

CG004 Status Epilepticus in Adults and Children

1. Key Recommendations for operational use				
1	Initial	<ul style="list-style-type: none"> Apply high flow oxygen and then titrate to SpO₂ 94-98%. Apply basic monitoring: SpO₂, NIBP, ECG. Perform standard ABC management as required. Consider buccal or intranasal therapy. Site IV or IO access. 		
2	Differential	<ul style="list-style-type: none"> Consider eclampsia - use CG029 Obstetric Emergencies. In adults, be aware that psychogenic non-epileptic seizures (PNES) can present similarly. 		
3	Individual plan	<ul style="list-style-type: none"> If applicable, follow the patient specific anticonvulsant plan. 		
4	Benzodiazepines	<ul style="list-style-type: none"> SEIZURES >5 MINUTES, give a benzodiazepine: <ul style="list-style-type: none"> drug choice depends on drug availability and IV/IO access, in order of preference: 		
			Adults	Children
		- Midazolam BUCCAL / INTRANASAL / INTRAMUSCULAR	10mg 5mg elderly or <50kg	0.3mg/kg 3-11 months: 2.5mg 1-4 years: 5mg 5-9 years: 7.5mg 10-17 years: 10mg
		- Lorazepam IV / IO	up to 4mg (2mg then 2mg after 2-3 min)	0.1mg/kg (max 4mg)
		- Diazepam	10mg IV or PR 5mg elderly or <50kg	0.5mg/kg PR only (max 20mg) 1mth - 1year: 5mg 2-11 years: 5-10mg 12-17years: 10-20mg
		<ul style="list-style-type: none"> Repeat once after 5 to 10 minutes if no response. Consider a third dose if there is a delay to hospital and no other anti-convulsant is available. 		
5	Glucose	<ul style="list-style-type: none"> Check blood glucose. Treat hypoglycaemia if blood glucose < 4mmol/l. 		
			Adults	Children
		• 10% glucose IV / IO	250ml	2 ml/kg

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6	Thiamine	<ul style="list-style-type: none"> In adults with a suggestion of malnutrition or alcohol misuse, give 2 pairs of IV Pabrinex in 100ml 0.9% saline over 30 mins. 		
7	Anti-convulsant drugs	<ul style="list-style-type: none"> If applicable and administration is feasible, give the usual dose of the usual anticonvulsant. SEIZURES >30 MINUTES, administer an anticonvulsant drug (AED): <ul style="list-style-type: none"> use a different agent to any that the patient is already taking. drug choice also depends on its availability; levetiracetam is easiest to administer. 		
			Adults	Children
		- IV / IO Levetiracetam (Keppra)	60mg/kg over 15mins, (max) 4.5g	40mg/kg over 5mins (max 3g)
		- IV / IO Phenytoin (CG011 Drug Infusions), with ECG monitor.	18mg/kg at a rate less or equal to 50 mg/min, (max 1.8g)	20mg/kg over 20min (max 2g)
		- IV / IO Phenobarbital	Not recommended	20mg/kg over 20min (max 1g)
	- IV Valproate Avoid in pregnancy / child bearing age	25 mg/kg over 15 mins, (max 2.5g)		
8	General anaesthesia	<ul style="list-style-type: none"> If seizures continue, and within 60 minutes, induce anaesthesia. Midazolam, thiopentone, propofol or ketamine are suitable induction agents. Propofol or midazolam are suitable maintenance infusions. Use neuroprotective physiological strategies. 		
9	Further anticonvulsants	<ul style="list-style-type: none"> Consider giving a second anticonvulsant if there is a delay to inducing anaesthesia. 		
10	Investigations as feasible	<ul style="list-style-type: none"> Measure temperature and actively treat pyrexia. Chest X-ray - assess for signs of aspiration. Arterial blood gas. Check electrolytes for sodium and potassium. <ul style="list-style-type: none"> consider severe hyponatraemia as a cause of seizures. consider 3% hypertonic saline 3ml/kg (or 150ml in adults) if seizures are due to hyponatraemia. consider hyperkalemia secondary to rhabdomyolysis. Consider CT brain. 		
11	Consider	<ul style="list-style-type: none"> Potential for CNS infection and need for antibiotic therapy. Requirement for EEG as part of triage decision. Possibility of non-accidental injury in infants. 		

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2. Document History				
Reference Number	CG004			
Version	2			
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	Medic 1		X	
	Referring centres via service websites		✓	
	Rural GPs Association of Scotland		✓	
	SAS	Specialist Services Desk	X	
			JRCALC+ App	✓
	ScotSTAR	Air Ambulance		✓
		EMRS North		✓
		EMRS West		✓
		Paediatric		✓
Neonatal		X		
Tayside Trauma Team		X		



3. Scope and purpose

- Overall objectives:

Status epilepticus carries considerable morbidity and mortality. The aim of this guideline is to summarise an incremental management plan to adults and children with seizures lasting >5 minutes that can be applied to a range of healthcare settings, mindful of variable resources between these facilities.

- Statement of intent:

This guideline is not intended to be construed or to serve as a standard of care. Adherence to guideline recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgement must be made by the appropriate healthcare professional(s) responsible for clinical decisions regarding a particular clinical procedure or treatment plan.

- Feedback:

Comments on this guideline can be sent to: sas.cpg@nhs.scot

- Equality Impact Assessment:

Applied to the ScotSTAR Clinical Standards group processes.

- Guideline process endorsed by the Scottish Trauma Network Prehospital, Transfer and Retrieval group.



4. Explanatory Statements				
4.1 Initial management			Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> Apply high flow oxygen and then titrate to SpO₂ 94-98%. Apply basic monitoring: SpO₂, NIBP, ECG. Perform standard ABC management as required. 			Strong	Guidelines [1,2,3,4]
<ul style="list-style-type: none"> Consider buccal or intranasal therapy. <p>This route may be needed for initial control of seizures when responding alone.</p>			Conditional	Guideline [2]
<ul style="list-style-type: none"> Site IV or IO access. 			Strong	Guidelines [1,2,3,4]
4.2 Differential				
<ul style="list-style-type: none"> Consider Eclampsia - use CG029 Obstetric Emergencies. In adults, be aware that psychogenic non-epileptic seizures (PNES) can present similarly. 			Conditional	Guidelines [2,5]
4.3 Individual Plan				
<ul style="list-style-type: none"> If applicable, follow the patient specific anticonvulsant plan. 			Strong	Guidelines [2,3,4]
4.4 Benzodiazepines				
<ul style="list-style-type: none"> SEIZURES >5 MINUTES, give a benzodiazepine: <ul style="list-style-type: none"> drug choice depends on drug availability and IV/IO access, in order of preference: 			Strong	Guidelines [1,2,3,4]
	Adults	Children		
- Midazolam BUCCAL / INTRANASAL or INTRAMUSCULAR	10mg 5mg elderly or <50kg	0.3-0.5mg/kg		Guidelines [1,2,3,4,5]
- Lorazepam IV / IO	up to 4mg (2mg then 2mg after 2-3 min)	0.1mg/kg		Guidelines [1,2,3,4,5]
- Diazepam	10mg IV or PR 5mg elderly or <50kg	0.5mg/kg PR only		Guidelines [1,2,3,4,5]
<ul style="list-style-type: none"> Repeat once after 5 to 10 minutes if no response. <p>Published guidance varies in the recommended interval between the first and second dose of benzodiazepines. Recommendations are an interval of 5 [4], 5 to 10 minutes [2], 10 minutes [1,5,6], 10 to 15 minutes [3].</p>			Strong	Guidelines [1,2,3,4,5,6]
The IV preparation of midazolam can be administered by buccal or intranasal routes; this is unlicensed.			GPP	

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			Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> Consider a third dose if there is a delay to hospital and no other anti-convulsant is available. <p>Specific recommendation from JRCALC if the time to hospital is >25mins from the second dose of benzodiazepine.</p>			Conditional	Guideline [5]
4.5 Glucose				
<ul style="list-style-type: none"> Check blood glucose. Treat hypoglycaemia if blood glucose <4 mmol/l. 			Strong	Guidelines [1,2,3,4,5]
	Adults	Children		
<ul style="list-style-type: none"> 10% IV glucose 	250ml	2 ml/kg		
4.6 Thiamine				
<ul style="list-style-type: none"> In adults with a suggestion of malnutrition or alcohol misuse, give 2 pairs of IV Pabrinex in 100ml saline over 30 mins. 			Strong	Guideline [1]
4.7 Anticonvulsant drugs				
<ul style="list-style-type: none"> If applicable and administration is feasible, give the usual dose of the usual anticonvulsant. 			Strong	Guidelines [1,2]
<ul style="list-style-type: none"> SEIZURES >30 MINUTES, administer an anticonvulsant drug (AED): <ul style="list-style-type: none"> use a different agent to any that the patient is already taking. drug choice also depends on its availability; levetiracetam is easiest to administer. 			Strong	Guidelines [1,2,3]
	Adults	Children		
<ul style="list-style-type: none"> IV / IO Levetiracetam (Keppra) 	60mg/kg over 15mins, (max) 4.5g	40mg/kg over 5mins (max 3g)		Guidelines [2,3,4] 1++ [7,8,9]
<ul style="list-style-type: none"> IV / IO Phenytoin (CG011 Drug Infusions), with ECG monitor. 	18mg/kg at a rate less or equal to 50 mg/min, (max 1.8g)	20mg/kg over 20min (max 2g)		Guidelines [1,2,3,4]
<ul style="list-style-type: none"> IV / IO Phenobarbital 	Not recommended	20mg/kg over 20min (max 1g)		Guideline [4]
<ul style="list-style-type: none"> IV Valproate <p>Avoid in pregnancy / child bearing age</p>	25 mg/kg over 15 mins, (max 2.5g)			Guideline [1,2]

	Authors' recommendation	Level [Reference]
Two clinical trials [7,8] compared levetiracetam 40mg/kg and phenytoin 20mg/kg in an entirely paediatric population and showed no difference in efficacy or incidence of adverse events. A further recent trial [9] in a population of adults and children compared levetiracetam 60mg/kg, fosphenytoin 20mg/kg phenytoin equivalent and valproate 40mg/kg. There was no significant difference in efficacy or incidence of adverse events. NICE [2] suggest levetiracetam may be quicker to administer and have fewer side effects. APLS [4] recommend 40mg/kg levetiracetam as the first line anticonvulsant in children due to ease of administration and also suggest it is given over 5 minutes.		1++ [7,8,9] Guidelines [2,4]
Avoid valproate in pregnancy or women of child bearing age. Valproate is not included as a recommendation from RC(UK) paediatric guideline [3] or APLS [4].	Conditional	Guidelines [1,10]
The current RC(UK) and APLS guideline recommends phenobarbital as a second line anticonvulsant.		Guidelines [3,4]
4.8 General anaesthesia		
<ul style="list-style-type: none"> • <i>If seizures continue, and within 60 minutes, induce anaesthesia.</i> • <i>Midazolam, thiopentone or propofol or ketamine are suitable induction agents.</i> • <i>Propofol or midazolam are suitable maintenance infusions.</i> 	Strong	Guidelines [1,2,3,4]
<ul style="list-style-type: none"> • <i>Neuroprotective physiological strategies.</i> <p>Standard neuroprotective targets should be achieved, similar to the management of a head injured patient: normocarbica, MAP>70mmHg, 15° head up tilt, normoglycemia.</p>	GPP	
4.9 Further anticonvulsants		
<ul style="list-style-type: none"> • <i>Consider giving a second anticonvulsant if there is a delay to inducing anaesthesia.</i> <p>This is a specific recommendation from APLS [4] based on data from the ConSEPT trial [7] but with the acknowledgement that the risk of delaying induction of anaesthesia is unquantified. It is mentioned as an option in the RC(UK) paediatric guideline [3] and in the NICE guideline [2].</p>	Conditional	Guidelines [2,3,4]

4.10 Investigations as locally feasible	Authors' recommendation	Level [Reference]
<ul style="list-style-type: none"> • <i>Measure temperature and actively treat pyrexia</i> <p>Normothermia is a key neuroprotective target mechanism. Pyrexia may result from prolonged seizures or indicate infection or drug toxicities as an underlying cause.</p>	Conditional	Guideline [3]
<ul style="list-style-type: none"> • <i>Chest X Ray - assess for signs of aspiration</i> 	Conditional	Guideline [1]
<ul style="list-style-type: none"> • <i>Arterial blood gas</i> <p>For both gas exchange and appraisal of acidosis</p>	Conditional	Guideline [1]
<ul style="list-style-type: none"> • <i>Check electrolytes for sodium and potassium.</i> <ul style="list-style-type: none"> - <i>consider severe hyponatraemia as a cause of seizures.</i> - <i>consider 3% hypertonic saline 3ml/kg (or 150ml in adults) if seizures are due to hyponatraemia.</i> 	Conditional	Guidelines [3,11]
<ul style="list-style-type: none"> - <i>consider hyperkalemia secondary to rhabdomyolysis.</i> <p>Treat conventionally.</p>	GPP	
<ul style="list-style-type: none"> • <i>Consider CT brain.</i> <p>Unless a clear non-structural cause is confidently identified, a CT brain is likely to form part of the early in-hospital management and should be factored into triage decisions.</p>	GPP	
<p>4.10 Consider</p>		
<ul style="list-style-type: none"> • <i>CNS infection and antibiotic therapy.</i> <p>Meningitis and encephalitis should be considered; have a low threshold for blood cultures and empirical antibiotics if there is any suggestion of CNS infection.</p>	Conditional	Guideline [1,3]
<ul style="list-style-type: none"> • <i>Requirement for EEG as part of triage decisions</i> <p>SIGN [1] raise EEG emergency availability as a grade D recommendation. Although EEG availability is limited to major centres, factor this into triage decisions.</p>	Conditional	Guideline [1]
<ul style="list-style-type: none"> • <i>Possibility of non-accidental injury in infants.</i> 	GPP	

5. References

1. Scottish Intercollegiate Guidelines Network (SIGN). Diagnosis and management of epilepsy in adults. Edinburgh: SIGN; 2018. (SIGN publication no. 143). https://www.sign.ac.uk/media/1079/sign143_2018.pdf
2. NICE Clinical Guideline (NG217) April 2022. Epilepsies in children, young people and adults. 7 Treating status epilepticus, repeated or cluster seizures, and prolonged seizures. <https://www.nice.org.uk/guidance/ng217/chapter/7-Treating-status-epilepticus-repeated-or-cluster-seizures-and-prolonged-seizures>
3. Resuscitation Council UK Guidelines 2021. Paediatric emergency algorithms & resources. <https://www.resus.org.uk/sites/default/files/2022-03/RCUK%20Paediatric%20emergency%20algorithms%20and%20resources%20Mar%202022%20V1.pdf>
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