



# Assessment of Efficacy of Emergency Medical Professionals in Management of Status Epilepticus Using High Fidelity Simulation

Dr. Parag Rishipathak<sup>1\*</sup>, Dr. Monesh Bhandari<sup>2</sup> and Dr. Anand Hinduja<sup>3</sup>

<sup>1\*</sup> Professor and Director, Symbiosis Centre for Health Skills, Symbiosis International (Deemed University), Pune, India.

<sup>2</sup> Medical Officer (Academics), Symbiosis Centre for Health Skills, Symbiosis International (Deemed University), Pune, India.

<sup>3</sup> Adjunct Faculty, Symbiosis Centre for Health Skills, Symbiosis International (Deemed University), Pune, India.

## Corresponding Author Details\*

Dr. Parag Rishipathak<sup>1\*</sup>

Professor and Director, Symbiosis Centre for Health Skills, Symbiosis International (Deemed University), Pune, India.

9822040971

[director\\_schs@siu.edu.in](mailto:director_schs@siu.edu.in)

## ABSTRACT

### Introduction:

A 2006 study, conducted by the World Health Organization (WHO), reported that out of 50 million people affected with epilepsy worldwide, 80% reside in developing countries, making it a significant public health challenge in countries like India. A diagnose of epilepsy is arrived at when a patient experiences recurrent (two or more) epileptic seizures, unprovoked by any immediate identified cause.

Improper handling of epileptic patients in the Emergency Room (ER) by Resident doctors, nurses, Emergency Medical Professionals (EMP's) can result into dangerous complications. In order to avoid such untoward consequences, simulation training can be a useful tool to identify and manage the status epilepticus patients and train the healthcare professionals.

**Objective:**

To assess the efficiency of Emergency Medical Professionals in management of status epilepticus using high-fidelity simulation.

**Methodology:**

The study was conducted amongst 150 Emergency Medical Professionals (EMP's). Emergency Neurological Life Support (ENLS) course designed by Neurocritical care Society (NCS), includes algorithms for management of epilepsy alongwith other neurological disorders. The 150 EMPs were divided into 15 groups of 10 participants each and standard epilepsy scenarios were used for this study. Each group performed according to the scenario in order to control and manage the simulated epileptic patient.

**Conclusion:**

EMP's require training and re-inforcement of the management protocol of SE to ensure that all critical actions are performed during a real patient emergency. Participant action during the simulation assessment can predict their conduct when faced with a real situation of SE.

**Key words:** Status epilepticus, high fidelity simulation, emergency medical professionals

---

**Introduction:**

A 2006 study, conducted by the World Health Organization (WHO), reported that out of 50 million people affected with epilepsy worldwide, 80% reside in developing countries, making it a significant public health challenge in countries like India.<sup>1</sup> Epilepsy is a neurological disorder characterized by an enduring predisposition to generate seizures and its neurobiological, cognitive, psychological, and social consequences. A diagnose of epilepsy is arrived at when a patient experiences recurrent (two or more) epileptic seizures, unprovoked by any immediate identified cause.<sup>2</sup>

Markus Leitinger *et al*, in a study published in 2020 emphasized upon the incidence and mortality rate due to epilepsy in developing countries. The study provided comprehensive details on census-based population statistics and reference populations and various study designs and characteristics essential for direct comparisons between epilepsy. Their findings conclude that application gap of clinical knowledge and EEG, diagnostic time criterion of ten or even more minutes for all Status Epilepticus (SE) forms, affected the patient outcomes in emergency department.<sup>3</sup>

A study in 2019, has reported that a large proportion of people with epilepsy in resource-poor countries never received appropriate treatment for their condition, and many, although diagnosed and initiated on treatment, soon discontinued treatment. The high cost of treatment, a lack of availability of antiepileptic drugs, and superstitious and cultural beliefs contribute to a significant epilepsy treatment gap.<sup>4</sup> There have been various governmental and non-governmental programmes to raise awareness regarding epilepsy all over India. In a study in 2015, D. C. Jain *et al* enumerated in detail the objectives and strategies to implement national epilepsy control program.<sup>5</sup> A study in 2021 by Shweta Sarma *et al* emphasizes on the measures to be taken during and after the treatment to improve the quality of life among the epileptic patients.<sup>6</sup>

Dr. Luc Valton *et al* in a paper published in 2010, reinforces the adherence to protocol as a significant factor in management of status epilepticus which further improves patient recovery and significantly decreases the refractory status, complication rate and duration in the hospital.<sup>7</sup>

Improper handling of epileptic patients in the Emergency Room (ER) by resident doctors, nurses, Emergency Medical Professionals (EMP's) can result into dangerous complications like fractures, dislocations, airway compromise, aspiration etc. in the patient.<sup>8</sup> In order to avoid such untoward consequences, simulation training can be a useful tool to identify and manage the status epilepticus patients and train the healthcare professionals.<sup>9</sup>

Raoul Sutter *et al* in a prospective study on emergency management of status epilepticus using high-fidelity simulation points out the urgent need of guideline-based clinical training in order to maintain and improve the quality of SE management.<sup>10</sup> A study conducted in University of Missouri by Gulshan Uppal *et al*, 2012 highlights that the medical students prefer High Fidelity Simulation (HFS) training over didactic classroom teaching.<sup>11</sup> Studies reveal that HFS training has been much more beneficial and appreciated by the participants and enhance their cognitive skills and critical decision making abilities.<sup>12,13</sup>

A 2015 study by Barbara A Dworetzky *et al*, on training of Epilepsy Monitoring Units (EMU) using high-fidelity simulation recommends a robust training curriculum including safe-practice checklist to sustainably improve the performance of EMU professionals.<sup>14</sup> In 2014, a study conducted among caregivers at Qatar, utilized simulation based intervention to assess and evaluate the management of seizures in children. The study emphasize that simulation based intervention improve the confidence and competence of healthcare providers.<sup>15</sup>

The present study is an attempt to assess the efficacy of EMP's in the management of status epilepticus using post-simulation training.

**Objective:**

To assess the efficiency of Emergency Medical Professionals in management of status epilepticus using high-fidelity simulation

**Methodology:**

The study was conducted amongst 150 Emergency Medical Professionals (EMP's) including emergency care residents, casualty residents, healthcare professionals working in hospitals and ambulances) in and around Pune City. Emergency Neurological Life Support (ENLS) course designed by Neurocritical care Society (NCS) includes algorithms for management of epilepsy alongwith other neurological disorders. ENLS course was utilized to impart knowledge on the management of SE.<sup>16</sup> The epilepsy management algorithm was discussed and explained to the participants in detail for 4

hours and rigorous practice sessions were conducted in order to perform the management protocol efficiently for next 4 hours.

A high fidelity manikin was utilized to create 15 unique clinical simulation scenarios of epilepsy. The 150 EMPs were divided into 15 groups of 10 participants each. The participants no previous experience of performing a case on a high fidelity simulation manikin. The participants were oriented to HFS prior to assessment.

Standard epilepsy scenarios formulated by Jonathan Lee *et al* in 2017 were used for this study.<sup>17</sup> Each group included 10 participants and performed according to the scenario in order to control and manage the simulated epileptic patient. All the participants had never undergone any simulation training prior this session. The participant's performance was based on completion of the critical actions as per the ENLS algorithms.

The critical actions include (i) primary actions viz., recognizing that patient is in status epilepticus, maintaining airway (ultimately resulting in intubation), breathing, and circulation (ii) secondary actions viz., IV Administration, oxygen, and monitor application and (iii) advanced actions viz., administering first line anti-epileptics (benzodiazepines), ordering appropriate lab investigations, imaging and (iv) administering second line anti-epileptics (levetiracetam, fosphenytoin, or valproic acid) . The maximum score that could be obtained on the critical action checklist was 10. The participants were asked to perform the simulation scenarios prior to the training session and 2 weeks after the training session.

Informed consent was taken from the participants. Each simulation session lasted for approximately 10 minutes followed by structured debriefing lasting for 20 minutes. The shortcomings of the participants were discussed during debrief.

After 2-week period of the training session the participants underwent post intervention simulation session structured in the same format as the pre-intervention session. The mean score of all the participating groups was calculated before and after the

intervention. The pre-intervention vs post-intervention data was tabulated and analyzed using the SPSS version 20.0 software.

**Result:**

The study focuses on the interventions to be taken during management of epilepsy.

The scores have been tabulated below:

**Table 1: Demographic Data**

**Table 2: Mean Score on Critical Actions Checklist**

<b>Age group:</b>	<b>Participants:</b>		
	<b>(in percentage)</b>	<b>(in no.s)</b>	
Less than 25	34.66 %	52	
25 to 30	53.34 %	80	
Above 30 years	12 %	18	
<b>Sex:</b>			
Male	32 %	48	
Female	68 %	102	
<b>Work Experience :</b>			
Upto 1 year	56 %	84	
More than 1 Year	44 %	66	
	<b>Mean Score obtained</b>	<b>Std. Dev.</b>	<b>t- test</b>
<b>Pre intervention</b>	5.2	1.55	0.008*
<b>Post intervention</b>	8.5	2.57	

\*Indicates significance

### **Discussion:**

Every EMP is expected to perform the critical actions in a case of SE in order to achieve the best clinical outcome. Simulation offers a safe environment to perform realistic clinical scenarios. It is a robust tool to perform assessment of participants. In the present study, most participants performed the Primary and Secondary critical actions accurately at baseline. EMP's performed airway management – giving rescue breaths

using bag valve mask ventilation, inserting advanced airway, attaching ventilator and taking an IV access to administer the drugs diligently. In the advanced actions, the participants missed some critical actions which were corrected after the training session. The difference in competence at baseline could be attributed to the fact, primary and secondary critical actions are common to all emergencies while advanced actions are specific to status epilepticus. The poor performance at baseline could be due to less training or exposure to SE cases at the workplace. The improved scores obtained during the post intervention simulation session are encouraging as it indicates that the training session was impactful. The short term knowledge retention was significant as indicated by the high scores obtained 2 weeks after the training session.

### **Conclusion:**

EMP's require training and re-inforcement of the management protocol of SE to ensure that all critical actions are performed during a real patient emergency. Participant action during the simulation assessment can predict their conduct when faced with a real situation of SE.

**CONFLICT OF INTEREST:** Nil

**SOURCE OF FUNDING:** Self

**ETHICAL CLEARANCE:** Independent Ethics Committee, SIU

### **References:**

1. Geneva: World Health Organization; 2006. WHO. Neurological Disorders: Public Health Challenges. [[Google Scholar](#)]
2. Hauser WA, Kurland LT. The epidemiology of epilepsy in Rochester, Minnesota, 1935 through 1967. *Epilepsia*. 1975;16:1–66. [[PubMed](#)] [[Google Scholar](#)]
3. Brophy GM, Bell R, Claassen J, Alldredge B, Bleck TP, Glauser T, Laroche SM, Riviello JJ Jr, Shutter L, Sperling MR, Treiman DM, Vespa PM; Neurocritical Care Society Status Epilepticus Guideline Writing Committee. Guidelines for the evaluation



and management of status epilepticus. *Neurocrit Care*. 2012 Aug;17(1):3-23. doi: 10.1007/s12028-012-9695-z. PMID: 22528274.

4. Radhakrishnan K. Challenges in the management of epilepsy in resource-poor countries. *Nat Rev Neurol*. 2009 Jun;5(6):323-30. doi: 10.1038/nrneurol.2009.53. Epub 2009 May 19. PMID: 19455183.

5. Tripathi M, Jain DC, Devi MG, Jain S, Saxena V, Chandra PS, Radhakrishnan K, Behari M, Gupta M, Puri V, Mehndiratta MM, Bala K, Anand KS, Rawat S, Shah PU, Gulati S, Johri S, Nadkarni VV, Chandra PS, Bachani D. Need for a national epilepsy control program. *Ann Indian Acad Neurol*. 2012 Apr;15(2):89-93. doi: 10.4103/0972-2327.94989. PMID: 22566719; PMCID: PMC3345606.

6. Sharma S, Kumar A, Rana N, Panda S. Quality of Life among Patients with Epilepsy: Institutional-based Survey, Western Rajasthan, India. *Ann Indian Acad Neurol*. 2022 Mar-Apr;25(2):285-289. doi: 10.4103/aian.aian\_489\_21. Epub 2021 Oct 7. PMID: 35693654; PMCID: PMC9175427.

7. Aranda A, Foucart G, Ducassé JL, Grolleau S, McGonigal A, Valton L. Generalized convulsive status epilepticus management in adults: a cohort study with evaluation of professional practice. *Epilepsia*. 2010 Oct;51(10):2159-67. doi: 10.1111/j.1528-1167.2010.02688.x. PMID: 20738380.

8. Hawkes, M.A., Hocker, S.E. Systemic Complications Following Status Epilepticus. *Curr Neurol Neurosci Rep* 18, 7 (2018). <https://doi.org/10.1007/s11910-018-0815-9>

9. Sigalet E, Cheng A, Donnon T, Koot D, Chatfield J, Robinson T, Catena H, Grant VJ. A simulation-based intervention teaching seizure management to caregivers: A randomized controlled pilot study. *Paediatr Child Health*. 2014 Aug;19(7):373-8. doi: 10.1093/pch/19.7.373. PMID: 25332677; PMCID: PMC4173907.

10. Sutter R, Tisljar K, Opić P, De Marchis GM, Bassetti S, Bingisser R, Hunziker S, Marsch S. Emergency management of status epilepticus in a high-fidelity simulation: A

prospective study. *Neurology*. 2019 Nov 5;93(19):838-848. doi: 10.1212/WNL.00000000000008461. Epub 2019 Oct 8. PMID: 31594860.

**11.** The Use of Hi-Fidelity Mannequin for Status Epilepticus Simulation to Enhance Medical Student's Performance (P04.252) Gulshan Uppal, Bala Nimmana, Sean Lanigar, David Lardizabal, Pradeep Sahota *Neurology* Feb 2013, 80 (7 Supplement) P04.252;.

**12.** Malakooti MR, McBride ME, Mobley B, Goldstein JL, Adler MD, McGaghie WC. Mastery of Status Epilepticus Management via Simulation-Based Learning for Pediatrics Residents. *J Grad Med Educ*. 2015 Jun;7(2):181-6. doi: 10.4300/JGME-D-14-00516.1. PMID: 26221431; PMCID: PMC4512786.

**13.** Teran F, Harper-Kirksey K, Jagoda A. Clinical decision making in seizures and status epilepticus. *Emerg Med Pract*. 2015 Jan;17(1):1-24; quiz 24-5. PMID: 25902572.

**14.** Dworetzky BA, Peyre S, Bubrick EJ, Milligan TA, Yule SJ, Doucette H, Pozner CN. Interprofessional simulation to improve safety in the epilepsy monitoring unit. *Epilepsy Behav*. 2015 Apr;45:229-33. doi: 10.1016/j.yebeh.2015.01.018. Epub 2015 Mar 23. PMID: 25812939.

**15.** Sigalet E, Cheng A, Donnon T, Koot D, Chatfield J, Robinson T, Catena H, Grant VJ. A simulation-based intervention teaching seizure management to caregivers: A randomized controlled pilot study. *Paediatr Child Health*. 2014 Aug;19(7):373-8. doi: 10.1093/pch/19.7.373. PMID: 25332677; PMCID: PMC4173907.

**16.** <https://enls.neurocriticalcare.org/protocols>

**17.** Lee J et al Status Epilepticus, *JETem* 2017.2(2): S1-21 doi:10.21980/J8RC7V