

## THE CURRENT DEBATE

### THE CASE FOR DISPOSABLE EEG ELECTRODES<sup>1</sup>

Caroline Finnegan

Service Manager

Department of Clinical Neurophysiology

The Walton Centre for Neurology and Neurosurgery NHS Trust

Lower Lane, Liverpool, L9 7LJ

caroline.finnegan@thewaltoncentre.nhs.uk

#### Abstract

Modern day healthcare has resulted in the ability to treat and diagnose illnesses that previously would have been incurable. Yet one of the consequences of medical advancement is the increasing risk of healthcare acquired infection, which is now ranked as a major killer of patients worldwide, and not just restricted to the UK. In recent years the social and economic impact has become more widely understood. The financial impact of healthcare acquired infection is estimated to be approximately £1 billion per annum. Within Neurophysiology, disposable EEG electrodes are not commonly used. All patients, however, can harbour infection, and the infectious status of patients is not always known prior to the investigation being performed. In addition, reusable electrodes are used in many environments both for in-patients and out-patients, and the risk associated with this practice is discussed. This article examines the risk associated with the decontamination process for reusable EEG electrodes, and the case for using disposable EEG electrodes for all EEG and EP investigations. The article provides an overview of a successful multi-disciplinary business case for disposable electrodes and its impact within one Neurophysiology service. Guidance on how the business case can be structured is provided, together with key information contained within it. In addition, the article examines the many Department of Health documents and initiatives that support the use of disposable EEG electrodes, and how these should be incorporated into the business case.

**Key Words:** Disposable EEG electrodes, business case, healthcare-associated infection

#### Introduction

In recent years the impact of Healthcare Associated Infections (HCAI) has become more widely understood, both in terms of the clinical and financial implications. The use of disposable items within the wider healthcare setting is now viewed as normal practice. It would seem, however, that disposable EEG electrodes within Neurophysiology are less commonly used. This paper examines the case for using disposable EEG electrodes for all EEG and EP investigations, and provides an overview of the many Department of Health documents and initiatives that support such practice. In addition, the paper provides

an outline of a successful multidisciplinary business case for disposable electrodes and demonstrates the impact within one Neurophysiology service.

#### The Facts

Healthcare Associated Infection is defined as an infection that occurs in a patient in the healthcare setting in whom the infection was not present, or incubating, at the time of admission (World Health Organisation, 2002). It is a global issue, affecting approximately 1.4 million people worldwide (World Health Organisation, 2002). HCAI is a major killer of patients of all ages across the world today (World Health Organisation, 2005). This equates to approximately 9% of in-patients, at any one time (National Audit Office, 2000). For the patient, infection can result in functional disability,

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emotional stress, reduced quality of life and, in some cases, prove fatal. It has been estimated that approximately 5,000 patients die each year as a result of HCAI in the UK and, in a further 15,000 cases, has been considered a substantial contributor to patients' mortality (Department of Health, 2002). In fact, anecdotal evidence suggests that more patients in the UK die from HCAI than road traffic accidents. HCAI also has significant financial implications: the estimated cost due to HCAI is £1 billion per annum (National Audit Office, 2000). Another study (adjusted for age, sex and co-morbidity) concluded that patients with HCAI cost the NHS 2.8 times more per case to treat, their hospital stay is 2.5 times longer on average, and they are 7 times more likely to die (Mannion, 2000).

The NHS, however, is treating more patients than ever before, and this all comes at a cost. It has been estimated that, in gross terms, the financial deficit of the NHS was approximately £1.3 billion (King's Fund, 2006). Therefore, in this current climate, it may seem inappropriate to submit a business case for disposable electrodes, but assessment of the cost of control programmes to reduce infection, versus benefit, shows that major savings can still be maintained (Department of Health, 2003a).

Whilst HCAI cannot be totally eradicated, control of infection is an integral part of the role of all health care personnel. Tackling infection control requires an uncompromising commitment from managerial and clinical leaders, nationally and locally (Department of Health, 2003b). We have a duty, as healthcare professionals, to encourage a shift in culture, to one where the use of disposable electrodes, in all EEG and EP investigations, is viewed as normal practice.

#### **Risks associated with the use of reusable EEG electrodes**

It was stated in a health service circular, some time ago, that immediate action was required to ensure that decontamination was carried out effectively, and also to explore the practicality of implementing a policy for the use of disposable items (Department of Health, 2000). A local review of the reusable EEG electrode decontamination protocol concluded that it posed a number of risks. Decontamination needs to be carried out effectively, and adherence to an agreed protocol is essential. Yet the reality is that, in some situations, the electrodes will not be cleaned in the appropriate manner, and skin debris may remain on

the electrode cup. Electrodes that are not cleaned effectively can lead to cross-infection by Multi Resistant Staphylococcus Aureus (MRSA) and, also, Varicella Zoster (Chicken Pox virus) — for those patients in the incubation stage of the infection. The decontamination protocol (OSET, 1999) requires the use of chemicals listed in the Control of Substances Hazardous to Health (COSHH) regulations, in the UK, which is not ideal within a clinical environment. In addition, the local infection control team advised that this protocol would not eliminate the prions associated with Creutzfeldt-Jakob Disease (CJD).

No healthcare system can be entirely risk-free. Every patient and every staff member is a potential risk for cross-infection, and can harbour infection, whether symptomatic or not. Out-patients should be viewed as a source of cross-infection, just as much as in-patients. Changes in hospital care, and the increase in primary care facilities, have resulted in infection being transmitted through the community. Recent studies have shown that virulent strains, associated with high morbidity and mortality, exist within the community (Zetola et al., 2005).

Frequently, the infection status of the patient is not always apparent, whether an in-patient or out-patient, and maybe confirmed only after the reusable electrodes have been used on another patient. At the Walton Centre, reusable electrodes were being used on patients across a diverse range of locations: within the department on both out-patients and in-patients, ward-based portable recordings and long-term monitoring, ICU, theatre, and home-based recordings. This practice increased the scope of cross-infection. It is stated, in the OSET guidelines, that any breach of the epidermis, even with only slight rubbing to lower electrode impedance, predisposes the skin to leakage of tissue fluid that may become contaminated and provide a medium for cross-infection (OSET, 1999).

#### **The Business Case: Supporting Evidence**

For a department to change to disposable EEG electrodes, it may need to provide a business case, which should be built on a solid foundation of supporting evidence, to facilitate a successful outcome. Over recent years, the Department of Health has published documents with guidance to reduce HCAI, and these can be utilized for a business case. The documents include: Controls Assurance Standards for Infection Control (1999), Getting

Ahead of the Curve (2002), Winning Ways (2003), Towards Cleaner Hospitals (2004a), and Saving Lives (2005a). Infection Control is one of the core standards within the Standards for Better Health framework (Department of Health, 2006a). There is now a legal code of practice for the prevention and control of HCAI, which requires Trusts to do everything possible to eradicate avoidable infection, and appropriate procedures must be embedded into everyday practice. The code also states that new powers in the Health Act will be used if organisations fail to meet the minimum standards (Department of Health, 2006b).

In the Safety Domain section of Standards for Better Health, it requires that (a) the risk of healthcare acquired infection be reduced, (b) all risks associated with the use of medical devices are minimized, and (c) all reusable medical devices are properly decontaminated (Department of Health 2006a). It is important to note that electrodes are classed as medical devices because they are products used in healthcare for diagnosis, prevention, monitoring and treatment.

#### **Efficient working practice**

Standard EEG electrodes need to be decontaminated after every patient, as specified in both national (Evans et al., 1993) and international (OSET, 1999) guidelines. Also, the quality and performance of reusable electrodes deteriorate with time, and autoclaving significantly reduces their lifetime (Singh, 1997). The procedures specified in the guidelines are an inefficient use of time, when compared to that spent on disposable electrodes. It has been estimated that to undertake the process effectively takes approximately ten minutes per patient, and even longer when cleaning electrodes that have been used for long-term monitoring. In isolation this may not seem a significant amount of time yet, collectively, across our Neurophysiology service, this equated to approximately 450 hours per annum — just to clean electrodes. This time could be utilised more effectively, particularly when considering that this equates to approximately £6,500 per annum, based on a Band 6 salary (Department of Health, 2005b).

The 18-week delivery programme (Department of Health, 2004b) states that by 2008 no one will have to wait longer than 18 weeks from GP referral to hospital treatment. This target will pose significant

problems and pressures for many Neurophysiology services across the UK. Whilst the use of disposable EEG electrodes cannot solve this problem, it will enable more efficient working practices at a time when all aspects of our service are being evaluated.

#### **Who to get involved?**

There is no doubt that the business case needs to have a multidisciplinary approach. It is vital to seek the opinion of the Clinical Physiologists within your Neurophysiology department. Also, as there are different types of disposable electrodes available, it is useful to compare types of electrodes used within other Neurophysiology centres and to consider using this evidence within the business case. It is essential to demonstrate the support of the infection control team, as they are able to provide an expert opinion into the specific risks associated with reusable electrodes. Providing evidence that a competitive price has been negotiated is vital to any business case, and the procurement team will be able to support the negotiating process, as well as sourcing appropriate suppliers. At the Walton Centre, cup and lead disposable electrodes were purchased, as it is often the electrode lead that is overlooked in the decontamination process.

The opinion of the patient is fundamental to developments within the NHS. Patient and Public Involvement (PPI) Forums exist to provide a platform for the views and experiences of patients, their carers, and families. They have statutory powers to ensure that health service providers listen to their views. If you were a patient, which option would you prefer? Having reusable electrodes applied that may have been used within the department for many months, in various situations, potentially on patients whose infection status is unknown, or have single-use electrodes applied that are taken out of a packet and used solely for your investigation.

#### **Structure of the Business Case**

Each hospital will have a different format for presenting a business case. However, the business case should be as concise as possible to maximise its impact. Yet it is important to remember that the readers of the business case may have limited knowledge of your Neurophysiology service. Therefore this is the opportunity to provide background information about your service in your business case.

### Outline of the Business Case:

- **Purpose of request:** a brief outline of the request, together with an overview of the Neurophysiology service
- **Current practice:** an explanation of the purpose of the electrodes
- **Risk of not funding disposable electrodes:** including information from the infection control team, and any clinical incidents that have been logged whereby the infection status of the patient was not confirmed until after the test.

link into hospital ratings and targets. If the initial response to the business case is negative, it is wise to be prepared to negotiate.

### Surgical site surveillance, infection rate for depth and grid telemetry

The author was successful with the application for funding for disposable electrodes, which have been used at the Walton Centre for over eighteen months. A recent audit, within our service, showed a reduction in the infection rate of our grid and depth telemetry patients, from 18% in the year prior to the

### Option one

Description	Cost	Advantages	Disadvantages
Continue with reuseable EEG electrodes		No additional cost to the Trust	1. Risk of cross infection 2. Time lost due to decontamination process 3. Decline in technical quality of electrodes over time

### Option two

Description	Cost	Advantages	Disadvantages
Purchase disposable EEG electrodes		1. Reduction of cross-infection risk 2. Excellent technical quality 3. Streamlines the decontamination process	Additional financial cost

### Options available

It is important to be honest and discuss all the options that are available and their advantages and disadvantages.

### Technical quality of disposable electrodes

Prior to placing an order, we tested the recording characteristics and integrity of the disposable electrodes using a method originally described by Cooper et al. (1969), to confirm their integrity and recording characteristics. This information was included in the business case, which concluded that disposable electrodes had excellent, comparable recording characteristics to reusable electrodes.

### Presenting the Business Case

It is important to request a meeting with the Trust's Executive Team to discuss the business case. This provides an opportunity to raise the profile of your service, and demonstrate how your business case can

introduction of disposable electrodes to 0% in the year after the change. Whilst the reduction is not solely as a result of using disposable electrodes, it is likely to have been a contributing factor.

### Conclusion

HCAI is a worldwide problem and highlights the need for effective infection control measures in all healthcare settings. Disposable EEG and EP electrodes in Neurophysiology can contribute to the reduction of risks of cross-infection, and eliminate the use of COSHH substances for decontamination. Therefore, disposable electrodes have had a significant impact on our service. We have not regretted the decision to change to disposable EEG electrodes at the Walton Centre, and the Clinical Physiologists are unanimously in favour of the change. The funding is agreed on a recurrent basis, and we now view disposable electrodes as an essential requirement of our service.

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'The Current Debate' section of JET was introduced, a few years ago, to offer members the opportunity to publish potentially controversial topics on 'designated' pages as, under this heading, discussion was welcomed. Indeed, when new or novel ideas are being presented, it is healthy for a debate to be instigated, and, by publishing in JET, the ideas can be shared with our members.

A few subjects have already been 'debated' in earlier issues of JET, but topical discussions are more frequently carried out on the EPTA web. The main themes are noted on the 'EPTA Web Page Topics Update' in most issues of JET, some of which warrant expansion and elucidation. It is both interesting, and useful, to document these issues and members are encouraged to submit more 'controversial' papers to:

*judithal-seffar@talktalk.net*