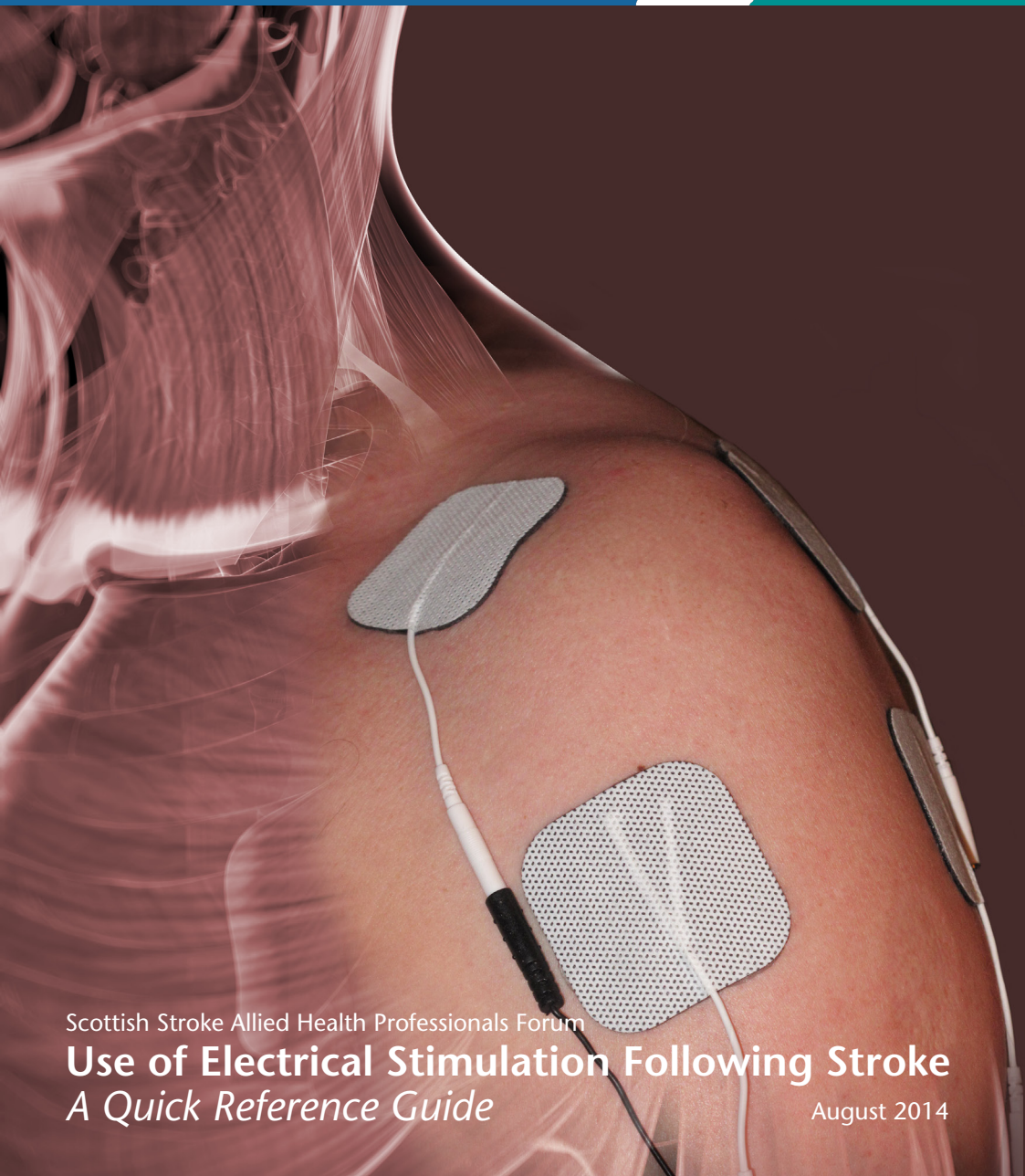
Scottish Stroke AHP Forum

Chest Heart & Stroke Scotland



Scottish Stroke Allied Health Professionals Forum

Use of Electrical Stimulation Following Stroke

A Quick Reference Guide

August 2014

Quick reference guide

There is an increasing body of evidence supporting the use of electrical stimulation (ES) for patients affected by stroke. However, the available guidance is limited and practice is varied. This quick reference guide summarises the main points of a consensus statement which was produced by the SSAHPF in collaboration with Allied Health Professionals (AHPs) from across Scotland who have an interest in stroke. The target audience for this statement are Allied Health Professionals working in stroke rehabilitation. The full consensus statement can be downloaded at www.chss.org.uk/ssahpf/ecs-statement.pdf

Table 1: Electrical Stimulation Treatment Parameters reported for Motor Recovery

ES Parameter	Description	Reported treatment parameters	Consideration
Frequency	Pulses per second (Hz)	12-35 Hz	Needs to be sufficiently high to achieve a smooth contraction but not so high as to cause fatigue or a tetanic contraction
Pulse width	Length of individual pulses (µsec)	200-400 µsec	Increasing pulse width and/or amplitude increases the area and strength of activation. So these parameters may need to be adjusted with respect to one another.
Intensity	Wave amplitude (mA)	0-100 mA	
Duration	Individual treatment time (minutes)	60 minutes	Consider patient tolerance/compliance, response, feasibility and situation.
Dosage	Number of treatments per day/week/total treatments	Daily 4 weeks	
Ramp/ramp down	Time to reach chosen treatment intensity and then return to rest after selected stimulation	No recommendation can be made 2 seconds up and down	Adjust to obtain a comfortable near normally graded movement.
Stimulation wave form	May be Monophasic (repetitive unidirectional pulse) or Biphasic (pulses with current flow in both directions) which may be Symmetrical or Asymmetrical	No recommendation can be made	These parameters may affect skin irritation and patient comfort.
On/off cycle time	Work/rest time (seconds)	10 seconds on /10 seconds off	Adjust in order to obtain balance between rest and fatigue.
Time since stroke	Acute or chronic phase	No recommendation can be made	There is a lack of differentiation within studies and further research is required.
Additional considerations	+/- EMG trigger Percutaneous/ implantable electrodes	No recommendation can be made	These additional parameters may need to be delivered in a specialist setting.

Table 2: Electrical stimulation treatment parameters reported for reduction of shoulder subluxation

ES Parameter	Description	Reported treatment parameters	Considerations
Frequency	Pulses per second (Hz)	10-60Hz	Needs to be sufficiently high to achieve a smooth contraction but not so high as to cause fatigue. Many studies aimed to produce tetanised contraction.
Pulse width	Length of individual pulses (µsec)	100-350µs	Increasing pulse width and/or amplitude increases the area and strength of activation. So these parameters may need to be adjusted with respect to one another.
Intensity	Wave amplitude (mA)	No recommendation can be made. Aim to produce painless contraction	
Duration	Individual treatment time (minutes)	5 minutes to 7 hours per session, generally 1 hour per day	Consider patient tolerance/compliance, response, feasibility and situation.
Dosage	Number of treatments per day/week/total treatments	5-7 days per week 4-6 weeks or until sufficient voluntary muscle activity/reduction of subluxation without stimulation	
Ramp/ramp down	Time to reach chosen treatment intensity and then return to rest after selected stimulation	No recommendation can be made 2-3 seconds up and down	Adjust to obtain a comfortable near normally graded movement.
Stimulation wave form	May be Monophasic (repetitive unidirectional pulse) or Biphasic (pulses with current flow in both directions) which may be Symmetrical or Asymmetrical	No recommendation can be made	These parameters may affect skin irritation and patient comfort
On/off cycle time	Work/rest time (sec)	No recommendation can be made based on evidence 10-15 second on and off common with 1:1 ratio	Adjust in order to obtain balance between rest and fatigue.
Muscles stimulated	Muscles which, if sufficiently stimulated, will attain reduction in shoulder subluxation in a hemiplegic arm	Supraspinatus +/- Posterior Deltoid +/- Middle Deltoid	Consider number of channels available to provide stimulation (2 or 4). Consider direction of subluxation
Duration since stroke	The length of time since stroke onset and therefore onset of paralysis/risk of subluxation/actual subluxation	As early as possible, ideally within 48 hours. Certainly within 2-3 weeks of stroke onset	Increasing length of time since stroke increases likelihood of developing subluxation and that this will become irreversible.

Table 3: Commonly reported contraindications, cautions and reasons to stop ES treatment.

Contraindications	Cautions
Cardiac demand pacemaker	Poor skin condition
Pregnancy, application directly over trunk	Excessive tissue swelling
Poorly controlled epilepsy	Excessive adipose tissue
Acute DVT (over site)	DVT post anticoagulation
Complete peripheral nerve lesion	Avoid stimulation over carotid sinus
Uncontrolled hyper/hypotension	Avoid stimulation over thoracic region
Neoplastic tissue	Avoid stimulation over phrenic nerve
Active infection	Peripheral vascular disease
	Implanted devices
Reasons to stop stimulation	
Patient cannot tolerate (e.g. pain, agitation)	
Electrode intolerance (skin irritation/allergy)	
Benefits outweighed by practical difficulties	

List of Requirements for an ES device for home use/self management:

1. Current ramp (at beginning and end)
2. Dual channels for stimulation
3. Easy to use
4. Inexpensive
5. Uses standard electrodes
6. Not for single person use only
7. Suitable for patients to use unsupervised
8. Easy to charge
9. Lightweight and compact
10. Easily cleaned
11. Range of frequency: 10 – 50Hz (normally 20 - 40Hz)
12. Pulse width: 100 –450μs
13. Input current: 10 – 15mA
14. Output current: 70 – 100mA
15. CE marked medical device