



## **ASET Position Statement**

### **Skin Safety During EEG Procedures – A Guideline to Improving Outcome**

#### **Addendum: Neonatal Continuous EEG**

The Skin Safety Guideline developed by the Skin Safety Task Force (SSTF) and approved by the ASET Board of Trustees in 2015 provides instruction in attaching surface electrodes for continuous electroencephalogram (EEG) on adults. In 2016, the task force determined additional guidelines would be beneficial for patient subgroups, such as pediatrics, neonates, and those with skin conditions. The SSTF was directed to develop addenda for the existing guideline to address these special patient groups. Due to the level of work established by the previous task force, it was determined to be advantageous to form separate subcommittees to address each issue. The SSTF began with developing addenda for neonates and patients with dermatologic skin conditions; this addendum addresses neonatal patients undergoing continuous EEG.

Neonatal EEG is defined as an EEG performed between birth and the first 4 weeks of life up to and including 44 weeks gestational age. Many of these patients are premature and may have serious or even life threatening complications. It is crucial that EEG Technologists do not cause additional injury to these patients through over preparation of the skin, failure to monitor the skin condition around and under the electrodes, or failure to respond quickly to changes in the condition of the skin.

It is important that every technologist understand and *document* the infant's age according to the following terms in order for physicians to properly evaluate the EEG of neonates.

- Gestational age (GA) – time in weeks from conception to the infant's birth
- Conceptional age (CA) – GA plus time in weeks since birth
- Premature infant – born before 38 weeks GA
- Full-term infant – born 38–40 weeks GA
- Newborn period - first 4 weeks after term
- Infantile period - between 5 and 12 weeks after term

A thorough literature review was conducted by members of the subcommittee. Over 40 scientific articles were reviewed based on the following criteria: skin breakdown, pressure ulcers (PU),

medical device related pressure ulcers (MDRPU), hospital acquired pressure ulcers (HAPU), medical adhesive related pressure ulcers (MARPU), electroencephalogram (EEG) and neonates.

### **Existing Guidelines**

Existing guidelines and assessments regarding the care of neonate patients and continuous EEG include: ACNS Guideline 13, Braden Q (only ages 3 weeks to 8 years), Glamorgan scale, Neonatal Skin Risk Assessment Scale (NSRAS), and Association of Women's Health, Obstetric and Neonatal Nurses (AWOHNN) recommendations.

The American Clinical Neurophysiological Society (ACNS) guidelines instruct technologists in setting up continuous EEG on neonatal patients, but do not address skin safety (Shellhaas et al. 2011). In 2016, the ACNS released new guidelines raising the acceptable impedance limit to 10 kOhms, which will help to reduce skin breakdown.

The Braden Q Scale is intended for pediatric patients ages 3 weeks to 8 years and is designed to identify patients at risk for skin breakdown, but not breakdown due to medical devices such as electrodes.

Glamorgan Scale is intended for patients birth to age 18 years. The Glamorgan scale is the only pediatric PU risk assessment scale addressing medical devices. It has been researched by several European groups and the sensitivity, specificity, and inter-rater reliability score higher than any other pediatric PU risk assessment scale (Baharestani and Ratliff 2007, Sterken et al. 2015, Kottner et al. 2010, August et al. 2014, Apold et al. 2012, Noonan et al. 2006).

The NSRAS and AWOHNN recommendations are mentioned briefly in literature and are not as specific or sensitive as the Braden Q or Glamorgan scale (Dolack et al. 2013, Huffines et al. 1997, Baharestani and Ratliff 2007). Other lesser known scales are being reviewed and researched constantly in hopes that an ideal scale will be uncovered. According to international research, the Glamorgan Scale is the most ideal scale in existence at this time. It is the only scale to incorporate medical devices as a risk for PUs (Anthony et al. 2010).

Common Risks for Neonates according to Murray et al. (2013), "Head is proportionately larger in infants than in children, teens and adults, becoming a primary pressure point for occipital pressure ulcers. This same article reports that medical devices, items used to secure medical devices, and the moisture that forms between those layers increase risk for pressure ulcers.

Adding to those risks, "securements that are applied circumferentially can significantly increase risk of injury" (Murray et al. 2013). Neonates often suffer from fluid imbalances which lead to swelling in tissues. This process causes devices that were fit properly initially to tighten over time and cause constriction to the tissue with prolonged exposure. EEG leads rank 6 of 18 identifiable causes for hospital-acquired pressure ulcers according to Murray et al. (2013).

“We must remember that the greatest risk factor for PUs between hospitalized neonates is the belief on the part of health professionals, that the PUs are not a problem in neonates” (Garcia-Molina and Balaguer-Lopez, 2014).

### **Instructions Specific to Neonates**

Several large groups have published in depth instructions regarding methods of assessing newborn skin to avoid pressure ulcers or breakdown and a few have addressed medical device-related PUs, but only 2 found addressed EEG specifically. A recent study published in *Acta Paediatrica* by Lloyd et al. (2015) clearly outlines a step by step method for conducting an EEG in the neonatal ICU (NICU) for preterm infants (Lloyd et al. 2015). A study by Lund et al. (2014) published in the *Newborn and Infant Nursing Reviews (NAINR)* refers to EEG specifically and the skin breakdown issues that arise with the use of medical adhesives (Lund et al. 2014). McNichol and colleagues address electrodes specifically, as well as other medical adhesive-related skin injuries (MARSI) and published a consensus statement addressing the assessment, prevention, and treatment of MARSI (McNichol et al. 2013).

Per Lloyd et al. (2015), the ideal process is as follows:

1. Pre-labelled, pre-gelled, flat, cloth like electrodes, bundled and plugged into the amplifier/breakout box.
2. Mefix or other gentle medical tape, approved for newborns, cut into 1 inch squares.
3. Gently apply skin prep to the head with light pressure using a cotton tip applicator or a gloved finger. Then remove prep gel with gauze square.
4. Apply all electrodes to one side of the head. Turn the head and apply electrodes to opposite side of head.
5. Secure with a CPAP hat or gauze cap to secure leads. Ensure that two fingers can fit easily between cap and infants head to allow for swelling.
6. When removing, take great care to slowly and gently remove tape to avoid skin tearing.

See Lloyd et al. 2015 article for photographs and details (available for free access at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5024034/>). It is imperative that steps are taken to minimize movement of the baby’s head to reduce stress to the baby. It is also of premier importance to remove all traces of prep solution and any adhesives to prevent further skin injury, such as anetoderma of prematurity and calcinosis cutis (Cheng et al. 2011). Cheng et al. (2011) also suggest that only gold disposable electrodes be used for neonates as this helps to prevent burns in the isolettes.

### **Future of Continuous EEG in Neonates**

Many researchers are developing caps and electrodes to alleviate prepping of multiple sites and to avoid gels and pastes on newborns. Their delicate, still-developing skin requires contact with

as few substances as possible until it is fully developed. The newborn skin can absorb chemicals easily and suddenly become toxic to these chemicals resulting in permanent scarring or infection. Fridman et al. (2016), Löfthede et al. (2012) and Mullen et al. (2015) are only a few of the many researchers striving to improve the lives of newborns through improving products we use every day.

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