

A photograph of a large, modern multi-story hospital building with a white facade and extensive blue-tinted glass windows. The building has a curved roofline and a prominent entrance area with a blue canopy. The text 'children's MEDICAL CENTER' is visible on the upper left side of the building. In the background, other city buildings are visible under a clear blue sky.

UT Southwestern
Medical Center

When Medications Aren't Enough Exploring All the Options

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When medications are not doing enough...

Session Title: *Developmental and Epileptic Encephalopathies:
Medication, Surgery, and Developmental Outcomes*

What options do parents have ?

- 30% patients refractory
- Referral trigger: Lack of control within one year
- **Misconception**: Resective surgery



[National Academies Press \(US\)](#); 2012.

ISBN-13: 978-0-309-25506-6; AAN guidelines 2014

What options do parents have?

Diet

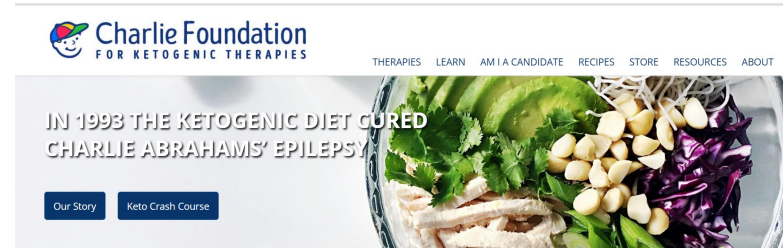
“Palliative
Surgery”

Neuromodulation

New molecules
and Trials

Multidisciplinary
team

Diet



Overview of initial clinical considerations

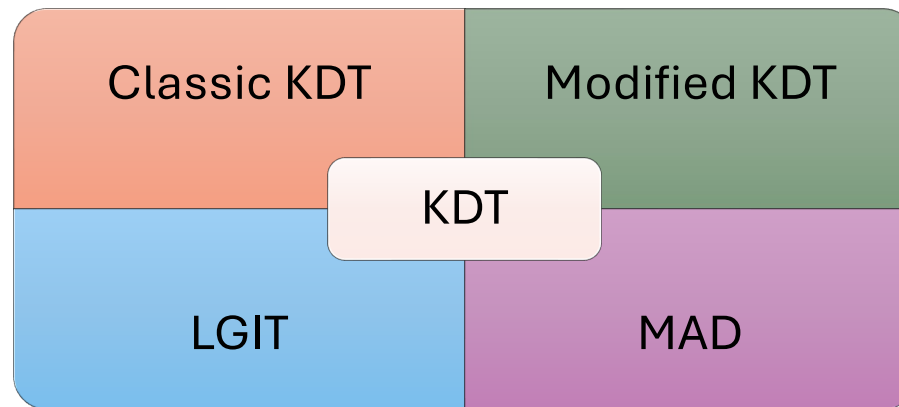
- Etiology of epilepsy
- Epilepsy syndrome classification
- Age
- Comorbidities
- Clinical presentation (e.g., seizure frequency and duration)
- Accessibility to KD clinic support
- Cultural beliefs and dietary preferences



Epilepsy syndrome in which KDT is particularly effective

- Patients with the following epilepsy syndromes and conditions (in alphabetical order):
 - Angelman syndrome (AS)
 - Complex I mitochondrial disorders (MC1DN)
 - Dravet syndrome (DS)
 - Epilepsy with myoclonic-atonic seizures (EMATs)
 - Febrile-infection related epilepsy syndrome (FIRES)
 - Glucose transporter I deficiency syndrome (Glut1DS)
 - Infantile epileptic spasm syndrome (IESS)
 - Ohtahara syndrome
 - Pyruvate dehydrogenase complex deficiency (PDCD)
 - Tuberous sclerosis complex (TSC)

Lancet Neurol . 2026 May;25(5):519-532.

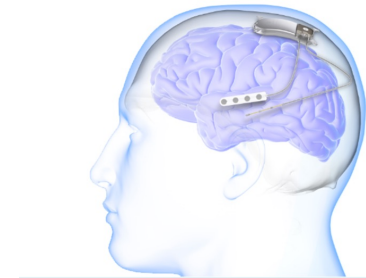
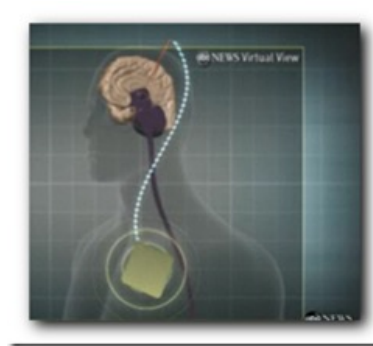
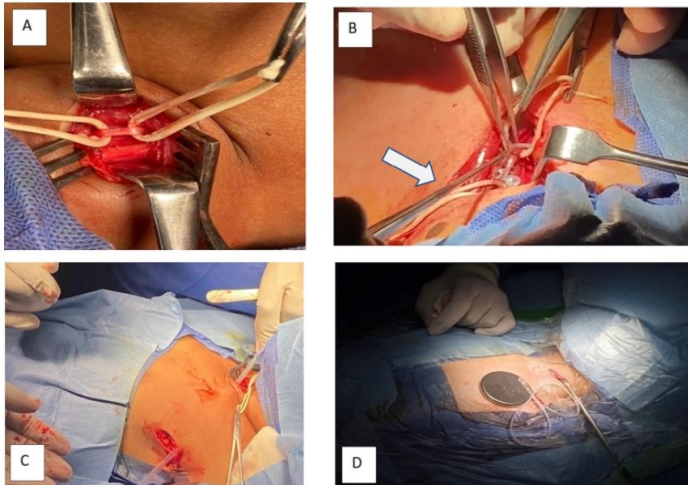
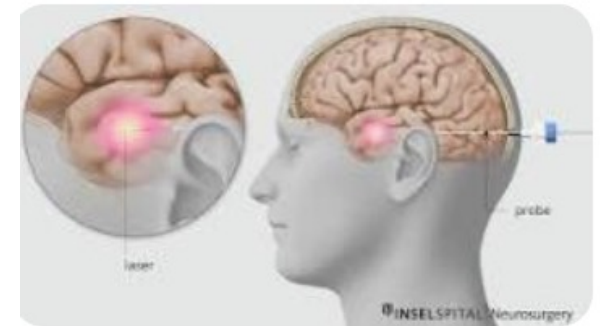


	Infants	Toddlers	Adolescents	Inpatients
Types of diet	Usually 3:1 or 4:1	Classic or MAD	MAD/ LGIT	Classic
Advantages	Formula	Variety	Variety and less stringent	Can be tube fed-formula
Duration	3 m-2 years	3m-2 years	3m-2 years	3m-2 years

Lancet Neurol . 2026 May;25(5):519-532.

“Palliative” surgery

- Corpus callosotomy
- LITT
- Neuromodulation



Outcomes after Corpus Callosotomy

- Honda et al 2021-

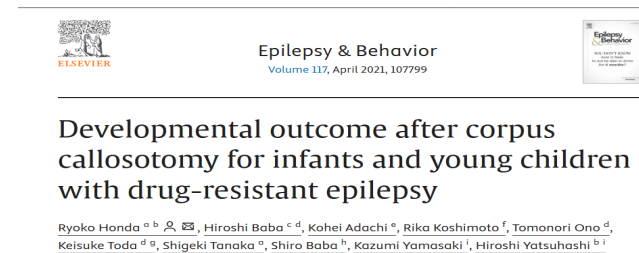
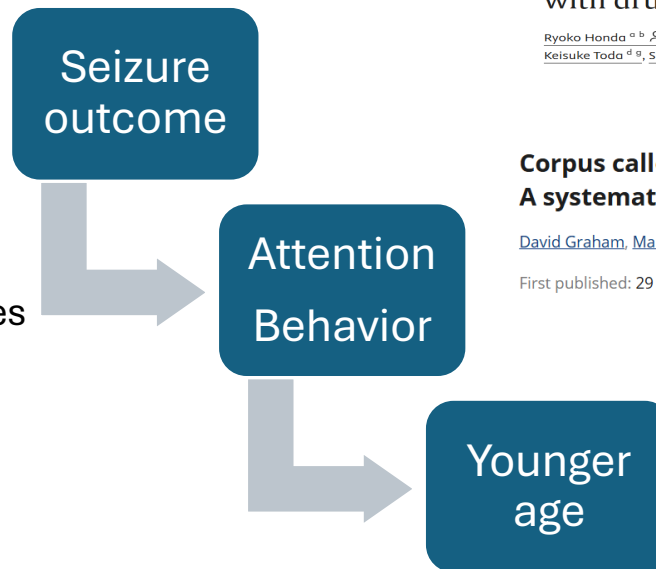
- 106 patients- DQ improved (↓age, seizure improvement , gains first month)

- Graham et al 2016-

- 377 pts
- improvements related- sz outcomes

- Passamanti 2014-

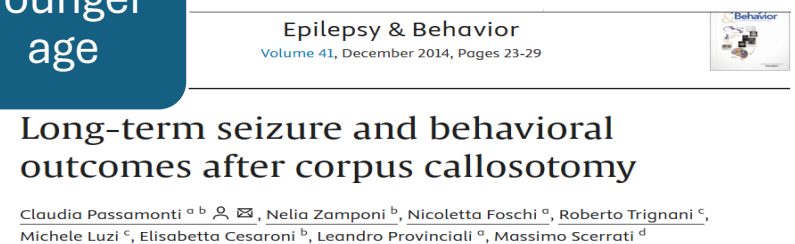
- 26 pts- attention (sz impr), Behaviors(younger age)



Corpus callosotomy outcomes in pediatric patients: A systematic review

David Graham, Martin M. Tisdall, Deepak Gill

First published: 29 May 2016 | <https://doi.org/10.1111/epi.13408> | [VIEW METRICS](#)

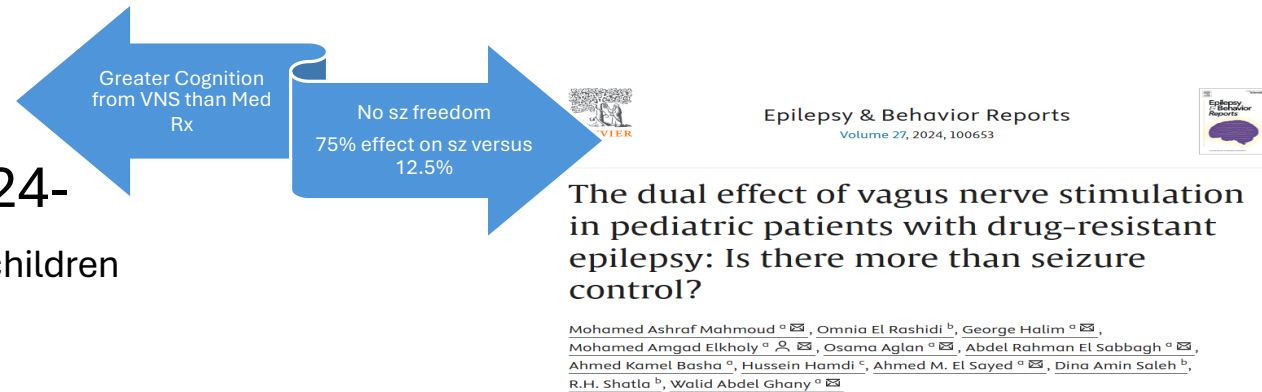


Neuromodulation – VNS/ RNS/ DBS

VNS	RNS	DBS
• Outside the head(leads and IPG) • Continuous	• Inside the head (leads and IPG) • On demand	• Inside head leads with chest IPG • Continuous

Outcomes after VNS

- Mahmoud 2024-
- BMT versus VNS- 26 children



- Knorr et al 2021-
- 45 children



Intracranial neuromodulation

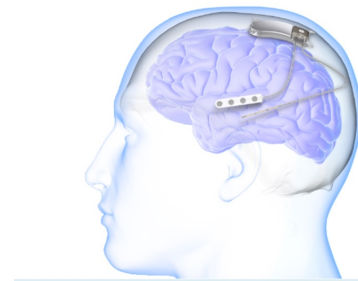
DBS Approved in 2018 – patients > 18 years

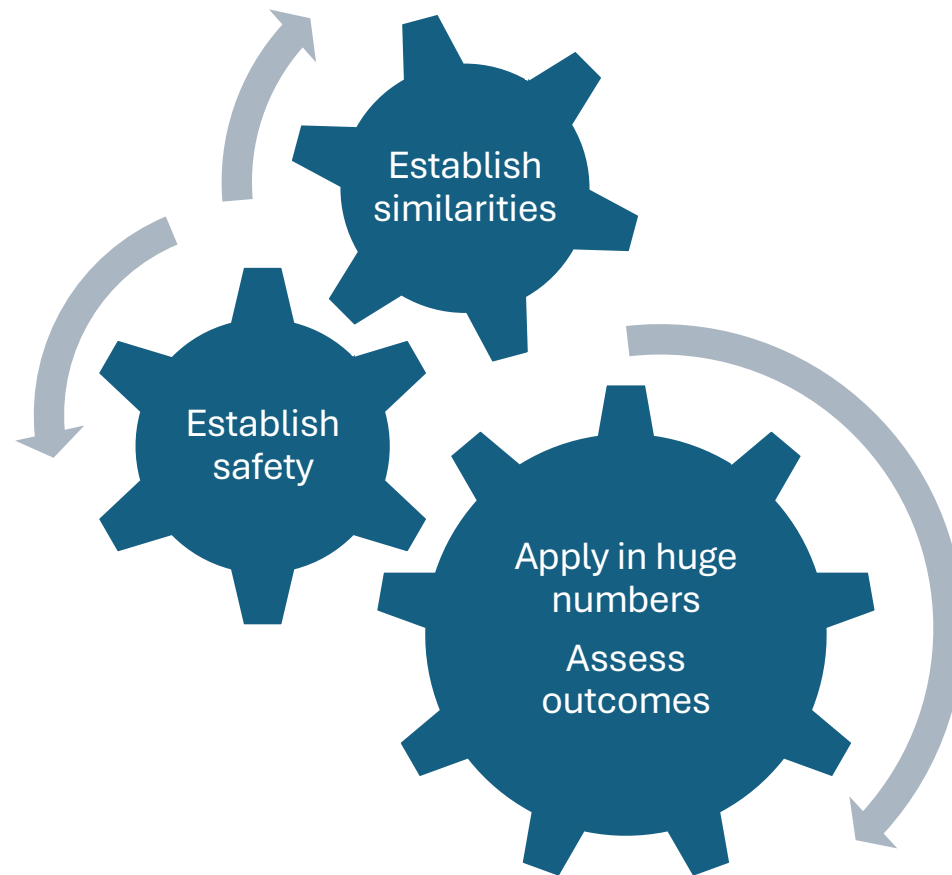
- Surgery in 2 parts
- First- Intracranial lead placement
- Later- Implantable pulse generator placement (IPG)



RNS: Approved in 2013 patients > 18 years

- Some patients will need invasive EEG (SEEG) to determine seizure onset.
- One part surgery- Intracranial leads and implantable generator all placed at the same time.
- Programming starts later (2-4 weeks).





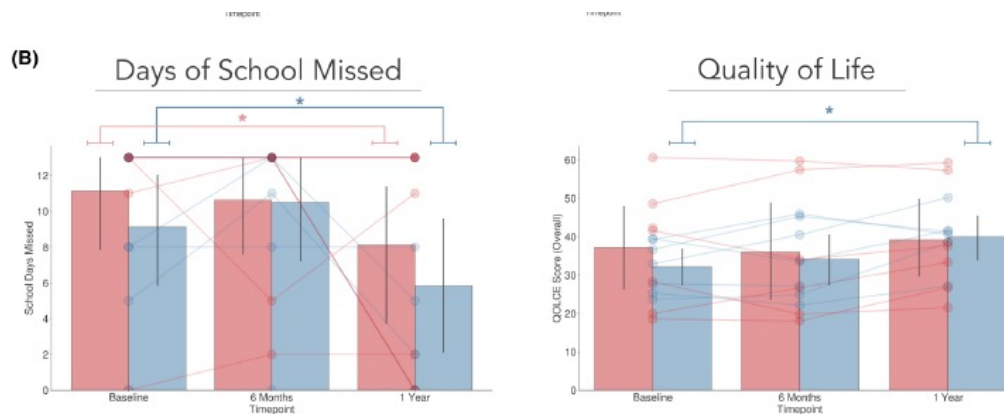
Neuromodulation in various DEEs

- Progressive myoclonus epilepsy
- Rasmussens encephalitis
- Hypothalamic hamartoma
- Tuberous Sclerosis
- Dravet Syndrome
- FIRES

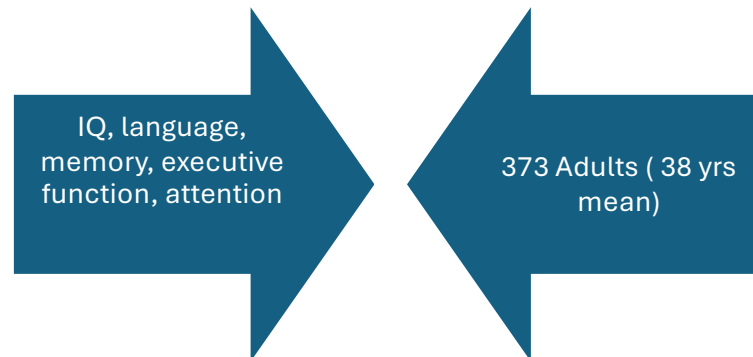
DEE's	Network	Neuromodulatory Therapies			
Progressive Myoclonus Epilepsies (PME)	Cortical-basal ganglia motor network. Specific components of the basal ganglia play critical roles, namely the subthalamic nucleus (STN) and substantia nigra pars reticulata (SNr).				
Rasmussen Encephalitis (RE)	RE is a progressive neuroinflammatory disorder affecting the cortical and subcortical regions of one hemisphere. Additionally there is unilateral cortical atrophy, and subcortical gray matter atrophy in the basal ganglia and thalamus.				
Hypothalamic Hamartoma (HH)	HH can alter large-scale networks with epileptic activation of the ipsilateral temporal lobe, ANT, hypothalamus, brainstem, tegmentum and contralateral cerebellum, as well as deactivation of the DMN.				
Tuberous Sclerosis (TSC)	Often a widespread epileptic network due to the presence of multiple epileptogenic tubers, with or without involvement of eloquent cortex				
Dravet's Syndrome	Limited evidence for a shared Dravet's specific network				
Febrile Infection-Related Epilepsy Syndrome (FIRES)	Multifocal seizures often spread bilaterally, suggesting early involvement of the corticothalamic network, prompting use of thalamic neuromodulation				

Outcomes after neuromodulation

- DBS
- Children



- RNS
- Adults



Deep brain stimulation of the centromedian nucleus for drug-resistant epilepsy in children: Quality-of-life and functional outcomes from the CHILD-DBS registry

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CRITICAL REVIEW

Neuropsychological and neurobehavioral outcomes of responsive neurostimulation in epilepsy: A systematic review and meta-analysis

Marco Malaga, Yosefa Modiano, Zuñifi Haneef

First published: 18 June 2025 | <https://doi.org/10.1111/epi.18505>

Staged surgeries

- Resection plus LITT..
- LITT plus intracranial neuromodulation..
- VNS plus intracranial neuromodulation..



