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Project to improve management following a head injury for acute medical admissions and reduce CT head requests as per NICE guidance

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Introduction: Head injury is a common presentation to A&E accounting for 1.4 million attendances each year. Most patients require no radiological intervention and only head injury advice. Inappropriate CT head scans leads to unnecessary radiation exposure and significant expense to the NHS. NICE have produced guidelines for head injury management and criteria for a CT Head scan.

Objectives: Aim of this study is to assess management of head injury in acute medical patients and use of CT head scanning against NICE guidance and to put in place interventions to improve compliance with NICE guidance and reduce unnecessary CT head scanning.

Method: In the initial audit, a total of 26 patients' cases were reviewed over a period of one month. Adult patients aged 16 years and over attending A&E with a head injury were audited. Data was collected by reviewing medical documentation and the imaging IMPAX system. Following the initial audit 3 interventions were put in place: Teaching sessions to junior medical staff around the management of head injury as per NICE guidance; sign posting to trust head injury protocol; printed summary NICE guidance head injury pathway next to A&E staff computers. Following these interventions, re-audits were performed as per the method above.

Results: In the initial audit, 13 out of 26 patients met the criteria for a CT head. A total of 13 (50%) of 26 patients had a CT head scan despite not meeting NICE head injury criteria. Following the 1st intervention the number of CT head scans that did not meet NICE criteria fell to 11 (42%) out of 26. Following interventions two & three, the number of inappropriate CT head scans fell further to only seven (27%) out of 26 patients.

Conclusion: The current management of acute medical patients with head injury showed that many CT head scans were requested inappropriately and did not fit NICE criteria. Following several interventions, we improved the knowledge of junior medical staff, compliance with NICE head injury guidance and criteria for CT head scans, resulting in a reduction of inappropriate CT head scans from 50% to 27%.

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The study of small world network in the patients with concussion and diffuse axonal injury

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Objective: Brain functional network is constructed to analyze the properties of small world network in patients with concussion and diffuse axonal injury by resting functional magnetic resonance imaging (fMRI).

Method: 13 patients with concussion, nine patients with diffuse axonal injury and 14 healthy controls were collected to test the resting fMRI. The collected data was labeled brain areas by AAL90 and Dosenbach160 after pretreatment. The correlation coefficients of the brain regions were calculated and constructions of N*N matrix were founded in specified sparsity. To study its small world and areas under curve of network parameter were calculated. Variance analysis was used to distinguish the differences of the two groups.

Results: In given threshold, the brain network of patients with concussion, diffuse axonal injury and normal subjects were in line with the characteristics of small world, and a higher situation of global efficiency, local efficiency and average connectivity degree ($p < 0.05$) were presented in patients with concussion and a lower situation of global efficiency, local efficiency and average connectivity degree ($p < 0.05$) were presented in patients with diffuse axonal injury.

Conclusion: The brain network of patients with concussion or diffuse axonal injury still has a characteristic of small world, but the global efficiency, local efficiency and the average degree of the patients can be higher or lower which may be caused by compensation or de-compensation.

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