EDITORIAL (to accompany ANCH-D-16-01037R1 "Clinical audit effectively bridges the Evidence-Practice Gap in Chronic Subdural Haematoma Management")

Title: Chronic subdural haematoma: disseminating and implementing best practice

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Chronic subdural haematoma (CSDH) is one of the most common 'neurosurgical' conditions, with a rising incidence especially among elderly patients [6]. The placement of a subdural drain following burr-hole evacuation had been supported as a type B recommendation (i.e. based on class II evidence) in an authoritative review published in 2003 [13] but the utilisation of this simple and inexpensive manoeuvre was infrequent in the UK according to a questionnaire survey conducted in 2006 [11]. Subsequently, our unit sought to provide class I evidence for the role of subdural drains in the management of CSDH with the conduct of the Cambridge CSDH Trial. This randomised trial was published in 2009 and provided high-quality evidence that the use of a subdural drain can more than halve the risk of recurrence (recurrence rate 9.3% with a drain vs 24% without a drain, p=0.003) without an increase in the rate of complications [10]. Additionally, in this issue of the *Acta Neurochirurgica* longer-term results from the Cambridge CSDH trial are presented showing that subdural drains are associated with improved long-term survival which appears similar to that expected for the general population of the same age and sex [5].

The accompanying paper by Tailor et al. from the King's College Hospital in London provides a unit-specific perspective regarding the post-trial dissemination and implementation phase [12]. The authors report that the use of drains increased from 17% to 35% in the post-trial period, but it was only until after a departmental presentation of the trial results in 2015 that drain utilisation increased to 75%.

This is an important paper as it highlights the difficulties associated with implementation of trial findings in real-world practice. Of course, this is an issue that affects all clinical disciplines, so much so that in recent years 'implementation research' has become a scientific field *per se*. Implementation research has been defined as "the scientific inquiry into questions concerning implementation—the act of carrying an intention into effect, which in health research can be policies, programmes, or individual practices (collectively called interventions)" [8]. The science of implementation "can consider any aspect of implementation, including the factors affecting implementation, the processes of implementation, and the results of implementation, including how to introduce potential solutions into a health system or how to promote their large scale use and sustainability" [8].

A number of barriers may affect the implementation of the findings of a trial in the real-world. Such barriers may exist at the level of the patient, the individual clinician, the healthcare team, the healthcare organisation, or the wider environment [3]. Clinicians, including surgeons, do not simply rely on clinical research and trials for their decision-making; personal experience and departmental experience play an important role in guiding clinical decisions for individual patients. Clinical autonomy and judgement are also considered important; trial findings or guidelines which go against the "usual" practice of an individual surgeon, unit or organisation may face resistance [4]. Another barrier is a lack of belief in the model of evidence-based medicine and the necessity of randomised trials for providing high-quality answers to important questions in an unbiased way. Surgeon-led efforts are underway in the UK to educate surgical trainees in the concepts of evidence, randomisation, equipoise, bias etc [9]. However, as Tailor et al. state, there is a need for having departmental mechanisms in place for critically appraising and implementing changes in response to emerging evidence. This is especially important in an era characterised by widespread subspecialisation, when individuals often struggle to keep up with the information overload available to them.

Finally, we would like to highlight an additional mechanism that can facilitate dissemination and implementation of trial findings, namely, the conduct of prospective multi-centre observational studies (also known as national audits in the UK). Such studies can also serve the purpose of ensuring that the findings of a trial hold true in the real-world. For example, in the multi-centre prospective observational CSDH cohort study of the British Neurosurgical Trainee Research Collaborative [7], data on 1205 patients with CSDH were collected from 26 of the 33 UK and Ireland neurosurgical units between May 2013 and January 2014. The project was driven by trainees and supported by consultants in all participating units [2]. The study found that a subdural drain was used in 85% of patients, while in 2006 85% surgeons in the UK and the Republic of Ireland would either never use or use drains in less than quarter of burr hole drainage operations [10]; this confirms the substantial uptake of the Cambridge CSDH trial findings across the UK [1]. Additionally, the study established that the UK-wide recurrence rate was 9%, which is very similar to the recurrence rate observed in the drain arm of the Cambridge CSDH trial. More importantly, multivariate analysis demonstrated that failure to insert a drain independently predicted recurrence and

unfavourable functional outcome at discharge. This serves as a validation of the effectiveness of subdural drains in a real-world setting.

Conflict of Interest: The authors declare that they have no financial conflict of interest.

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