rates of 40–80%. However, observational studies suggest lower proportions. We investigated the initial SE termination rate in a large multinational observational study, and explored variables associated with it.

Methods: Data of adults treated for SE were collected prospectively in centers in Germany, Austria, and Switzerland, during 4.5 years. Incident episodes of 1,049 patients were analyzed using uni- and multivariate statistics to determine factors predicting cessation of SE within 1 hour (for generalized convulsive SE, GCSE) and 12 hours (for non-GCSE) of initiating treatment.

Results: The median age at SE onset was 70 years; the most frequent etiology was remote (32%), followed by acute (31%), or a combination of acute and remote factors (10%). Semiology was generalized convulsive in 43%, focal motor in 28%, and non-convulsive in 29%. Median latency between SE onset and first treatment was 30 minutes in GCSE and 150 minutes in non-GCSE. The first intravenous compound was a benzodiazepine in 86% in GCSE, and 73% in non-GCSE. Bolus doses of the first treatment step were lower than recommended by current guidelines in 76% of the GCSE patients and 78% of the non-GCSE patients. In 319 GCSE patients (70%), SE was ongoing 1 hour after initiating treatment, and in 342 non-GCSE patients (58%) 12 hours after initiating treatment. Multivariate Cox regression demonstrated that the use of benzodiazepines as first treatment step, and a higher cumulative dose of anticonvulsants within the first period of treatment were associated with shorter time to cessation of SE for both groups.

Conclusions: In clinical practice, treatment guidelines were not followed in a substantial proportion of patients. Our data suggest that benzodiazepines should be used as first treatment step and with a sufficient cumulative dose.

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Long term cognitive outcome in adult and adolescent FIRES and NORSE patients

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Background: Febrile illness related epilepsy syndrome (FIRES) is a rare and devastating subtype of new onset refractory status epilepticus (NORSE). Little is known about the long term outcome in adolescent and adult survivors. The aim of this pilot study was to identify factors associated with the long-term outcome in important aspects of daily life and cognition.

Methods: Retrospective chart review 2005-2019, clinical interview during routine visits and follow-up between 3 to 5 years after onset. Assessment of various clinical and outcome parameters: global assessment of severity of epilepsy (GASE), modified Rankin scale (MRS) and scores of independence for neurologic and geriatric rehabilitation (SINGER). Results are reported as means (with lower - upper 95% confidence intervals) or frequencies.

Results: We identified 9 patients who fulfilled the criteria of FIRES syndrome survivors. Only two were diagnosed with FIRES at the time, the others as autoimmune encephalitis. Mean age at onset was 27 years (range, 17-37). One patient developed non convulsive, prolonged refractory SE (PRSE), two persistent refractory SE (PRSE) and six persistent, super refractory SE (PSRSE). CSF pleocytosis was reported in 8/9 cases with 63 (4-123) leukocytes/µl. All patients received benzodiazepines and intravenous anticonvulsants prior to anesthetics and intubation. They spent 53 days (27-79) in intensive care. They were seen by us 21 (2-40) months after discharge from the ICU. Outcomes varied with a favorable outcome (MRS = 1) in one case, moderate outcomes in seven cases (MRS = 2-3) and unfavorable outcome (MRS = 4) in one case. One patient had a mild epilepsy (GASE = 3), three had moderate epilepsy (GASE = 4) and two more severe outcomes (GASE = 5-6). Long term SINGER assessment included 7/9 patients. Two patients reported mild, three moderate and three only mild cognitive impairment. Problems with interpersonal communication were reported in two cases.

Conclusions: Long term evaluation of cognitive outcome in patients with FIRES showed that the majority of patients lost independence in daily functioning due to persisting seizures and cognitive. As the condition is very rare, we propose collaborative projects, to investigate factors for a favorable / unfavorable long-term outcome in NORSE/ FIRES survivors.

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Terminating pattern of ictal high-frequency oscillations is associated with short-term recurrence of seizures

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Purpose: It is not uncommon to meet a patient who experiences short-term seizure recurrence after long-term seizure freedom. In case of seizure recurring within a short interval as status epilepticus (SE), that will be life-threatening. Pathologic high-frequency oscillations (HFOs) encompassing ripples (80–200 Hz) and fast ripples (250–500 Hz) have been linked to ictogenesis. And the amount of interictal HFOs is now known to associate with seizure frequency. In the animal studies, especially a 4 aminopyridine (4 AP)-induced status epilepticius, fast ripples in hippocampus occurred at higher rates than ripples during the ictal and postictal periods. In this study, our objective is to address the mutual interaction of ripple and fast ripple in the seizure offset.

Methods: Ictal electrocorticographies (ECoGs) in the seizure-onset zone from patients with staged approach for epilepsy surgery. We only selected ictal ECoGs from patients who had frequent seizure occurrence with different interictal intervals for the study demand. We categorized high frequency of seizure occurrence (inter-seizure interval less than 4 hours) as clustered seizure group and lower reoccurrence (seizure separated by over 4 hours) as isolated seizure group. Signals derived from subdural grid and/or depth electrodes (Ad-Tech Medical Instrument Corporation, Racine, WI, USA) were sampled by 4 kHz (EBNeuro S.p.A., Italy). The ECoG signals from the SOZ-channel were first low-pass, filtered at 500 Hz and then down sampled to 2 kHz to prevent aliasing. The distribution of ripples and fast ripples during the ictal and postictal periods was averaged for these 2 groups. The ictal period of the selected seizures was normalized into 100 bins. To account

for differences in seizure duration, the average rate of ripples and fast ripples was normalized according to the duration of the seizure. The preprocessed ECoGs were filtered in the 80-200 Hz and in the 250-500 Hz frequency range by a finite impulse response filter. The filtered ECoGs were then normalized using a 60 s reference period selected from 120 s to 60 s before the seizure onset. oscillatory events in each frequency band needed at least four consecutive cycles having an amplitude of 3 SD above the mean of the reference period. Also, the time lag between two consecutive cycles ranged from 5 to 12.5 ms for ripples and from 2 to 4 ms for fast ripples. We arbitrarily divided each period into three equal parts to compare the rates of occurrence of ripples and fast ripples during the ictal and postictal periods. We then compared the rate of occurrence of ripples and fast ripples using Wilcoxon signed-rank tests followed by Bonferroni–Holm corrections to correct for multiple comparisons.

Results: Forty seizure (24 in isolated group, 16 in clustered group) from 8 patients were analyzed. All ictal ECoGs were manifested with 3 subsequent phases including low-voltage fast activity, irregular spiking and poly-spikes bursting. Before seizure offset, the fast ripple activity kept highly and ceased abruptly in the isolated group. Postictally, the fast ripple activity didn't remain silence in the clustered group ($p < 0.05$).

Conclusions: Ripples may represent synchronous IPSPs generated by principal cells in response to inhibitory interneurons firing while fast ripples reflect the abnormal synchronous firing of principal neurons. The ceaseless fast ripple activity after each one of frequently reoccurring seizures suggests that there should be a system fail to overcome or conversely to enhance the high band HFO. The HFO patterns at seizure-offset and post-ictal stages associated with the seizure termination and clustering.

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Prospective evaluation of ADAN Scale: a tool to a prompt identification of Status Epilepticus (SE)

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Background: The ADAN scale was designed to select those patients with risk to develop status epilepticus (SE) after experiencing an epileptic seizure. This scale was defined after a retrospective study and it is based on 4 clinical items: **A**bnormal speech, ocular **D**eviation, **A**utomatisms and **N**umber of motor seizures. However, this scale needs a prospective evaluation and this is the purpose of our study.

Methods: This is a prospective evaluation of all patients arriving at our emergency department with a suspicion of seizure or other neurological symptoms. All these patients were scored using the ADAN scale upon arrival. Afterwards, all patients were evaluated by a neurologist and were performed all necessary ancillary tests; if all the symptoms were not clearly explained by a stroke, they performed an emergent EEG to rule out SE. We ruled out stroke patients for this study.

Results: A total of 128 no-stroke patients were evaluated using ADAN scale upon arrival during 6 months (June - December 2018). Median age was 58.5; 79 (61.7%) were male. 58 (45.3%) had a previous history of epilepsy. Regarding ADAN score: 65 (51,6%) had a low risk for SE (ADAN = 0-1) it was 0; 28 (21,9%) had a moderate risk (ADAN = 2) ADAN and 34 (26,6%) had a high risk (ADAN>2). After a thorough clinical evaluation and a EEG, 45 (35.2 %) fulfilled criteria for SE. When analyzing the ADAN score and the finding of SE, a score >1 was significantly associated with a diagnosis of SE (69% in ADAN>1 group vs. 3% in ADAN = 0-1; $p = 0.0001$). The predictive capacity of the scale for identifying SE in the validation dataset was 95.6%. Taking into account, the different groups according to risk, 85.3 % of high-risk group showed SE, 50 % of moderate-risk group and 3% of low-risk group.

Conclusion: ADAN scale is a strong predictor of the diagnosis of SE in patients who experience an epileptic seizure. This scale may be a useful tool for clinical use in order to help to select patients in high risk of SE, and allow a faster diagnosis and an early treatment.

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The outcome of non-convulsive status epilepticus

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Background: It is not entirely clear, to what extent, non-convulsive status epilepticus (NCSE) contributes to clinical impairment and neurological injury. To assess the clinical impact of NCSE, we retrospectively analysed the cases of NCSE in our cohort.

Methods: NCSE episodes diagnosed during electroencephalographic evaluation over a period of three years from January 2012 to December 2014 were identified, and the clinical data of patients was analysed for the admission during which NCSE occurred. Outcomes at discharge were defined as good if the patient was back to baseline functional status or had mild functional decline requiring some rehabilitation; and poor if death occurred or if the patient had significant functional decline.

Results: From 2663 inpatient EEGs done over three years, 81 episodes of NCSE were identified (3.04%). The average age of patients with NCSE was 65 years. 42 were females and 39 males. The mean duration of NCSE was 3.36 days. The average length of inpatient stay during the admission under consideration was 30.66 days. 29(25.8) had a primary neurological cause for NCSE, 15(18.5%) had a systemic (metabolic/septic/toxic) cause, and 36(44.4%) had both. 23(28.4%) were known to have epilepsy prior to the NCSE episode.

35(43.2%) had a good outcome at discharge, whereas 46(56.8%) had a poor outcome. It was apparent that the poor outcome was unrelated to the NCSE itself, from the wide difference in the averages of length of hospital stay and length of NCSE itself, and there being no relation between the number of antiepileptic drugs used or anaesthetic agent usage (midazolam in most cases) with the outcome.

Factors associated with poor outcome were no prior epilepsy (OR 3.85; 95% CI 1.26 to 1.78; $p = 0.01$); no episode of clinical seizure associated with NCSE (OR 4.06; 95% CI 1.41 to 11.6; $p = 0.009$) and NCSE due entirely to systemic causes (OR 3.2; 95% CI 0.97 to 10.45; $p = 0.05$).

Conclusion: In our cohort, outcome of NCSE is poor and is likely to be influenced by the nature of underlying illness rather than NCSE