Vagus Nerve Stimulation For The Treatment Of Epilepsy In Children: A Review Based On Epilepsy Syndrome And Seizure Type
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Rationale
Despite appropriate treatment 30% of children will develop pharmaco resistant epilepsy. For some of these patients epilepsy surgery will be the best treatment option; however, many patients will not be candidates for surgery. Patient who have primary generalized epilepsy, multifocal seizure onset, mixed epilepsy with both focal and generalized seizures will not be candidates for a surgical resection. Vagus Nerve Stimulation (VNS) is an option for pharmaco resistant patients who are not surgical candidates. VNS has been available for use for over ten years but there is limited pediatric data available to help physicians determine which patients are the best candidates and which seizure types or syndromes will respond the best.

Method
An IRB approved database was created and all patients who met entrance criteria were added to the database. Entrance criteria included video/EEG proof of seizure type, MRI and seizure frequency documentation for at least 3 months prior to implant, follow-up data available for at least 1 year post implant. Seizure frequency, side effects, quality of life improvements and VNS settings were collected at each visit. All patients had their VNS programmed following the same protocol (Table 1). Based on history, EEG findings, neurologic exam and imaging findings patients were classified for analysis by seizure type, epilepsy syndrome and etiology when possible.

Results
At time of review, the database had 114 patients who met entrance criteria and had at least 1 year follow-up data. Results by syndrome and seizure type are included in Table 2. Overall, patients with primary generalized epilepsy, especially those with a symptomatic etiology, had a better response to VNS than patients with focal onset seizures. Patients with Lennox-Gastaut Syndrome also responded well to VNS with significant reductions in drop seizures, atypical absence seizures and tonic seizures. Seizure reductions improved from the 6 month visit to the 1 year visit and continued for those patients with longer than 2 years follow-up. Side effects were minimal, improved over time and were often decreased by changes to the VNS settings. Overall 58% of patients were able to decrease or discontinue one or more medications.

Conclusions
VNS is a safe and effective treatment for children with pharmaco resistant epilepsy who are not candidates for epilepsy surgery. All of the patients in our study had video/EEG proof of seizure type resulting in outcomes that are based on specific seizure type, epilepsy syndrome and etiology when possible. We believe this data will help physicians chose patients who would be good candidates for VNS therapy and better advise patients of expected results based on their specific seizure type, epilepsy syndrome or etiology.