

Assessment of Trainees' Performance During a Simulation of Viral Encephalitis Complicated by Status Epilepticus

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Introduction

- Delays in treatment of both Herpes Simplex Virus (HSV) encephalitis and seizures are associated with poor patient outcomes.
- We sought to assess trainee performance in the management of HSV encephalitis complicated by status epilepticus using high-fidelity simulation.

Methods

- Prospective, observational, single-center simulation-based study of trainees that rotate in the neurocritical care unit
- Simulation case: patient with encephalopathy and fever due to HSV encephalitis followed by non-convulsive status epilepticus
- Case and critical actions were developed by a modified Delphi approach and based on the Neurocritical Care Society's Emergency Neurological Life Support (ENLS) protocols

Methods

- Primary outcome:
 - Sum score of 25 critical action items completed by trainees
- Secondary analyses to support validity of primary outcome:
 - Performance comparison by level of training included *novice*, *intermediate*, and *advanced* participants. *Novice* participants included neurology sub-interns and neurosurgery interns. *Intermediate* participants included neurology residents, medical critical care fellows, surgical critical care fellows, and emergency medicine critical care fellows. *Advanced* participants included neurocritical care fellows as well as neurocritical care attending physicians to establish expert group.
 - Performance correlation with multiple choice pre-test
 - Performance correlation with self-rated experience with status epilepticus

Results

Table 1. Participant Demographics	N = 48
Age, mean in years (SD)	31.5 (3.3)
Female, n (%)	23 (48)
Level of training, n (%)	
Neurology sub-intern	2 (4)
Neurosurgery intern	2 (4)
PGY-2 neurology resident	12 (25)
PGY-3 neurology resident	6 (13)
PGY-4 neurology resident	5 (10)
Medical critical care fellow	6 (13)
Emergency medicine critical care fellow	5 (10)
Surgical critical care fellow	1 (2)
Neurocritical care fellow	9 (19)
Primary work location, n (%)	
Medical intensive care unit	10 (21)
Surgical intensive care unit	1 (2)
Neurocritical care unit	11 (23)
Neurology floor	24 (50)
ENLS certification, n (%)	23 (48)
Experience in medical simulation, n (%)	45 (94)

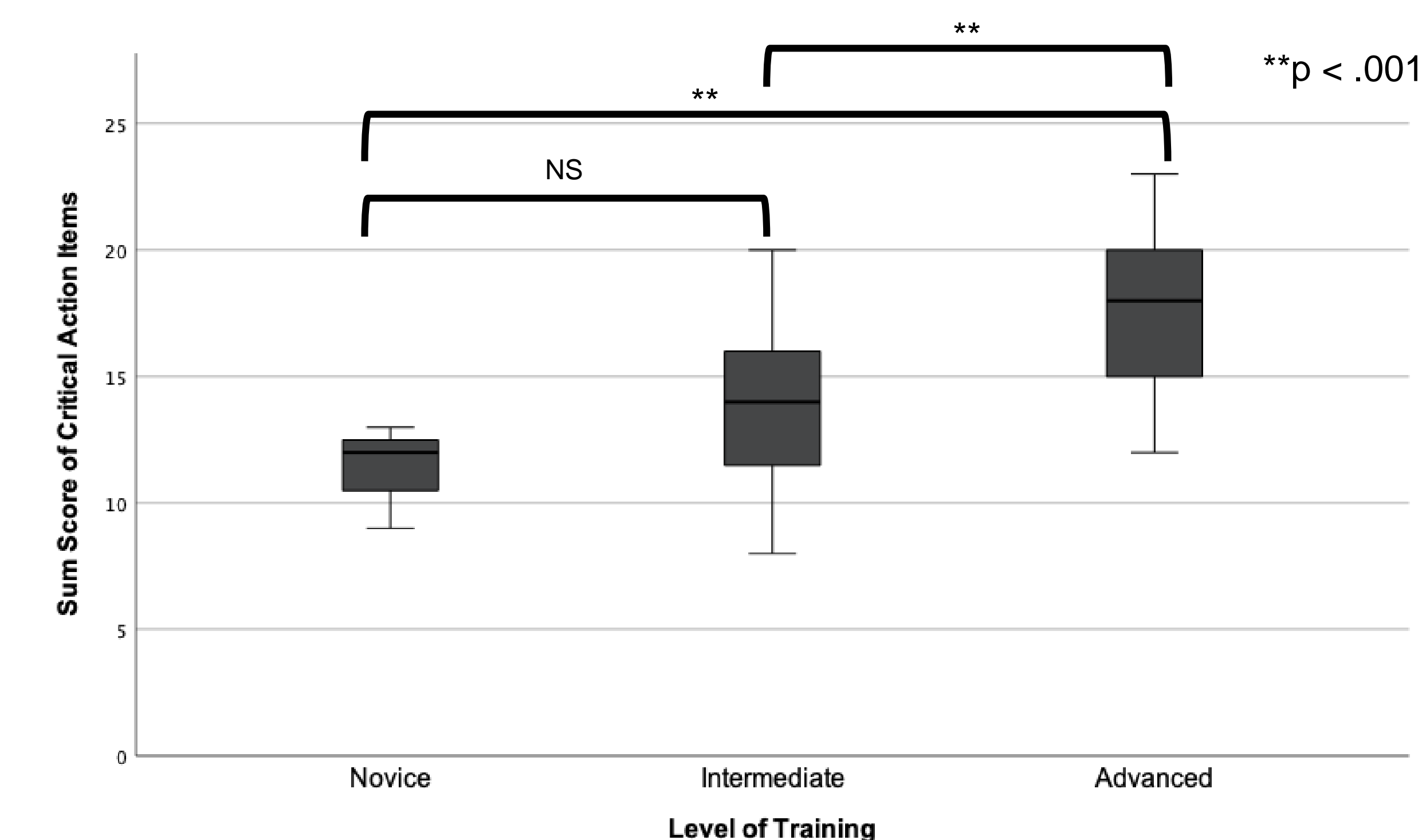
Results

- Mean sum of critical action item sum score for trainees: 14.6 (SD 3.5) out of 25

Table 2. Critical Action Items Performed by Trainees	No. (%)
Assess for meningismus	26 (54)
Assess for fever	40 (83)
Elicit seizure history	33 (69)
Elicit substance abuse history	24 (50)
Verbalize differential diagnosis	21 (44)
Order non-contrast head CT	47 (98)
Review CBC and BMP	47 (98)
Check point of care blood glucose	16 (33)
Order toxicology screen	29 (60)
Order Keppra level	9 (19)
Obtain blood cultures	22 (46)
Obtain lumbar puncture	35 (73)
Obtain continuous EEG	44 (92)
Administer thiamine	8 (17)
Administer lorazepam 4 mg for one dose	39 (81)
Administer appropriate 2 nd line antiepileptic therapy	45 (94)
Administer dexamethasone	7 (15)
Administer empiric vancomycin, ceftriaxone, ampicillin, and acyclovir	11 (23)
Recognize need for intubation	43 (90)
Pre-oxygenate for intubation	19 (40)
Order CXR and confirm ETT placement	14 (29)
Administer 3 rd line treatment with anesthetic drip at proper dosing	32 (67)
Continue to bolus and titrate anesthetic agent to achieve either seizure or burst suppression	35 (73)
Recognize viral encephalitis as most likely diagnosis based on CSF results	22 (46)
Recognize non-convulsive seizures on EEG without assistance	33 (69)

Results

Figure 1. Sum Score of Critical Actions by Level of Training



- There was a significant effect of training level on critical action sum score (novice mean score [standard deviation (SD)] = 11.3 (2.1) vs. intermediate mean score = 13.9 (2.8) vs. advanced mean score = 17.9 (3.4), $p < .001$).
- Sum scores were positively correlated with multiple choice pre-test scores, $r = .448$ $p < .01$, and self-rated experience with status epilepticus, $r = .358$, $p < .05$.

Discussion

- Trainees frequently fail to diagnose and treat HSV encephalitis despite its textbook presentation.
- Trainees most often focus on seizure management without further investigation and treatment of underlying etiology of seizures.
- Most trainees are proficient in the initial management of status epilepticus, but fewer adequately manage refractory status epilepticus.
- Our findings warrant further study to understand why classic cases escape trainee diagnosis.