

Assessment of Trainees' Performance during Acute Ischemic Stroke Simulation

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Introduction

- Eligible patients often fail to receive treatment with intravenous tissue plasminogen activator (tPA) or endovascular therapy.
- Multidisciplinary acute stroke teams improve acute ischemic stroke management but can hinder trainees' education.
- This may contribute to poorer outcomes in community hospitals upon graduation.
- Our goal was to assess individual trainee performance during an acute stroke simulation independent from the stroke team.

Methods

- Primary outcome measure was the sum score of critical action items
- Secondary analyses to support validity of primary outcome:
 - Comparison of *novice* (sub-interns, neurosurgery interns, medical critical care fellows, surgical critical care fellows), *intermediate* (neurology residents and emergency medicine critical care fellows), and *expert* trainees' (neurocritical fellows, stroke fellows, attending physicians) performance and comparison of trainees certified in ENLS vs. trainees without ENLS certification using ANOVA and t-tests
 - Correlation of trainees' performance on written, multiple-choice test with simulation performance using Pearson correlation

Results

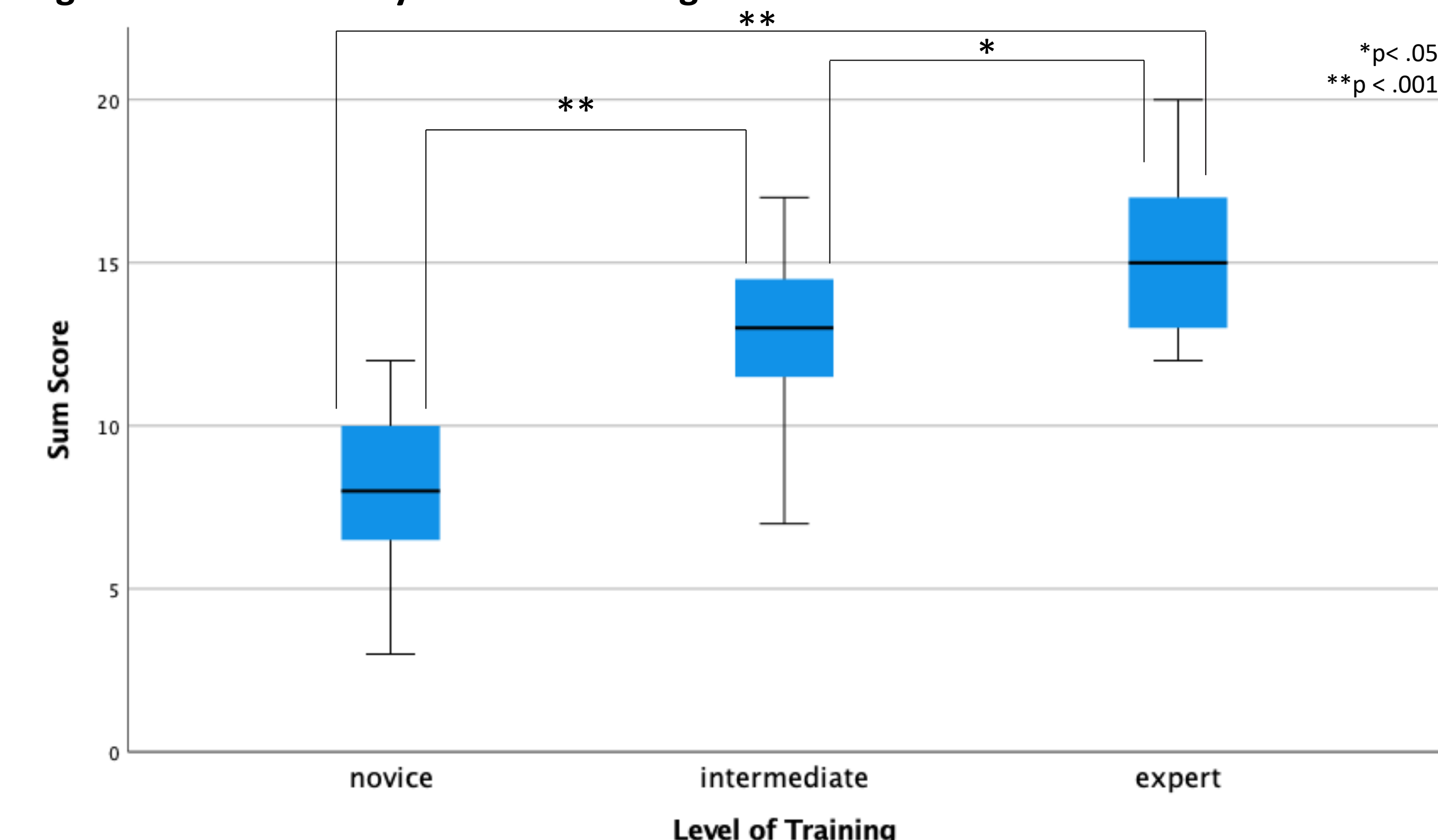
- Mean sum of critical actions performed: 11.7 (SD 3.8)

Table 2. Critical Actions Performed by Participants – no. (%)

Obtain last known normal time	35 (81)
Perform NIHSS completely	6 (14)
Localize lesion to left MCA territory	37 (86)
Ask to review head CT	43 (100)
r/o contra-indications to tPA	27 (63)
Determine ASPECTS score	2 (5)
Lower BP < 185/110	28 (65)
Administer IV tPA dose correctly	24 (56)
Alert neuro-interventional team to large vessel occlusion	14 (40)
Order CTA at appropriate time	25 (58)
Re-examine after deterioration	8 (19)
Stop tPA once worsening noticed	23 (53)
STAT labs including coags/fibrinogen	11 (26)
Repeat head CT	39 (91)
Reverse tPA with cryoprecipitate +/- fibrinolytic	16 (37)
Consult neurosurgery	39 (91)
Pre-oxygenate for intubation	16 (37)
Intubate at appropriate time	36 (84)
Verify endotracheal tube placement by EtCO ₂ , bilateral chest rise, auscultation	12 (28)
Head of bed elevation	21 (49)
Appropriate hyperventilation	12 (28)
Hyperosmolar therapy	24 (56)

Results

Figure 1. Sum Score by Level of Training



- There was significant effect of training level on critical action sum score (novice mean score [standard deviation (SD)] = 8.3 (2.7) vs. intermediate mean score (SD) = 12.7 (2.8) vs. expert mean score (SD) 15.6 (2.9), $p < .001$).
- Participants certified in ENLS (M = 14.1, SD = 3.1) compared to trainees not certified in ENLS (M = 10.2, SD = 3.6) demonstrated significantly better sum scores of critical action items, $t(41) = 1.4$, $p = .001$.
- Sum scores were positively correlated with multiple choice pre-test scores, $r = .60$, $p < .01$ and self-reported acute ischemic stroke experience, $r = .46$, $p < 0.05$
- A high degree of reliability was found between the two raters, average ICC .922 with a 95% CI .836 to .961, $p < .001$

Methods

- Prospective, observational, single-center simulation-based study, trainees ranging from sub-interns to attending physicians.
- Simulation case: patient with acute ischemic stroke followed by tPA-related hemorrhagic conversion leading to cerebral herniation.
- Critical actions were developed by a modified Delphi approach and based on the Neurocritical Care Society's Emergency Neurological Life Support (ENLS) protocols and the American Heart Association (AHA) Guidelines.

Results

Table 1. Characteristics of Participants. N = 43

Sex – no. (%)	Female	20 (47)
Age – years (SD)		31.9 (4.6)
Level of training – no. (%)	Neurology sub-interns	6 (14)
	Neurosurgery interns	2 (5)
	PGY-2 neurology residents	11 (26)
	PGY-3 neurology residents	4 (9)
	PGY-4 neurology residents	2 (5)
	NCC/stroke fellows	7 (16)
	Other CC fellows	9 (21)
	Attending physician	2 (5)
ENLS certification – no. (%)		17 (40)
Experience in medical simulation – no. (%)		39 (91)

Categorical data shown as n (%), continuous data as mean (SD).

Discussion

- Nonadherence to acute ischemic stroke guidelines and errors in the treatment of hemorrhagic transformation after tPA are frequent.
- Additional training is necessary to prepare trainees for independent practice at community hospitals that lack multidisciplinary stroke teams.
- High-fidelity simulation holds promise as an assessment tool for acute stroke management performance.