Objectives

• Why is childhood head injury important to me?

• 2014 update to NICE head injury guideline (CG176)

• Childhood head injury research
The clinical perspective

• Common

• Minimal head injury

• Severe traumatic brain injury

• Mild traumatic brain injury (mTBI)
The parent perspective
Balancing risks in mild TBI
Right test, right patient, right time
NICE guidelines for head injury

- Updates reflect latest evidence

- Introduced CT scans as reference standard
- Since inception, downward trend in mortality rates (but upward trend in admissions)

- Early management
  - Point of injury to ED discharge, but not into hospital
  - Investigation and admission decisions
The NICE guideline update (CG176)

- Getting to the right place
- Which test
- Which patients
- Timelines for investigation and reporting
- Safeguarding
- Discharge advice
- Communication
Key questions for CT scanning

• Do all need a CT scan?

• Do all need a CT scan immediately?
Deciding who to CT

• Can we predict neurosurgical TBI?

• Clinical decision rules (CDRs)
  – CHALICE (UK)
  – Missed injuries, low CT rates
  – Improve early pick-up

  – CATCH and PECARN (Canada/US)
  – Rising CT rates (doubled between 1995/2005)
  – Up to 50% of mild TBI getting scanned
  – Drive to reduce scan rate, but not miss any TBI
### Performance accuracy

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<th>Sensitivity</th>
<th>Specificity</th>
<th>NPV</th>
<th>PPV</th>
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<tr>
<td><strong>CHALICE</strong></td>
<td>97.6%</td>
<td>87.3%</td>
<td>99.9%</td>
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<tr>
<td>Clinically significant intracranial injury in patients with GCS 13-15 Minimal exclusion criteria</td>
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<td><strong>CATCH</strong></td>
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<td>70.2%</td>
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<td>Need for neurologic intervention</td>
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<td>Rigid exclusion and inclusion criteria</td>
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<td><strong>PECARN &lt;2yrs</strong></td>
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<td>96.7%</td>
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<td>Clinically important traumatic brain injury</td>
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<td>Rigid exclusion criteria, limited inclusion criteria</td>
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*Comparison not straightforward due to different criteria*
CG176 update – which CDR?

• Stick with CHALICE as base
• Has been in use for last 7 years
• Seems to work
• Seems cost effective

• Other CDRs have not demonstrated sufficient superiority to warrant wholesale change across the UK
Are we scanning at the right time?

- The clock is ticking
- 4 hours to neurosurgical intervention

- But childhood head injuries have an evolving picture

- Observation vs immediate CT
- Common practice to observe in some situations
What happens if we observe?

- Observation associated with reduced CT use
- Equivalent rates of TBI between observed and non-observed

- Does it affect outcome?
- How long should we observe for?
Is it safe to observe?

• Subsequent reports from PECARN
  – Isolated severe injury mechanism
  – Isolated vomiting
  – Isolated scalp haematomas in <2 years
  – Isolated loss of consciousness

• Risk present but low
• CG176 - Observation seems a reasonable strategy for *some* patients
The update....

guidance.nice.org.uk/CG176

nice.org.uk/pathways
CG176 – stratifying risk

• High risk factors
  – CT within one hour

• Medium risk factors
  – CT scan within one hour if more than one present
  – Observe if single variable present
  – CT within one hour if deteriorates
  – Observe at least four hours from injury

• Warfarin
  – CT scan within eight hours
And then after CG176 published...

  - Easter JS et al. *Ann Emerg Med* 2014 (March 10)

- External comparative validation
- 1009 patients, single centre
- Prospective data collection on CDRs & physician suspicion of TBI
## Performance accuracy

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Additional update areas

• Timeliness
  – Initial assessment
  – CT scan performance and reporting

• Communication
  – With GPs/health visitors/school nurses
  – With patients and families/carers
Discharge practice

• Acute
  – Risk of bleeding/rising ICP

• Long term
  – Post concussion syndrome
  – Post traumatic stress disorder

• Linking to services and organisations
• Available at guidance.nice.org.uk
Childhood head injury research

- Parental Responses To Experiences of Child Trauma (PROTECT)
- Predictors of anxiety outcomes following mTBI and parenting styles
- Validation of outcome measures for mTBI
- Psychological first aid
- MEMPHIS
MEMPHIS

Multicentre Emergency Medicine & Psychology Head Injury Study

Can an enhanced discharge package of information and support for parents improve psychological outcome in young children who experience mild TBI?
The hidden burden of mild TBI

• Everyone expects normality but.....
  – Abnormal MRI at 3 weeks in 30% mild TBI after normal CT
  – Post traumatic stress disorder (PTSD)
    • 27% of adults at six months
  – Post concussion syndrome (PCS)
    • 20% of children at three months
  – Behaviour problems, ADHD
  – Social & educational re-integration
  – Violent criminal offences
Post concussion syndrome

- Cognitive, physical, psychological, emotional
- Impairs daily functioning
- Some improvement over time
- May become entrenched
- More common in stressful family circumstances
mTBI in young children

• High incidence in young children
• Young brains particularly vulnerable to damage
  – Plasticity vs elasticity
• Sequelae may go unrecognised
  – Parents exasperated, behaviours ingrained
• mTBI before 5 years
  – Hyperactivity/inattention & conduct disorders
  – Personality change & aggression
Current practice

• Standard discharge advice
  – Focuses on acute early deterioration
  – Limited in setting parental expectations

• Unable to identify at risk subgroups

• Psychological outcomes are modifiable
  – Simple interventions in children and adults
  – Is the same true in young children?
MEMPHIS

• Feasibility stage
• Intervention for parents of young children (18 months – 5 years) with mTBI
• Discharged from ED/observation unit
• Follow up at one week and three months
• Patient & public involvement
• Determine core outcomes of importance to families
Potential impact

• Reduce prevalence & severity of PCS in vulnerable group
• Appropriate signposting of psychological support
• Enable early return to normal family activities
• Long term gains in health and well-being
• Clinically and cost effective for families and health care services