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Can neonatal staff site EEG leads in the correct position? A pilot study

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2
3 Under and over diagnosis of neonatal seizures is common, with 73% of suspected seizures
4 not being associated with epileptiform activity on electroencephalography (EEG) and 66% of
5 EEG detected seizures having no clinical features.(1) As a result, recent studies into
6 treatments for neonatal seizures have utilised prolonged EEG for accurate outcome
7 measurement.(2) Study design and funding is hampered by logistical and financial difficulties
8 in accessing EEG throughout the day and weekend. If neonatal staff could site EEG leads
9 and start monitoring then EEG could be started in a timely fashion with a view to, for
10 example, physiologist input within office hours. Commercial templates to aid EEG lead
11 positioning are available, using a modified neonatal EEG montage.(3)

12
13 For this pilot study, 24 participants (7 ST1-3 trainees; 6 ST4-8 trainees, 3 consultant
14 neonatologists, 3 advanced neonatal nurse practitioners and 5 staff nurses) from a neonatal
15 intensive care unit in Sheffield were recruited. Ethical approval was granted by the University
16 of Sheffield, and signed consent obtained. Participants reviewed a 10minute video
17 explaining how to site EEG leads on a resuscitation doll using a BraiNet template and EEG
18 paste. This is an elastic template with holes and colour boxes to indicate the correct location
19 for EEG leads (figure 1). A member of the neurophysiology team measured the linear
20 distance of each lead was away from the gold standard. In physiologist training, a lead within
21 5mm of the optimal site is considered satisfactory,(4) which was the standard adopted in this
22 study.

23
24 11(45.8%) participants sited all leads within 5mm of the ideal position. 9 (37.5%) sited all
25 but one lead in the correct location. The suboptimal leads varied: 2 participants T6, 2 O2,
26 and 1 each for FP2, F7, F8, T4, O1. The maximum distance away from the ideal location for
27 any of these leads was 10mm. One participant sited 2 leads incorrectly, and 2 participants
28 site 3 leads incorrectly. A final participant sited the 7 leads incorrectly, with the distances
29 from the ideal location for these leads ranging from 10-30mm. This participant adopted a

1
2
3 haphazard approach. Table one shows the frequency the EEG leads were sited within 5mm
4
5 of the correct location for each of the leads, and the median distances for each lead. Two
6
7 qualified physiologists also completed the study and sited all leads within 5mm of the
8
9 standard using the template.
10
11

12
13
14 These results show that 87.5% neonatal staff can site all EEG leads appropriately or with
15
16 only 1 or 2 leads in suboptimal position on a resuscitation doll. With adjustment to our
17
18 training package to rectify commonly made mistakes, this figure may increase. Future work
19
20 will examine whether these results are replicated in real babies, especially those who are
21
22 ventilated and whether neonatal staff can undertake the further requirements of EEG
23
24 recording such as skin preparation and impedance checking. Should this prove successful,
25
26 early EEG recording of neonates at high risk of seizures may be possible, particularly in
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28 research studies.
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Table one: Frequency each lead was sited to the optimal position, and medial (IQR) from the optimal position

Lead	% within 5mm of ideal location	Median distance from optimal position (IQR)
FP1	100%	2mm(0.75,5)
FP2	95.8%	3.5mm(1.5,5)
F7	91.7%	5mm(1.75,5)
F8	95.8%	5mm(0,5)
Cz	95.8%	0mm(0,5)
C3	95.8%	0mm(0,5)
C4	95.8%	0mm(0,5)
T3	91.7%	5mm(0,5)
T4	91.7%	2mm(0,5)
T5	91.7%	0mm(0,5)
T6	79.2%	0mm(0,5)
O1	85.5%	5mm(3,5)
O2	87.5%	5mm(0,5)

Figure 1: EEG leads attached to the resuscitation doll using the BraiNET template

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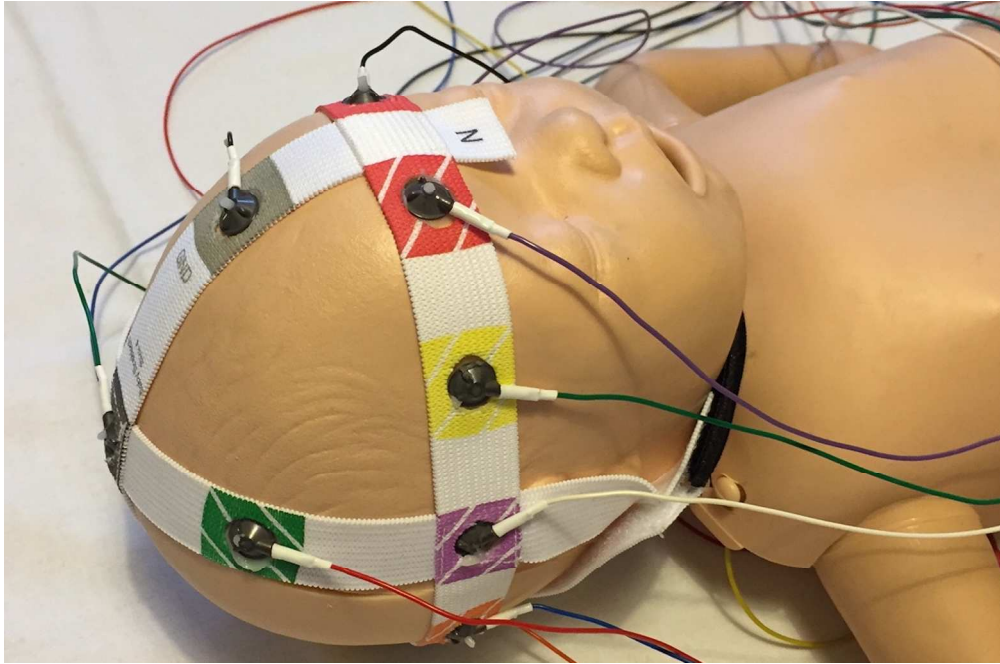


Figure 1: EEG leads attached to the resuscitation doll using the BrainNET template

412x272mm (300 x 300 DPI)