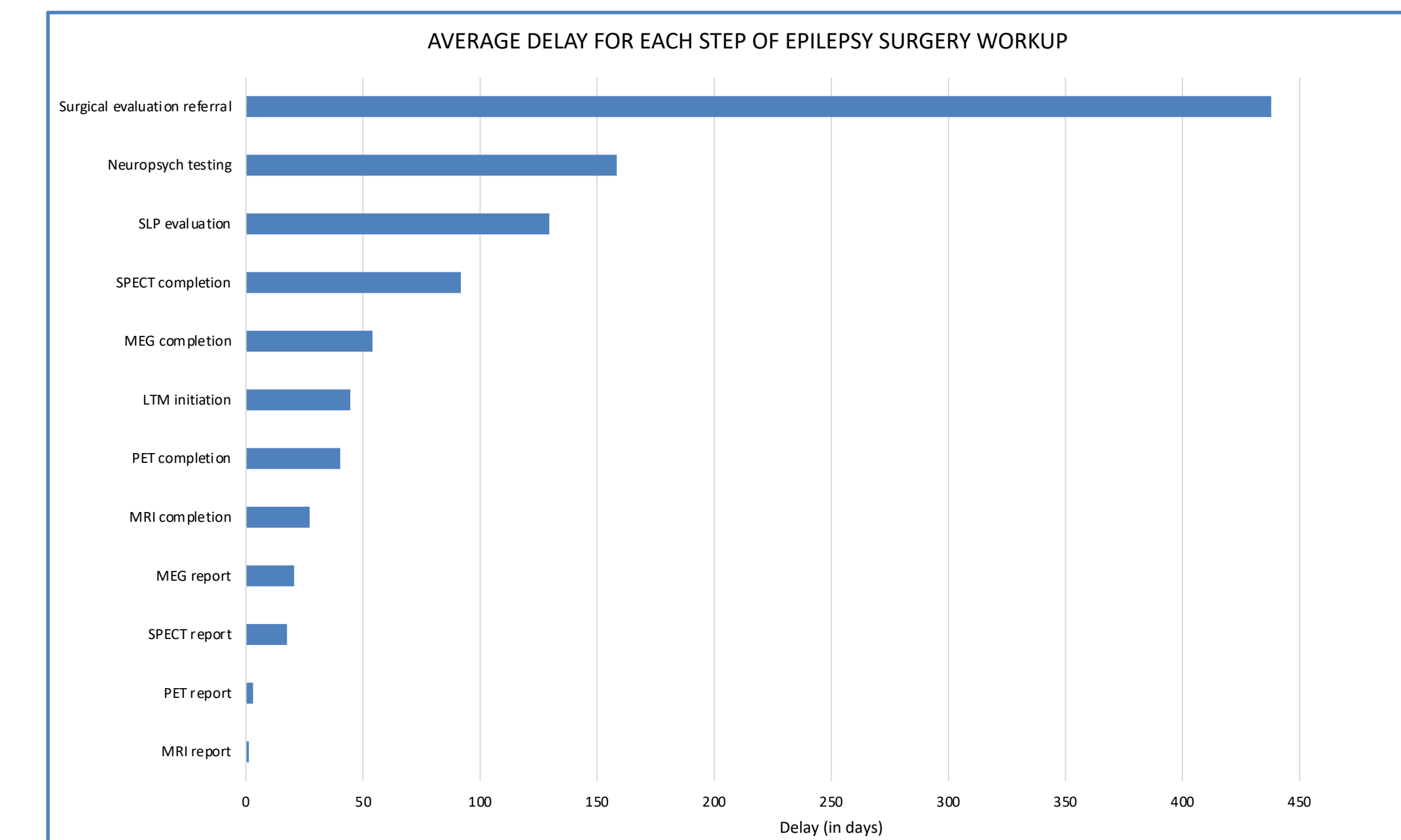
Despite the improvement in surgery workup efficiency over time, there is still room to improve the overall efficiency of the epilepsy surgery workup pathway. Figure 2 depicts the average time needed for each step of the epilepsy surgery workup pathway to be completed. Based on this graph, it is evident that certain steps in the pathway are responsible for the most significant delays. These steps can be targeted in the future with directed countermeasures designed to improve their efficiency, thereby continuing to minimize the time from a refractory epilepsy diagnosis being made to a resective operation. By improving the efficiency of the epilepsy surgery program at Michigan Medicine, a larger number of patients will be able to undergo epilepsy surgery evaluation in a shorter period of time, thereby improving overall quality of life and minimizing disease burden for these patients.

## Conclusions

While epilepsy surgery workup has become more efficient over time at Michigan Medicine, there is still room for improvement. Future directions include implementing countermeasures to target the most inefficient steps in the surgery workup pathway and then determining if those interventions led to a decrease in time from when a patient is diagnosed with refractory epilepsy to when they undergo resective surgery.



**Figure 1.** The average time from a refractory epilepsy diagnosis being made to patients undergoing an operation (in days) has decreased over time from fiscal year 2011 to fiscal year 2018.



**Figure 2.** This graph shows the time (in days) for each step of the epilepsy surgery workup pathway to be completed. The placement of a surgery referral and completion of neuropsychology testing were the two steps that caused the most significant delays in epilepsy surgery workup.

## Contact

Prabhjot Grewal  
University of Michigan Medical School  
Email: gprabhjo@med.umich.edu

## References

- Engel J Jr. The Current Place of Epilepsy Surgery. *Curr Opin Neurol*. 2018; 31:192-197. [PubMed: 29278548]
- Wiebe S, Blume WT, Ginvin JP, Eliasziw M. A randomized, controlled trial of surgery for temporal lobe epilepsy. *N Engl J Med*. 2001; 345:311-318. [PubMed: 11484687]
- Engel J Jr, McDermott MP, Wiebe S, Langfitt JT, Stern JM, et al. Early surgical therapy for drug-resistant temporal lobe epilepsy: a randomized trial. *JAMA*. 2012; 307:922-930. [PubMed: 22396514]
- Dwivedi R, Ramanujam B, Chandra PS, Sapra S, Gulati S, Kalavani M, et al. Surgery for drug-resistant epilepsy in children. *N Engl J Med*. 2017; 377:1639-1647. [PubMed: 29069568]
- Engel J Jr. What can we do for people with drug-resistant epilepsy? The 2016 Wartenberg Lecture. *Neurology*. 2016; 87:2483-2489. [PubMed: 27920283]
- Berg AT, Langfitt J, Shinnar S, Vickrey BG, Sperling MR, Walczak T, et al. How long does it take for partial epilepsy to become intractable? *Neurology*. 2003; 60:186-190. [PubMed: 12552028]
- Berg AT, Langfitt J, Shinnar S, Vickrey BG, Sperling MR, Walczak T, et al. How long does it take for partial epilepsy to become intractable? *Neurology*. 2003; 60:186-190. [PubMed: 12552028]
- Tomson T, Nashed L, Ryvlin P. Sudden unexpected death in epilepsy: current knowledge and future directions. *Lancet Neurol*. 2008; 7:1021-31. [PubMed: 18805738]