Neurocognitive outcomes for acute presentations in Pediatric Neurology

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Mortality has fallen for many of neurological conditions in childhood, which has exposed the need for data on morbidity and its predictors, particularly if it may be preventable, e.g. with vaccination for infectious disease.[1] The economic cost of chronic neurological conditions in childhood is very substantial. In addition to the cost of acute treatment and rehabilitation for those who need it, e.g. after traumatic brain injury (TBI) or stroke,[2] life expectancy, although reduced, may be much closer to that of the typically developing child than many physicians appreciate.[3, 4] The conditions in this section on neuro-developmental disorders typically come on relatively suddenly in child with or without previous problems and have a cost in terms of cognition in a substantial proportion of the patients. For an initial presentation with epilepsy in the clinic, just as for acute presentation with, in- or out-of-hospital cardiac arrest, stroke, or neurological complications of essential treatment, such as brain tumor or cardiopulmonary bypass, the first question that parents and physicians want answered is "How is s/he going to be in the long term?" The family then want to know what can be done to optimise outcome for their own child. If the attending physicians cannot supply answers to either of these questions, they usually turn to alternative sources of information from social media, including family support groups as well as the internet. Despite this high level of anxiety for all those involved, especially if there may be a medicolegal claim in countries where no-fault compensation[5] is not available, there has been a paucity of long-term outcome data to inform conversations with families and to act as endpoints in essential trials of treatment.

Recently in a number of areas there has been a focus on cognitive outcomes and the papers in this section represent an attempt to pull this literature together to encourage debate and, ideally, appropriate funding for adequately powered studies which involve not only observation of the natural history but appropriate trials of management. For some conditions, such as paediatric stroke, to the professional the initial cognitive outcome may look relatively

good, and there is some evidence for better outcome than for the elderly adult for the same extent of injury perhaps related to "plasticity" but children may "grow into" certain deficits.[6] There are very few data on whether physical or cognitive rehabilitation improves outcome or even has a detrimental effect[7] so the planning and conduct of randomized controlled trials is very welcome; it will be essential to avoid publication bias in favour of those suggesting a positive effect. In pediatric stroke, the actual infarct may be small or large and may occur at a very early age or in a teenager and these may have important effects on outcome, as Greenham et al point out.[8] Site of neuroimaging abnormality is not necessarily a predictor of outcome in acute neurological conditions but, as Catsman-Berrevoets discusses,[9] recent studies in cerebellar mutism suggest more widespread abnormality, at least acutely, and this may be worth investigation with novel neuroimaging techniques in all causes of cognitive difficulties associated with acute neurological presentation.

For children with epilepsy it is clear that cognition is often affected before the onset of seizures even in children with no obvious genetic or neuro-imaging cause for their seizures. In addition, as outlined by Braun,[10] the combination of clinical and sub-clinical seizures and the drugs used to treat may have a combined effect on cognitive outcome which is often difficult to monitor if clinics are spaced at six month intervals.

For children with global insults such as head injury, encephalitis or meningitis, the prognosis is often thought to be poor, as Kirkham discusses,[11] but in fact many of these children do surprisingly well and it is important to consider etiology before making any prognostic predictions. For example, in children with meningococcal meningitis, although they may often lose limbs, cerebral infarction is very rare, whereas in pneumococcal meningitis arterial or venous stroke may affect up to 50%, making this a focal as well as a global injury.

Seizures and status epilepticus are associated with poor outcome in many etiologies of coma. Intensive care management requires sedation and sometimes therapeutic paralysis so clinical seizures may not be manifest. There has been considerable controversy about the importance of electrographic seizures in predicting outcome, and more importantly, on how they can be most appropriately managed, but the data set out in Hahn's contribution suggests that this should be an important priority.[12]

Understanding the previous literature is important as we move forward to the era of expensive international randomised control trials. To reduce cost it is often tempting to document a simple outcome scale and indeed even when IQ or executive function have been collected, they may not be published because the whole team has moved on. There are methodological concerns about data already published, for example reporting of the number of assessors and their training,[13] but these issues are not likely to put a child with apparently poor outcome into a good outcome group. One way forward may be to collect routine academic data eg., the results of SATs in the UK, as these are standardised and reflect the real world in terms of work opportunities as well as educational attainment. It may then be possible to assess outcomes and the results of introduction of new interventions, such as vaccination or effective Pedaitric Intensive Transport and Care, on a population basis in a timely fashion.

There are very few data on cognitive rehabilitation in children despite the now dazzling array of apps for phone and tablet as well as computer which can be used to practice cognitive skills including language, attention and processing speed. Interventions to enable families to work with children and adolescents on their behavioural issues, which are likely to improve social participation, are also likely to be important. However, there are generic barriers to

self-management via telemedicine[14] which may limit availability despite the attraction of low cost to funders. There is now real hope of improvement in acute management and cognitive rehabilitation for children, families and physicians.

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