A faint, light blue ECG (heart rate) line graphic is overlaid on the dark blue grid background. It starts on the left side, moves across the top, then down, then across the middle, and finally down again on the right side.

PROVINCIAL GUIDELINES FOR EPILEPSY SURGERY REFERRALS IN ONTARIO

Epilepsy Implementation Task Force
Version 1.0 | Critical Care Services Ontario | February 2016

This document is a product of Critical Care Services Ontario (CCSO)

The *Provincial Guidelines for Epilepsy Surgery Referrals in Ontario* is the result of a collaborative effort between CCSO, the Epilepsy Implementation Task Force (EITF), and Provincial Neurosurgery Ontario (PNO). The EITF was established in June 2013 to develop and implement a provincial framework to maximize value from the system of epilepsy care in Ontario. CCSO supports the work of the EITF, a subgroup of PNO, as part of its mandate to support equitable and timely access to neurosurgical care, including epilepsy surgery, and to help maintain the province's neurosurgical capacity.

How to Use This Document

The Guidelines included in this document have been developed by a sub-group of the Epilepsy Implementation Task Force for any health care provider engaged in the care of patients with epilepsy. The guidelines are based on current processes and represent expectations for the highest standards of epilepsy care.

This document provides guidelines only.

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Please see Appendix A for a list of the
Epilepsy Implementation Task Force (EITF) membership

Version Control

| | |
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Disclaimer: The contents of these Guidelines may change over time. Clinicians and hospital administrators should use sound judgment for individual patient encounters. Critical Care Services Ontario, the Epilepsy Implementation Task Force and Provincial Neurosurgery Ontario strongly recommend evidence-based practices.

Definitions

| | |
|--|--|
| Comprehensive Epilepsy Program (CEP) | <p>Denotes an integrated care model for the management of individuals with epilepsy within a multidisciplinary team. A CEP covers various aspects of care including medical, psychosocial, and nutritional management, appropriate neurodiagnostic investigations, a mandatory epilepsy monitoring unit [see Provincial Guidelines for EMUs], capability for pre-surgical diagnostic evaluation, and established links to Community Epilepsy Agencies. All epilepsy centres whether designated as District Epilepsy Centre or Regional Epilepsy Surgical Centre should have a CEP to deliver the clinical mandate.</p> |
| District Epilepsy Centre (DEC) | <p>A comprehensive epilepsy program that provides all appropriate epilepsy related clinical services except epilepsy surgery. DEC should provide basic investigations necessary to determine candidacy for epilepsy surgery including assessment by an Epileptologist, and full EMU service including neuropsychological evaluations.</p> <p>List of Ontario's DECs:</p> <ul style="list-style-type: none"> • Hamilton Health Sciences • The Ottawa Hospital • Health Sciences North • Children's Hospital of Eastern Ontario |
| Epilepsy | <p>Disorder of the brain characterized by an enduring predisposition to generate epileptic seizures and by the neurobiologic, cognitive, psychological, and social consequences of this condition. The definition of epilepsy requires the occurrence of at least one epileptic seizure (Fisher et al, 2005). In most situations, occurrence of two epileptic seizures is an evidence of enduring predisposition to generate epileptic seizures.</p> |
| Epileptic Seizure | <p>An epileptic seizure is a transient occurrence of signs and or symptoms due to abnormal excessive and or synchronous neuronal activity in the brain (Fisher et al, 2005).</p> |
| Epileptologist | <p>Qualifications and Training:</p> <ol style="list-style-type: none"> 1. Clinical fellowship training in epilepsy and video-EEG for at least 12 months in a specialized center in Canada, US or abroad; 2. Recognized as a neurologist by the College of Physicians and Surgeons of Ontario (CPSO); and 3. Certification for EEG reporting (EEG examination by the Canadian Society of Clinical Neurophysiologists or APBN exam in Epilepsy) is mandatory. Neurologists who have/had been reporting Video EEG recordings without supervision in any jurisdiction in Canada or the United States of America anytime in or before 2013 are exempt from EEG/Epilepsy examination. |
| Medically-Refractory Epilepsy | <p>Failure of adequate trials of two tolerated, appropriately chosen and used antiepileptic drugs (whether as monotherapy or in combination) to achieve sustained seizure-freedom (Kwan, 2010 from International League Against Epilepsy).</p> |
| Regional Epilepsy Surgery Centre (RESC) | <p>A comprehensive epilepsy program that provides all the services available in a DEC and in addition, epilepsy surgery including facility for intracranial monitoring.</p> <p>List of Ontario's RESCs:</p> <ul style="list-style-type: none"> • London Health Sciences Centre • University Health Network - Toronto Western Hospital • The Hospital for Sick Children |

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Introduction

Epilepsy affects around 95,000 Ontarians, of whom approximately 80,000 are adults and over 15,000 are children under the age of 18 (Institute for Clinical and Evaluative Sciences [ICES] & Ontario Brain Institute [OBI], 2015). While most individuals with epilepsy can be treated effectively by a primary care physician or general neurologist, an estimated 30% of those diagnosed have medically-refractory epilepsy, experiencing seizures that do not respond to treatment with two or more appropriate antiepileptic drugs (Bowen et al. 2012). These numbers are not static. Each year it is estimated that 6,500 Ontarians will develop epilepsy, and 1,950 of them will have medically-refractory epilepsy (Tellez-Zenteno et al. 2004; Wiebe et al. 1999).

Surgical intervention could be successful in eliminating seizures; there is approximately an 80% chance that an individual will be seizure-free after surgery, resulting in far better outcomes with respect to seizure freedom, improved quality of life, and reduction of psychosocial comorbidities that accompany medically-refractory epilepsy than continued medical treatment (Bowen et al. 2012). However, not all individuals with epilepsy are candidates for surgery – approximately one third of those suffering from medically-refractory epilepsy will not be considered candidates. Despite its effectiveness, surgical treatment is underutilized in Ontario, with only a fraction of the population who may be eligible for surgery assessed every year. A 2012 report by the Expert Panel on a Provincial Strategy for Epilepsy Care (Health Quality Ontario [HQO], 2012) identified that long wait lists at the province's Epilepsy Monitoring Units (EMUs) and low referral rates contributed to the underutilization of surgical treatment. The Panel also noted that awareness of surgical treatment options was low and patients were not diagnosed, treated and referred appropriately. A 2011 estimate determined that less than 2% of potential surgical candidates accessed surgical treatment (HQO, 2011).

The Panel recommended action to improve epilepsy care infrastructure and surgical referral in the Province (HQO, 2012). As a result, the Ministry of Health and Long-Term Care (MOHLTC) made an investment of 21 new Epilepsy Monitoring Unit (EMU) beds in Ontario, bringing the total number of EMU beds to 39 (26 adult and 13 pediatric). The Ministry also resourced additional epilepsy surgery and vagal nerve stimulator capacity through CCSO's Provincial Neurosurgery Strategy and established the Epilepsy Implementation Task Force (EITF) to oversee epilepsy system improvements.

Epilepsy Implementation Task Force

The Epilepsy Implementation Task Force (EITF) was formed in June 2013 to develop and implement a provincial approach to an integrated system for epilepsy care in Ontario. Supported by CCSO, this committee is co-chaired by Dr. Carter Snead, Pediatric Neurologist at the Hospital for Sick Children, and Brenda Flaherty, Executive VP and Chief Operating Officer at Hamilton Health Sciences.

The EITF brings together senior clinical and administrative leaders from the epilepsy community to:

- Improve access along the full continuum of care by coordinating resources and wait lists
- Establish standardized diagnostic and surgical protocols across hospitals with comprehensive epilepsy programs
- Develop supports for primary care providers

CCSO supports the work of the EITF, a subgroup of Provincial Neurosurgery Ontario, as part of its mandate to support equitable and timely access to neurosurgical care, including epilepsy surgery, and to help maintain the province's neurosurgical capacity. CCSO is supported by the Ministry of Health and Long-Term Care, (www.criticalcareontario.ca). For a list of EITF membership, please see Appendix A.

The creation of the EITF stemmed a report by the Expert Panel on a Provincial Strategy for Epilepsy Care in Ontario, assessing the challenges to access in epilepsy care in Ontario (HQO, 2012). The report notes that the community of healthcare providers treating epilepsy needs support with a standardized approach to diagnosis and treatment (such as antiepileptic drugs (AED), electroencephalography (EEG) or neuroimaging), and process for referral to a neurologist or for surgery (if the seizures are determined to be medically-refractory). This document is the outcome of the recommendation to provide province-wide guidelines for first-contact healthcare providers (such as primary care and emergency department physicians) to standardize the diagnosis, treatment and referrals of patients with epilepsy in the province.

Epilepsy Care in Ontario

In order to maximize value and ensure that patients are receiving timely, high quality care, it is crucial to clarify system capacity and referral paths. This will help set clear expectations for planning, coordination and performance for all hospitals with specialty epilepsy care programs.

The EITF has developed a definition of a Comprehensive Epilepsy Program (CEP) and established a planning and integration framework for epilepsy care in Ontario:

A CEP is an integrated care model for the management of individuals with epilepsy within a multidisciplinary team. A CEP covers various aspects of care including medical, psychosocial, and nutritional management, appropriate neurodiagnostic investigations, a mandatory EMU, capability for pre-surgical diagnostic evaluation, and established links to community epilepsy agencies.

Hospitals with CEPs are divided into two categories based on the level of services they provide:

1. A District Epilepsy Centre (DEC) houses a comprehensive epilepsy program that provides all appropriate epilepsy related clinical services except epilepsy surgery. A DEC should provide basic investigations necessary to determine candidacy for epilepsy surgery including assessment by an Epileptologist, and full EMU service including neuropsychological evaluations.

The following hospitals are classified as District Epilepsy Centres:

| Hospital | Adult EMU Beds | Paediatric EMU Beds |
|--|----------------|---------------------|
| Health Sciences North | 1 | - |
| Hamilton Health Sciences | 3 | 2 |
| The Ottawa Hospital | 2 | - |
| Children's Hospital of Eastern Ontario | - | 2 |

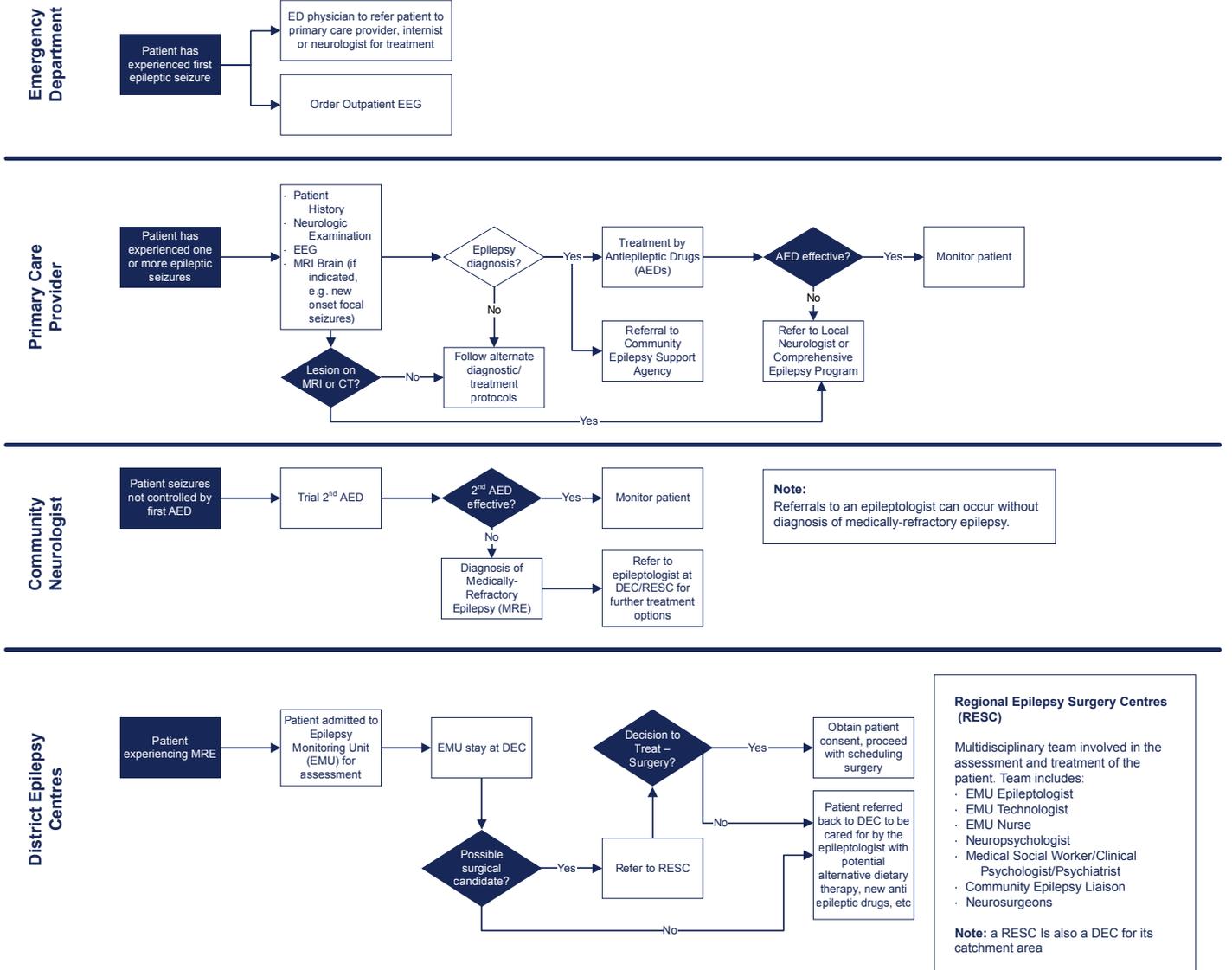
2. A Regional Epilepsy Surgery Centre (RESC) is a facility with a comprehensive epilepsy program that provides all the services available in a DEC, and in addition, epilepsy surgery including facility for intracranial monitoring.

The following hospitals are classified as Regional Epilepsy Surgery Centres :

| Hospital | Adult EMU Beds | Paediatric EMU Beds |
|--|----------------|---------------------|
| London Health Sciences Centre | 10 | 2 |
| The Hospital for Sick Children (SickKids) | - | 7 |
| University Health Network (Toronto Western Hospital) | 10 | - |

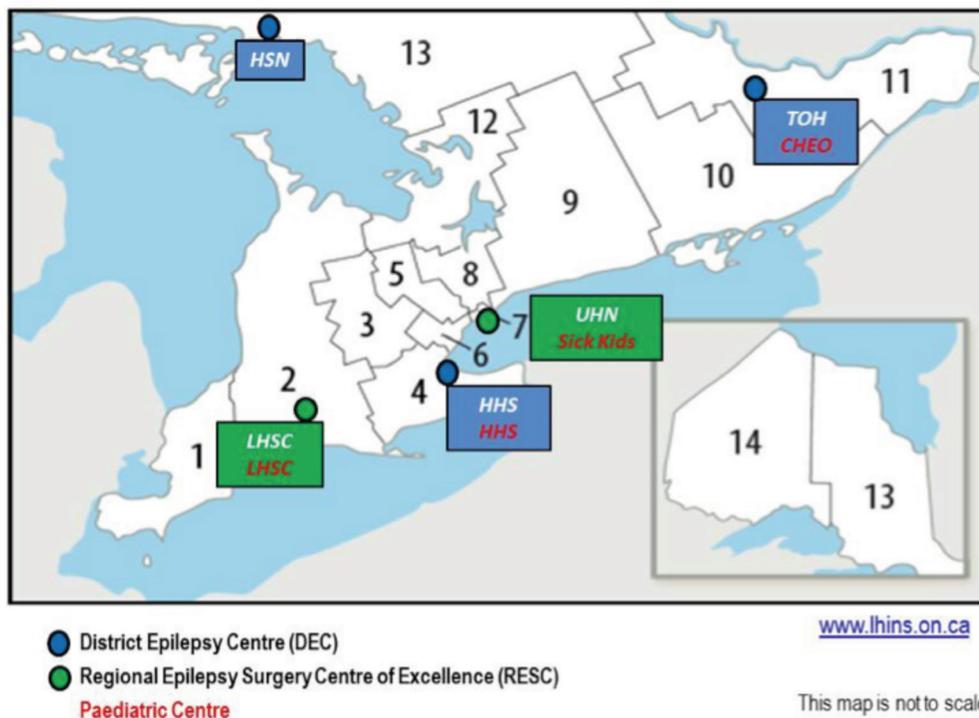
The following flow chart is a high-level depiction of the process each provider should follow in order to appropriately diagnose and manage a patient with epilepsy:

Epilepsy Patient Flow by Provider



Updated: February 3, 2015

Map of Ontario's Epilepsy Centres



When investment in the system has stabilized, the EITF will develop and publish defined catchment areas and referral paths for both epilepsy centres (both medical and surgical sites).

About this Document

CCSO and the EITF has developed this document in an effort to provide guidelines to referring physicians on appropriate evidence-based diagnostic and therapeutic referrals for patients who are determined to have medically-refractory epilepsy. It defines evidence-based indications to epilepsy surgery, with careful consideration given to infants.

Target Audience

This document is intended for adult and paediatric neurologists and primary care providers caring for and referring patients with medically-refractory epilepsy.

The EITF Guidelines Series

CCSO and the EITF are developing a series of guidelines intended to support primary care providers, community neurologists, and District and Regional Epilepsy Centres. These guidelines aim to increase the awareness of, and referrals to, appropriate diagnostic assessment and surgical care of patients in Ontario.

For Primary Care Providers:

1. *Provincial Guidelines for the Management of Epilepsy in Adults and Children (January 2015)*
To support the flow of patients towards appropriate treatment for epilepsy, this document contains a set of guidelines to help with the diagnosis, treatment and referral practices from the moment of a patient's first seizure.
2. *Provincial Guidelines for Epilepsy Surgery Referrals in Ontario (February 2016)*
This document provides an approach to referral of medically-refractory epilepsy patients by defining evidence-based indications to epilepsy surgery, with careful consideration given to infants.
3. *Provincial Guidelines for the Management of Medical-Refractory Epilepsy in Adults and Children Who are not Candidates for Epilepsy Surgery (forthcoming)*
This guideline will provide an approach to the management of the patient with medically intractable epilepsy in whom surgical treatment is not an option. It will include the use of antiepileptic medications and non-antiepileptic therapy such as dietary management and neurostimulation.
4. *Provincial Guidelines for Transitional Care of Paediatric Epilepsy Programs to Adult (forthcoming)*
To ensure uninterrupted quality medical care for adolescent patients with chronic disorders, this document provides guidelines for paediatric and adult practitioners to assist in the seamless transition of epilepsy care for adolescents who are departing the paediatric system and entering the adult health care network.

For Providers and Administrators in District and Regional Epilepsy Centres:

5. *Provincial Epilepsy Monitoring Unit (EMU) Guidelines for Ontario (January 2014)*
This document outlines protocols and provides guidelines for EMUs for diagnostic evaluation for epilepsy. It can be used as a guide for neurosurgical centres with EMU beds.
6. *Provincial Guidelines for Regional Epilepsy Surgical Centres (forthcoming)*
This document presents best practice guidelines and sets out accountabilities for hospitals and their collaborative interdisciplinary teams that provide care for patients at Regional Epilepsy Surgical Centres.

Patients with Medically-Refractory Epilepsy as Candidates for Referral

The definition of medically-refractory epilepsy varies across institutions, with diverse criteria used by different clinicians and researchers. To improve patient care, provide uniformity and facilitate clinical research, the International League Against Epilepsy (ILAE) formulated a consensus definition of medically-refractory epilepsy as failure of adequate trials of two tolerated, appropriately chosen and used antiepileptic drugs (whether as monotherapy or in combination) to achieve sustained seizure-freedom (Kwan et al., 2010).

This definition includes the three following concepts:

1. Appropriate Medication: A medication is appropriate if it has previously been shown to be effective, preferably in randomized controlled studies, which provide the highest level of evidence.
2. Importance of Documentation: Documenting an attempt to titrate the dose of the appropriate medication to a target clinically effective dose range should be made to show adequateness of the medication trial.
3. Sustained Seizure-Freedom: Seizure-free duration that is at least three times the longest inter-seizure interval prior to starting a new intervention (determined from seizures occurring within the past 12 months) or 12 months, whichever is longer (Kwan et al., 2010).

Treatment failure and undetermined seizure-free outcome are noted as:

1. Treatment Failure: Recurrent seizure(s) after the intervention has been adequately applied.
2. Undetermined Seizure-Free Outcome: If a patient has been seizure-free for three times the pre-intervention inter-seizure interval but for <12 months.

Any patient (regardless of age) who fulfills the above criteria for medically-refractory epilepsy is considered a surgical candidate and is eligible for assessment. These patients should be referred to a District Epilepsy Center (DEC) or a Regional Epilepsy Surgery Centre (RESC) in order to assess surgical candidacy. Recent epilepsy service investments by the Ministry of Health and Long-Term Care have increased access to treatment to improve outcomes for this patient cohort.

Special Considerations for the Paediatric Population

There are unique characteristics in infants and children with epilepsy that justify dedicated pediatric epilepsy centers. Early infancy and childhood is a time of rapid brain maturation, and patients with early epilepsy can have developmental arrest or progressive disturbance in cognitive, behavioral and psychiatric function that can also influence the decision for surgical management. Because of this, the Sub-Commission for Pediatric Epilepsy Surgery of the ILAE has proposed criteria for referral and evaluation of children for epilepsy surgery (Cross et al., 2006). Indications for referral included patients with several recognized etiologies and syndromes more commonly seen in children were identified:

- Cortical dysplasia
- Tuberous sclerosis complex (TSC)
- Polymicrogyria
- Hypothalamic hamartoma
- Hemispheric syndromes
(hemimegalencephaly and hemispheric dysplasias)
- Sturge-Weber syndrome
- Rasmussen syndrome and
- Landau-Kleffner syndrome

Similar to adults, children with uncontrolled (i.e. failure of two or three appropriate drugs, see previous description for treatment failure and underdetermined seizure free outcome) and disabling epilepsy are also possible surgical candidates. In addition, patients with lateralized seizures or other evidence of focality that cannot be definitely attributed to idiopathic focal epilepsies or in whom the MRI reveals a lesion amenable to surgical removal should be referred to a paediatric DEC or RESC for evaluation. In the paediatric surgical population, there are currently no preoperative clinical variables to predict seizure outcome, therefore, the presence of developmental delay, physical, and/ or psychiatric co-morbidities should not be a contraindication for pediatric epilepsy surgery (Cross et al., 2006).

Determining if a Patient is an Appropriate Candidate for Epilepsy Surgery

Patients with medically-refractory epilepsy who are potential surgical candidates should be evaluated by an Epileptologist at a DEC before being referred to a RESC. District Epilepsy Centres consist of an epilepsy monitoring unit (EMU), run by an Epileptologist with infrastructure and a multidisciplinary team of healthcare professionals as defined in the **Provincial Epilepsy Monitoring Unit (EMU) Guidelines for Ontario (2014)**.

To guide physicians in identifying patients who may benefit from an epilepsy surgery evaluation, the CASES Expert Panelists developed a free and easily accessible online tool based on available evidence through 2008 and expert consensus (www.epilepsycases.com) (Jette *et al.*, 2012). This tool is most appropriate for patients with focal epilepsy and are over 12 years of age. It uses the following eight variables in determining the necessity score for prioritizing epilepsy surgery referrals:

1. Seizure type and patient age
2. Epilepsy duration
3. Seizure frequency
4. Seizure severity
5. Number of AEDs tried
6. Drug side effects
7. Investigations (i.e. EEG, MRI)
8. Results of investigations

This tool will need to be applied in the presence of the patient, as it requires input from both the patient and the physician.

In the initial screening portion, patients with any of the criteria listed below (regardless of age) are recommended for referral to a DEC or RESC regardless of the tool used for assessment. Please refer to page 6 of this document for the definition of a comprehensive epilepsy program.

1. Medically-refractory epilepsy
2. Epileptic encephalopathy
3. Complex epilepsy syndromes including:
 - a. Rasmussen's encephalitis
 - b. Tuberous sclerosis
 - c. Sturge-Weber syndrome
 - d. Landau Kleffner syndrome
 - e. Polymicrogyria
 - f. Hypothalamic hamartoma
 - g. Dravet syndrome
 - h. Lennox-Gastaut syndrome
 - i. West syndrome/infantile spasms
 - j. Ohtahara syndrome
 - k. Epilepsia partialis continua
4. Seizures and a progressive neurological disorder, a newly diagnosed brain tumor or a vascular lesion

In summary, physicians, including general practitioners, neurologists, pediatricians and other specialists involved in the care of epilepsy patients can access The CASES Expert Panel resource as a guide for determining candidacy for epilepsy surgery evaluation. This web-based tool can be accessed via any computer or smart phone and can be emailed or immediately printed for the patient's chart.

Recommendations

- Any patient who failed to respond to one anti-epileptic drug should be referred by the healthcare provider to a neurologist.
- Patients with medically-refractory epilepsy or any patient with criteria for surgical candidacy as described in this guideline, should be considered for referral to an Epileptologist at a DEC or RESC who can provide a variety of advanced diagnostic and therapeutic services to determine the patients' suitability for epilepsy surgery or other therapeutic interventions (e.g. ketogenic diet, neurostimulation devices).
- Regional epilepsy centers should accept referrals for epilepsy surgery only after evaluation by an Epileptologist at a DEC or RESC.

Appendix A Epilepsy Implementation Task Force Membership

| Name | Title/Role | Organization |
|-----------------------------|--|---|
| Dr. Carter Snead (Co-Chair) | Paediatric Neurologist | The Hospital for Sick Children |
| Brenda Flaherty (Co-Chair) | Executive Vice President & Chief Operating Officer | Hamilton Health Sciences |
| Dr. Sharon Whiting | Paediatric Neurologist | Children's Hospital of Eastern Ontario |
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| Louise MacRae | Director, Regional Stroke Program | Hamilton Health Sciences |
| David McNeil | Vice President Clinical Programs/CNO | Health Sciences North |
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| Dr. Rajesh RamachandranNair | Paediatric Neurologist | McMaster Children's Hospital / HHS |
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| Liz Ferguson | Director, Centre for Brain and Behavior | The Hospital for Sick Children |
| Mike Tierney | VP Clinical Programs | The Ottawa Hospital |
| Dr. Ayman Hassan | Neurologist | Thunder Bay Regional Health Sciences Centre |
| Dr. Taufik Valiante | Adult Neurosurgeon | University Health Network |
| Janet Newton | Clinical Director | University Health Network |

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