



Infant cranial ultrasound: Applying practice development principles to enhance service delivery



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KEYWORDS

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Abstract *Aim:* To explore the potential for local delivery of evidence based practice by supplementing a secondary care infant cranial ultrasound protocol with one used at a tertiary referral centre.

Method: A single practitioner used 'Practice Development' methodology to learn, implement and evaluate the impact of adding supplementary (postero-lateral) fontanelle scanning to the anterior fontanelle infant cranial ultrasound examination routinely used at one District General Hospital (DGH). Over a 7 week period (March and April 2010) twenty one infants were scanned using both the routine (anterior fontanelle) and the new (additional postero-lateral fontanelle) technique. Images were evaluated by an independent tertiary referral centre expert (consultant neuroradiologist) to compare posterior cranial fossa visualisation and obtain a diagnostic second opinion. Pathology prevalence, posterior fossa visualisation and diagnostic agreement between local and tertiary referral opinions were compared.

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Results: Visualisation of the posterior cranial fossa was considered to be subjectively improved for the multiple fontanelle technique. The required associated increase in overall examination time did not necessitate additional infant handling. This small pilot study did not show any statistically significant improvement in intracranial pathology detection.

Conclusion: This study suggests that provision of multiple fontanelle scanning is practically feasible in a secondary care setting. Continued monitoring of diagnostic outcomes is required to assess its clinical value.

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Introduction

Health care services which reflect the best interests of patients and carers are an important component of contemporary service provision (Chin and McNichol, 2000). Any evaluation of health care delivery should consider impact at practitioner, patient, service delivery and organisational levels (Page and Hamer, 2002).

This study was undertaken at a secondary care provider (District General Hospital) which has a strategic objective to provide evidenced based accessible care close to the patient's home (Beard, 2010). The aim of the study was to assess the feasibility of improving diagnostic outcomes by creating an infant cranial ultrasound service at a similar level of technical complexity to that delivered at a geographically distant tertiary referral center.

The emancipatory 'Practice Development' methods employed in this study are characterised by a transformational culture, a shared vision for positive change, shared responsibility and staff development perspectives (Manley and McCormack, 2003).

Background

Diagnostic tests are used to establish and monitor the presence of disease, inform treatment and assess prognosis (Mant, 2005). Infant Cranial Ultrasound (CUS) is performed to assess and monitor the infant brain (Maalouf et al., 2001). It can be performed in infants up to approximately 15 months of age (Siegel, 2007) but is most commonly used in the neonatal period (Larroque et al., 2003) where it helps guide clinical management and provides a basis for long term prognosis of neurodevelopmental outcome in infants with a suspected brain injury.

The study hospital provides a sonographer-led infant CUS service to the Special Care Baby Unit (SCBU), postnatal and paediatric wards and to the

outpatient department. Delivery of this service is informed by guidelines compiled by the regional neonatal network based on the recommendations of the British Society for Paediatric Radiology (2003). The local guidelines outline minimum standards for image acquisition and recommend use of the anterior cranial fontanelle as the preferred – 'acoustic window' – for gaining access to the infant brain.

The anterior fontanelle (AF) is the largest of six cranial fontanelles and is considered the standard primary approach for infant CUS (van Wezel-Meijler, 2007; Carty et al., 2001). In the majority of cases scanning through the AF provides detailed information about the anterior and middle cranial contents but sometimes provides incomplete information about the more posteriorly located structures, particularly in the occipital regions and posterior cranial fossa (Leijser and Cowan, 2007). It is recognised that supplementary use of the posterior fontanelle (PF) and/or the paired postero-lateral fontanelles (PLF) can overcome this limitation (van Wezel-Meijler, 2007).

At the study site, AF scanning is taught, used and supported by radiological and medical staff as the standard technique. In contrast to practice at the tertiary referral centre multiple (posterior and postero-lateral) fontanelle scanning is not routinely performed or requested. It is hypothesised that this approach reduces the ability of the local service to detect posterior fossa abnormality in comparison to the service offered at the tertiary referral centre. In particular it is suggested that failure to visualise the occipital regions and posterior fossa may result in underdiagnosis of (posterior horn) intraventricular and cerebellar pathology.

Intraventricular haemorrhage (IVH) occurs in up to 40% of infants with a birthweight less than 1500 g and in those born prematurely before 32 weeks gestation (Carty et al., 2001). Suboptimal acoustic penetration to the posterior fossa when using the anterior fontanelle as the only acoustic

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