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INDICATIONS AND EXPECTATIONS FOR NEUROPSYCHOLOGICAL ASSESSMENT IN EPILEPSY SURGERY IN CHILDREN AND ADULTS:

EXECUTIVE SUMMARY OF THE REPORT OF THE ILAE NEUROPSYCHOLOGY TASK FORCE

DIAGNOSTIC METHODS COMMISSION: 2017-2021

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SUMMARY

The role of the neuropsychological assessment in the pre-surgical evaluation of epilepsy surgery candidates has evolved over time and this is now a mandatory part of the preoperative evaluation of epilepsy surgery patients. A comprehensive neuropsychological assessment provides a baseline against which changes in postoperative function can be identified and expectations of postoperative change can be managed. The presurgical assessment also contributes to seizure lateralization, localization and characterization, and provides evidence-based predictions of cognitive risk associated with the proposed surgery, including screening for amnesic risk. Baseline neuropsychological scores should be interpreted in the light of the results from all of the other pre-surgical evaluations in order to evaluate their lateralizing or localizing significance in terms of underlying pathology. Many different factors can combine to create the same profile of strengths and weaknesses within a neuropsychological profile. It is only when the neuropsychological test scores are interpreted through the lens of the full clinical history of the patient and the results of other investigations that the lateralizing and localizing significance of

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the neuropsychological profile becomes clear. The results from the presurgical neuropsychological assessment create the evidence base for preoperative counselling. This counselling should include explorations of the risks, benefits and likely cognitive costs of surgery and explorations of patient and family expectations of surgical treatment.

A neuropsychological assessment should comprise standardized measures of cognitive function. In the surgical setting, in addition to formal neuropsychological test scores, behavioral measures of function are useful, together with subjective ratings of the patients' difficulties. The latter are particularly important given the generally poor correlation between performance on formal neuropsychological tests and memory complaints. It is also important to ascertain baseline levels of social cognition and behavioral executive functions, particularly prior to frontal lobe resections. The pre-surgical neuropsychological assessment should also include formal measures of mood and health related quality of life. The measures used to establish these baselines should be standardized on appropriate populations to provide a reliable and accurate measure of the impact of the patients' epilepsy on the core domains of day to day function.

The scheduling of the preoperative neuropsychological assessment should be carefully planned. Clinicians should be cognizant of the proximity of the assessment to seizures and any associated sleep deprivation and the impact that these factors may have on test performance. Assessment conducted whilst a patient is undergoing video-EEG monitoring is recommended wherever possible, to allow for the consideration of sub clinical EEG abnormalities on cognitive function.

The surgical decision-making process must be based upon up to date information. Ideally, in adult populations, surgical decisions should not be based on the results of neuropsychological assessments that are more than 18 months old. Reassessments will be required following events which are likely to have had a significant impact on cognitive function, such as a period of status epilepticus. The interval between the neuropsychological assessment and surgical decision-making process should be shorter in pediatric populations with an interval of no more than one year, and ideally much less in younger children given the dynamic development of cognitive function in this population.

Our understanding of the aetiology of the cognitive and behavioral problems in epilepsy is based on a complex multifactorial model where the epilepsy syndrome, the underlying brain disorder, the characteristics of the epilepsy and aspects of brain development must all be considered in the interpretation of neuropsychological test scores, together with the treatments for the condition.

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These factors and their interactions determine the patients' cognitive state prior to surgery and their prognosis afterwards.

If the presurgical neuropsychological assessment indicates that the patient is at high risk of a postoperative deterioration in cognitive function, cognitive rehabilitation can be implemented prior to surgery to prepare the patient for the anticipated losses, this has been termed pre-habilitation, or prehab. The pre-habilitation approach has the advantage of utilizing functions before they are lost to establish the compensatory cognitive routines and strategies that the patient will need after the surgery. Patients and their families should also be prepared prior to surgery for any anticipated postoperative deterioration in mood, or likely difficulties with vocational or psychosocial adjustment.

The assessment of neuropsychological and psychosocial outcomes following surgery should be an integral part of the postoperative follow-up. The same principles that inform the comprehensive nature of the preoperative neuropsychological assessment should guide the assessment of postoperative outcome. The postoperative evaluation should assess all aspects of cognitive and behavioral function, as assessed prior to surgery. In addition to all of the factors that influence an individual's neuropsychological profile in a presurgical assessment, the nature, timing and extent of the surgery and other facets of postoperative outcome, particularly seizure control, must be considered in the interpretation of the results from a postoperative neuropsychological assessment. Neuropsychological changes following surgery are dynamic and careful consideration should be given to the potential impact of the interval since surgery on the results of any postoperative neuropsychological assessment. The neuropsychologist plays a key role in the postoperative rehabilitation and support of the patient and family members in their adjustment to the neuropsychological and social changes brought about by surgery and should work closely with other members of the multidisciplinary team . The checklist below summarizes the recommendations of the task force for best practice in the neuropsychological assessment of patients prior to and following epilepsy surgery today.

Checklist of the indications and expectations for neuropsychological assessment in epilepsy surgery in children and adults:

'Must' denotes a mandatory minimum requirement
'Should' denotes best clinical practice
'May' denotes helpful in some cases

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Function	Considerations
Pre Surgical Assessment	• Must be up-to-date • Function in all cognitive domains should be assessed • Should include objective & subjective measures of cognitive function • Should include formal measures of psychosocial function and health related quality of life • Must also include parental/caregiver evaluations of behaviour and ability in paediatric populations. • Teacher/educator evaluations may also be helpful in some cases in paediatric populations
1. Baseline for outcome comparison	• The timing of the formal assessment with respect to the proximity to the last seizure and medication effects will impact on the stability of the baseline measurements and must be considered in the interpretation of results.
2. Contribution to seizure characterisation, lateralisation & localisation	• Results must be interpreted in a developmental context • The organic and non-organic, static and dynamic influences on function must be examined in the interpretation of results from the preoperative assessment
3. Identification of cognitive risks associated with the procedure	• The preoperative baseline data should be used to predict the likely cognitive outcomes and identify the primary cognitive risks associated with the procedure • Predictive models and nomograms may aid these predictions in adults undergoing standardised operations. • Amnesic risk must be identified in temporal lobe surgery candidates
4. Feedback and preoperative counselling	• Should include explanation of the results of the pre-surgical assessment and education about the aetiology of cognitive and functional deficits identified

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	• Must include detailed discussion of any predicted cognitive changes following surgery • Must include discussion of the patient (and their families') expectations of surgery • May include prehabilitation for anticipated cognitive losses or psychosocial difficulties
Post-surgical Assessment	• Should evaluate all aspects of cognitive and behavioural function assessed prior to surgery. • Change must be identified using reliable methods • The nature of the surgery and postoperative seizure outcome must be considered in the interpretation of the postoperative results. • The timing of the postoperative assessment will have a significant impact on the results and must be considered in the interpretation of the results • The longer the follow-up the more accurate the picture of postoperative outcome that emerges. • It may take at least 5 years after the surgery for quantifiable changes in HRQoL to become evident in adults and for cognitive changes to emerge in children. • Psychotherapeutic input may be required in some cases to help surgical candidates maximise their postoperative potential.

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Bullet Points

- A neuropsychological assessment is a mandatory part of the preoperative evaluation of epilepsy surgery patients
- The assessment involves standardized measures of cognitive function and wider measures of behavioural and psychosocial function
- The assessment of neuropsychological and psychosocial outcomes following surgery are an integral component of postoperative follow-up

Ethical Publication Statement

All authors confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

Disclosures:

All of the authors are currently serving on the ILAE Neuropsychology Task Force 2017-2021. C. Helmstaedter reports from the EU, honoraria from UCB, Eisai Inc., GW pharma, Precisis for counselling and advisory board activities, travel support by Desitin, a honorary for editorial work for the journal Seizure (Elsevier), honoraria from insurance companies and court for testimonies, license fees from UCB in the past, and license fees from Eisai Inc. None of the other authors have any conflict of interest to declare.

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